

Forest Economy in the U.S.S.R.

An Analysis of Soviet
Competitive Potentialities

*Skogsekonomi i Sovjetunionen med en analys
av landets potentiella konkurrenskraft*

by

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Lord Keynes on the role of the economist:
“He must study the present in the light of the past
for the purpose of the future.”

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Foreword

Forest Economy in the U.S.S.R. is a special study of the forestry sector of the Soviet economy. As such it makes a further contribution to the studies undertaken in recent years to elucidate the means and ends in Soviet planning; also it attempts to assess the competitive potentialities of the U.S.S.R. in international trade.

Soviet studies now command a very great interest and are being undertaken at some twenty universities and research institutes mainly in the United States, the United Kingdom and the German Federal Republic. However, it would seem that the study of the development of the forestry sector has not received the detailed attention given to other fields. In any case, there have not been any analytical studies published to date elucidating fully the connection between forestry and the forest industries and the integration of both in the economy as a whole. Studies of specific sections have appeared from time to time, but I have no knowledge of any previous study which gives a complete picture of the Soviet forest economy and which could facilitate the marketing policies of the western world, being undertaken at any university or college.

With the present work the Department of Forest Economics of the Royal College of Forestry (*Skogshögskolan*), Stockholm, Sweden, has undertaken the important but difficult task of endeavouring to fill this research gap in forest economics. It should be stated that the conditions for a more objective and valid analysis of the purely forestry situation in the U.S.S.R. have improved very considerably during the last few years through the recently made forest inventories. This has made it possible to carry out the present work on a regional basis, with studies of the position of the forest industries in the different economic regions of the U.S.S.R., and to attempt to forecast the development potentialities of the forest industries on the basis of the inventories made. In view of the importance of assessing the competitive potentialities of the Soviet planned economy in forest products entering international trade a great deal of attention has also been devoted to the centrally directed Soviet trade policy and to the possibilities that the Soviet State trading monopoly consequently has, compared with the divided efforts of the capitalist countries, in the intense competitive situation which exists in the world market to-day.

This study has been facilitated by a special grant from the Pulp Industry Foundation for Research and Teaching in Technology and Forestry (*Cellulosaindustriens stiftelse för teknisk och skoglig forskning*). With the financial means which have been placed at our disposal it has been possible to commission the undertaking of this study by Karl Viktor Algvere, who has previously been associated with the Department of Forest Economics as research leader on special grants. Both in the planning and the undertaking of the research project Mr. Algvere has been able to draw from his extensive experience in the field concerned. He has systematically followed the development in Soviet forestry and forest industry on the basis of original Russian publications of the last 14 years and should therefore be familiar with the intricate matter of Soviet studies.

The importance given to the setting of goals in the analysis of Soviet forest management—a subject in which Mr. Algvere has taken special interest—is reflected in the particular attention devoted to it in this study with an account of the various economic ideologies and with a comparison of the systems of forestry employed under the Czarist regime and under the Soviets. Therefore Part II “Management of Forest Land under different Economic Systems”, which follows the introductory Part I “Natural and Economic Background”, provides not only a background for continuing the study of Soviet forest resources, forest industries and marketing policies concerning forest products but also can be considered as a special and carefully detailed thesis on the pertaining questions.

Stockholm, April 1966

EINAR STRIDSBERG

Head of the Department of Forest Economics
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Translator's Note

This study was compiled in Swedish with extensive passages in English, German and Russian. Mr. J. Flower-Ellis has corrected the sections concerning vegetation and conditions of forest growth; for the translation work I had the assistance of Mrs. Eva Marshall. The use of technical terms was decided in consultation with the author. The final version of the translation was supervised by the author together with the undersigned.

P. E. Burke

Acknowledgements

This study has been undertaken as a research project of the Department of Forest Economics of the Royal College of Forestry, Stockholm, Sweden. I acknowledge my indebtedness to that institution which has placed resources at my disposal for the realisation of this project.

My chief debt of gratitude is due to Professor EINAR STRIDSBERG, the Head of the Department of Forest Economics, for the initiation of the study and for the generous support and friendly advice at all stages of the work.

The various portions of the text have been read in draft form by a great many experts and improved by their comments. In this respect I owe profound gratitude to Professor THORSTEN STREYFFERT, the former Dean of the Royal College of Forestry, Stockholm, who has given me much encouragement, insight and valuable suggestions during our discussions of the subject matter.

For valuable suggestions made after reading the manuscript I am indebted to Professors GUNNAR ALEXANDERSSON of the Stockholm School of Economics, BERTIL NÄSLUND of Stockholm University, EINO SAARI, the former Head of the Department of Forest Policy at the University of Helsingfors, Finland.

Part IV has benefited from the critical comments of Professor VILJO HOLOPAINEN, the Director of the Forest Research Institute, Helsingfors, Finland, and of KNUT RONGE, the Director of the Swedish Timber Export Association, Stockholm.

My indebtedness is extended also to EDUARD POOM, lecturer at the University of Stockholm, who has read Part II and some sections of Part IV.

In addition, I have been aided in the collection of the material, in the compilation and the translation of the manuscript by a great number of persons in the employment of the Royal College of Forestry and elsewhere. Their help and co-operation are acknowledged with gratitude.

Stockholm, April 1966

K. V. ALGVERE

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Abbreviations

A. Statistical Yearbooks

N.Kh.SSSR	<i>Narodnoye Khozyaistvo SSSR</i> (National Economy)
V.T.SSSR	<i>Vneshnaya Torgovlya SSSR</i> (Foreign Trade)
Y.F.P.S.	FAO: Yearbook of Forest Products Statistics

B. Russian Journals and Newspapers

Izv.	the newspaper <i>Izvestia</i> (News)
L.Kh.	the monthly journal <i>Lesnoye Khozyaistvo</i> (Forest Management)
L.P., 1953,8	the monthly journal <i>Lesnaya Promyshlennost</i> (Timber Industry), 8, 1953
L.P. 15 Oct. 1954	the newspaper <i>Lesnaya Promyshlennost</i>
Pl.Kh.	the journal <i>Planovoye Khozyaistvo</i> (Planned Economy)
V.E.	the journal <i>Voprosy Ekonomiki</i> (Questions of Economics)
V.T.	the journal <i>Vneshnaya Torgovlya</i> (Foreign Trade)
D.P.	the journal <i>Derevoobrabatypayushchaya Promyshlennost</i> (Woodworking Industry)
L.Zh.	the journal <i>Lesnoy Zhurnal</i> (Forest Journal)
B.P.	the journal <i>Bumazhnaya Promyshlennost</i> (Paper Industry)
T.I.L.	the journal <i>Trudy Instituta Lesa</i> (Reports of the Forest Institute)
M.F.	the journal <i>Morskoy Flot</i> (Mercantile Marine)
E.G.	the weekly newspaper <i>Ekonomicheskaya Gazeta</i> (Newspaper of Economics)

C. Other Journals

P.T.J.	Paper Trade Journal
Z.f.W.	Zeitschrift für Weltforstwirtschaft
J.F.	Journal of Forestry
O.W.	Osteuropa—Wirtschaft
Z.f.F.J.	Zeitschrift für Forst- und Jagdwesen
J.Ecol.	Journal of Ecology
Fav.	Forstarchiv
R.E.S.	The Review of Economics and Statistics
A.E.R.	The American Economic Review
E.P.	Economics of Planning
F.A.	Foreign Affairs

Introduction

I. Purpose and Scope

This study deals with the forestry sector of the Soviet economy with particular reference to its potentialities. The main purpose is to give a picture of the forest economy as a whole and in particular to examine the background of the competitive ability of the Soviets in selling forest products in international markets. In any study which aims to examine the means of competition or the marketing potential of certain bulk commodities, attention must be centred on the raw-material resources and the conditions for obtaining, transporting and marketing them in existing internal and external economies, as well as on the policies pursued in this connection.

Timber stock is a renewable raw material and thus its position is different from a great many other raw materials, such as minerals. Consequently, the object of our study must be the entire process which is necessary for the production of timber as a raw material. This means that the primary stage of forest production constitutes a very important part of this study and thus we shall be concerned with how the management of forest land is carried out. As the growing of trees is a long-term undertaking, and the successive phases of production in the forestry sector do not coincide in time, one is obliged to examine developments in the past as well as to ascertain the present position. In the main we shall base our assessments of future developments on forest management because of the exceptional position occupied by the forestry sector compared to other branches of the economy—and this applies even to the end products of the wood-processing industry, the competitive position of which in fact will be investigated here. One must thus attempt to get an idea of the productive capacity of the forests and of the measures which have been taken in order to attain or to improve the output of timber.

The other important aspect in assessing the competitive ability is the position of the forest industries and their development possibilities. Forestry and forest industries are highly integrated especially in the modern industrial society. To-day it is inconceivable to establish wood-processing factories without taking into consideration how their supply of raw material will be provided. Consequently, it should

be evident that industries that are based on wood must plan their activities according to the supply and location of the raw material.

Geographical aspects play a particularly prominent part in the development of the Soviet forest industries. The very vastness of the U.S.S.R. means that there are quite different conditions for forestry operations in various parts of the country, and consequently this also applies to the activities of the forest industries. In order to give a more adequate description and appraisal of the potentialities of the forest industry it has been necessary to do this on a regional basis. Thus only the timber-surplus regions will be dealt with in more detail as these regions will be the only ones of any competitive importance for the next 20—30 years.

An important factor to be taken into consideration in the assessment of competitive ability is the domestic consumption of forest products. *Under the Soviets this consumption is largely planned by the State* and in principle the demand is adapted in accordance with the production trend. As there are no possibilities of obtaining data about the actual domestic requirements of forest products, this question cannot be dealt with in this study. However, the demand for forest products in the home market probably affects the Soviet exports to a great extent. The balance between domestic consumption and exports, which the Soviets regard mainly as a matter of planning, can in theory be deduced from the general economic policy.

This means that in this study one cannot avoid going into the economic system itself and how it is directed. Here it should be emphasised that the supreme planning authority determines not only the direction of production and distribution within the forestry sector but also determines the formulation of the competitive policy to be adopted in the export of forest products.

As the Soviet system differs in many respects from that of the free-market economy, it is important that the way in which the Soviet system functions should be elucidated more closely. It is also desirable to have a description of institutional arrangements as far back as necessary to explain how and why the present system has developed. Considering the vastness of this task only certain characteristic features of the system can be dealt with here. Therefore historical description will be kept to the minimum necessary to understand the functioning of the present-day forest economy. However, it would be important for western countries to get to know how the Soviet system has influenced basic forest production, the expansion of the forest industries, and what means the Soviets have at their disposal

to increase their share of the market in international trade with forest products. One must never forget that the U.S.S.R. has been the scene of a political, social and industrial revolution. Actually, the transformation of an industrially backward country into a giant industrial power, which has brought about a structural change of the whole economy, has had a tremendous impact on the forest economy at large. One should bear in mind that Soviet institutions were created to serve certain purposes of Soviet economic policy. This is the reason why a comparison must be made between forestry conditions in Czarist Russia and Soviet forestry, even though such a comparison is not strictly necessary to determine the present competitive ability of the Soviets in the marketing of forest products.

These and many other questions would seem to merit careful consideration because the forest economy of the U.S.S.R. has been the province of very few specialists—the “Sovietological” forest economics experts—because the ordinary forest economists in western countries need to know little outside of the traditional forest practices in their native countries. There are many explanations of this state of affairs. One certainly is the language barrier. Another is conservative thinking and the belief that Soviet forest economics is a matter of politics and therefore concerns politicians rather than foresters. Furthermore, it is believed that the study of “Sovietology” is seriously impeded by lack of information.

This study does not intend to deal with or to evaluate the Soviet politico-social system. Here the evaluation of economic activities will be made in as politically neutral a way as possible.

In brief, the primary purpose of this study is to investigate the competitive potentialities of Soviet forestry and forest industries. The conclusions may very well be of some value to many of those who are concerned with long-term planning affected by international trade in forest products.

A further purpose is to introduce Soviet forestry and its main problems to forest economists and others outside the U.S.S.R. who happen to be interested in world forestry.

Finally, there might be reason to ask what lessons can usefully be drawn from Soviet experience in the forestry sector by developing countries seeking to build up their forest industries.

However, there cannot be uniform coverage of the huge fields which are the subject of the four separate parts of this thesis. Certain parts will be dealt with in detail, some subjects will be treated briefly while others which are mentioned will get very little discussion. The omis-

sions are due partly to the lack of authentic source material, and partly to the decision of the author to cover, at least in outline, those features of Soviet forestry which distinguish it from forestry in other countries.

Also it is necessary to touch upon the limitations of scope involved with the main purpose of the study, namely the competitive potentialities of the forestry sector of the Soviet economy. Availability and use of labour, employment structure and wage determination will be omitted on the grounds that these require separate treatment and would enlarge the thesis too much. There will be no discussions about mechanisation and efficiency of forestry work, despite the fact that Soviet authorities maintain that it is in this very field that the Soviets have made their greatest achievements. Certainly it cannot be denied that a highly mechanised forestry is far superior from the competitive point of view to a less mechanised forestry. However, as the emphasis of this thesis is not on mechanical handling in the various phases of forestry, the entire question of mechanisation has been omitted deliberately, despite the fact that mechanisation has far-reaching consequences on the utilisation of timber resources and also has a marked influence on the forest economy.

2. Nature of the Study and Availability of Source Material

The present study is based primarily on original Soviet publications supplemented by material published outside the U.S.S.R. In addition, considerable use will be made of original material which throws light on the conditions prior to the October Revolution. The principle applied here has been to use as far as possible original sources particularly as far as forestry and forest conditions are concerned.

As to the economic conditions in the main and to the Soviet system and communist ideology in particular, there has been some deviation from this principle seeing that the scrutiny of the original material in this field would necessitate an enormous amount of work which would be only of secondary significance regarding the main object of this study. This is the reason why references have been made in certain cases to the writings of some western authors whose criticism of the centrally planned system and the ideology on which it is based can be regarded as being more abstruse than intrinsic. The choice of such "Sovietological" experts, who are quite numerous in the subject of the general economy, has been made without regard to all the authors who have dealt with the subject.

In general, the forestry problems with which we shall deal have not been treated very extensively by non-Soviet writers. Thus it is not by choice but by necessity that the writer of this thesis has been obliged to depend almost entirely on Russian sources in dealing with the main problem. In cases where forest economists in western countries have dealt with the subject, reference has been made to these authors irrespective of whether findings are in support of or in conflict with the conclusions of the writer's thesis.

The main sources used in this study are the publications of Soviet forest economists and high officials in the administration of the forestry sector. A great many books, journals and newspapers, which are issued by the State publishing houses for the forestry sector or which are the organs of the technical and the scientific institutions in Soviet forestry, have been scrutinised for this thesis and constitute the actual basis of this study. The nature of Soviet research is such that one is obliged to form an opinion on the conditions existing in that country mainly on the basis of Soviet publications available.

Another question is—how reliable are the publications on which we base our conception of Soviet forestry practice and the functioning of corresponding institutions in the U.S.S.R.? It cannot be denied that earlier, and particularly in the Stalin era, there was a tendency to describe the state of affairs desired rather than the one that existed. However, there is a great difference between "is" and "ought", and this very often can give rise to wrong conclusions. Textbooks in particular are apt to present an idealised version of forestry conditions and ignore reality where it is unpleasant. On the other hand, periodicals and especially professional journals seem to give a more accurate description of the state of affairs and thus supply the missing information. This provides a great deal of evidence, provided that it is carefully selected and systematised, as well as being correctly interpreted afterwards.

There is a tremendous amount of source material available in Soviet statistics regarding timber resources, physical output of forest products, and foreign trade. In this respect the U.S.S.R. is no longer a closed country and in recent years one certainly cannot complain about any lack of authentic material. However, a few words must be said about the use of the material which is now being issued in large quantities by the Central Statistical Administration (*Tsentrālnoye statisticheskoye upravlenie pri Sovete Ministrov SSSR*). One should first put the question: What are these figures trying to prove? If the purpose of the elaborate registration activity were merely to prepare

statistical compilations, the reliability of these figures would be hardly any problem. However, the Soviet Government has a monopoly of publication and has compelling political interests in the image of the Soviet type of economy that it presents outside. The role of information in such an economic system is also different from that under the private-enterprise systems in western countries. In the Soviet economy the centripetal flow of information in the matters of production is absolutely essential for the functioning of the system (Grossman, 1960, p. 4). Thus, numerical distortions, where the resulting inaccuracy is in the figure itself, occur often deliberately. This can happen in the form of write-ups by workers and by management, who—because of the rigorous structure of incentives and penalties under which they work—are put to such in order to simulate plan fulfilment. Despite the fact that there is much evidence of data distortion even in the forestry sector, there are also definite limits to such opportunities for misreporting and, by and large, it may be reasonable to assume that the relative magnitude of distortion from this source is not fatal to our purpose.

A much more serious problem is the distortion of the facts reported by the Soviet authorities in their publications. Although it has recently eased off, such an information policy run for propaganda purposes continues to impose on “Sovietological” researchers a heavy burden of “statistical” interpretation. This seriously impedes the ability of research workers to reconstruct an accurate picture of Soviet progress.

Further details of the availability and reliability of the statistics will be given below in the individual cases where such is deemed necessary. This is because the statistics, which will be used, are of a very varied nature and value, and can hardly be compiled in a useful way. To a large extent the degree of success achieved depends on the care and discretion with which the statistics are used and the results analysed.

3. Research Methodology

A number of different questions will be discussed in this study. Much of the subject matter is biological and technological, but every stage of forestry activities involves economic factors. Moreover, historical relationships as well as geographical aspects play a major role in the functioning of forestry.

The research methods employed in a sector of the economy are not developed by theoretical discussion but by actual work. Therefore no

special methodology in the general sense is offered in this study. Each individual problem discussed here gives the compiler the task of finding the specific method for dealing with it. For the understanding of casual and consequential relationships in forestry practice as a sector of the economy, the explanatory methods must be flexible and productive in form.

For obvious reasons this presentation must be mainly descriptive and explorative. Material has been assembled from a vast field, which has been very little researched to date, and the special nature of the source material imposes considerable limitations on the use of the analytical approach. However, the intention is to utilise descriptive data only as a basis from which the functioning of the forest economy could be analysed. Research methodology used in other social sciences is used for the basic approach in this study, which should be regarded as a special case of "Sovietological" research. Even here it is important to determine and establish the motives and targets which have guided the practical work in earlier periods and even in the present conditions. One thus is attempting to apply a "means-ends" approach, and this would seem to have a certain relevance to the problem to be treated. The whole idea behind this is that "in as much as we are able to determine which means for the achievement of a proposed end are appropriate or inappropriate, we can in this way estimate the chances of attaining a certain end by certain available means" (Weber, M., 1949, p. 53). A principle applied in this thesis is that "in social science the ends we attain cannot be clearly separated from the means we use to achieve them" (Simon, 1961, p. 65).

Despite the fact that we are chiefly concerned with "means" in this study, the evaluation of "ends" cannot be completely ignored. In addition to selecting and formulating the problem, the identification of ends and means thus becomes the starting point of our analysis. The selection of hypothesis or the assumption from which the conclusion will be drawn, depending on the nature of the problems studied, is not considered necessary in the early stages of the work. It is regarded as something which should be carried out continuously throughout the whole investigation. The very fact that there will be a lot of problems involved in testing the hypothesis would support such an approach. The scientific approach for verification by controlled experimental methods, which as a rule is used in the natural sciences and in exceptional cases even in the social sciences, could hardly be applied to the several statements and assertions made in this particular study.

However, the fact that the standard model of social research methodology is not strictly followed in this case does not mean that the drawing of useful inferences from this study would have no validity for scientific purposes. The critical feature is the researcher's understanding and interpretation of the information obtained; consequently, methodological considerations, i.e. how the problems are investigated, are not the main concern of this study.

4. Outline of Presentation

This study is presented in four major parts. Each of these parts can be regarded as an independent thesis treating different aspects of the same question. General conclusions from all the four parts are presented at the end of the study.

Part I supplies the background necessary for an understanding of the forest economy on the whole. The main emphasis is placed on the geographical aspects of the forest economy. There is a description of the forest resources and their associated industries as well as of the general facilities for transport. The approach is essentially static, and time dimensions are added only occasionally to the descriptive presentation of the characteristic features of the environment in which the economic activities take place.

Part II comprises topics which are intended to explain the nature of forestry practice and ideas bearing on forest management under different economic systems. The purpose of this is to examine and to evaluate the concepts of economic thought which have determined the course of action in forestry in Czarist Russia and in the U.S.S.R. A comparison of "means" used to attain the "ends" in forest management, with particular reference to dynamic changes in production conditions, is the theme of this presentation.

In this part of the investigation, the rules of scientific methodology have been applied more consistently. By and large, this is a study of the history of forest land management. The main objective of the historian is to understand relationships between "events". Thus also here the emphasis has been put on the description of successive "events" in forestry and an assessment of their repercussions for the future has been attempted.

Part III starts with an analysis of consumption and output of forest products under conditions of central planning and proceeds with an estimate of the resource potentialities of the timber-surplus regions. This part is mainly a study of spatial variations in terms of forest-

covered areas, together with the accessibility and conditions appertaining for the exploitation of timber stock. The present situation and the prospects of future developments of the wood-processing industries by main economic regions are given careful consideration. The emphasis is put on the prospects of supply of roundwood from the virgin forests.

Part IV is devoted to the international trade in forest products with special reference to the competitive advantage in world markets which the Soviets have through the monopoly status of their timber trade. Statistics cited here serve as a basis for the appraisal of future development. The prospects of increased Soviet exports can be regarded as the focal point of these considerations.

The study ends with general conclusions, where the main findings of Parts I, II, III and IV are integrated and analysed to give a clear picture of the competitive ability of the Soviet forest economy.

Part I
NATURAL AND ECONOMIC
BACKGROUND

Natural and Economic Background

1. Vegetation Zones

1.1 General Characteristics of Physiographic and Climatic Conditions

The Eurasiatic Plain, an eastern extension of the European Plain, is the greatest of the plains of the world. It widens in the form of a wedge, extending to its maximum width near the Ural Mountains, which divide it into two parts. It continues in Siberia as far east as the River Yenisey, and to the south, into Central Asia. Over this vast area few uplifts rise more than 300 metres above sea-level, and with the exception of the Urals, none of these elevations is mountainous in character. Even in the Urals, the slopes are usually gentle, and the surface conformation is plateau-like. The platform underlying this great plain was covered by the sea many times during geological history.

The West Siberian Lowland, as the section of the Great Plain east of the Urals is called, is relatively low, and is one of the most extensive level areas in the world. Toward the south-east, there is another lowland, the Turan lowland, part of the bed of an ancient sea, which included the areas occupied by the Black Sea, the Caspian Sea, the Aral Sea and intervening regions, until the end of the Tertiary period.

The periphery of the Great Plain, on the whole, is mountainous, particularly along the southern edge, where a continuous series of mountain ranges is to be found: the Carpathian Mountains and the Crimean Range, the Caucasus, the Kopet-Dagh and the Pamirs, the Tien-Shan, the Altay and the Sayan Mountains. Most of Eastern Siberia is mountainous, too.

“Continentality” is the main characteristic of the climate of the Great Eurasiatic Plain. Despite the vast extent of this area, climatic conditions have much in common in places thousands of kilometres apart, and the variety of weather is not as great as might be expected. Uniform conditions are remarkable, especially during the winter, though the weather over the western portion of the continent is influenced by the Atlantic Ocean, which acts as far east as the Yenisey, while the influence exerted by the Pacific on the climate is only local (Mirov, 1951, p. 27). The plain gives the wind free play, and even the

Urals seem not to function as a climatic barrier. In winter, the mild westerly winds prevail in the north, while cold easterly winds are predominant in the south, thus diminishing any latitudinal differences in temperature. Variations in winter temperature are, in fact, more striking from west to east, than from north to south.

In Eastern Siberia, where the marine influence of adjacent oceans is almost absent in winter, the cold is very severe. The temperature at Verkhoyansk and Oimekon reaches a January average of -50°C , and in 1892 an extreme minimum of -68°C was recorded in the former (Gray, 1947, p. 38). But even lower temperatures have been reported from Oimekon, where an unconfirmed reading of -75°C has been reported (Cressey, 1945, p. 96). During the winter, except for a very narrow strip along the Pacific Coast, the cold weather generally prevails throughout Siberia. A study of the air movements explains why nearness to the Pacific Ocean does not influence the winter temperature of the region; cold, dense air forms a centre of high pressure over north-east Siberia, and from here air flows eastwards toward centres of lower pressure over the ocean. Thus the air which moves along the eastern coast of Siberia is cold and of low humidity. The largest rivers are frozen for considerable periods, as the temperature is almost everywhere consistently below freezing-point, and many lakes and rivers are frozen to the bottom. Along the Arctic coast, the river mouths are frozen for eight consecutive months, while in Siberia, most of the rivers are closed for six months and in central Russia for four to five months. Even the Dniestr is frozen for more than 70 days on average. It is only in the extreme south that rivers remain unfrozen in the winter.

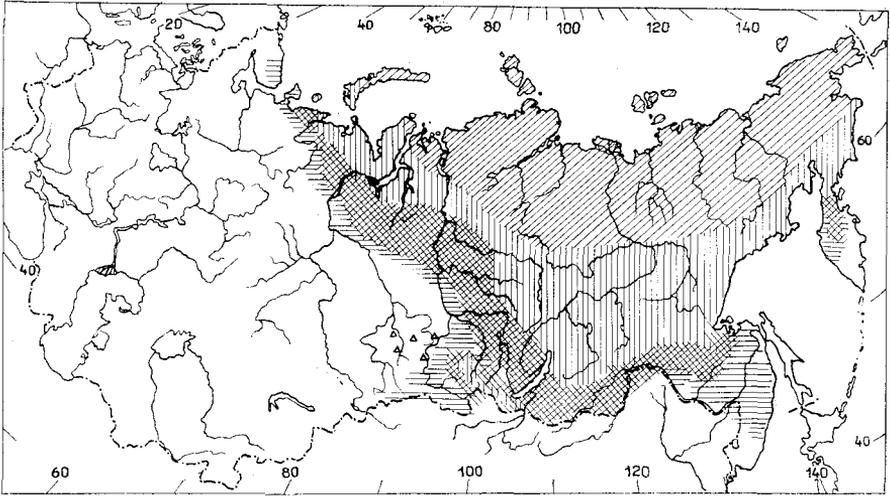
In summer, there is a general latitudinal decrease in temperature from south to north. The highest temperatures occur in the deserts of the south, for example, in Turkestan where the July average temperature exceeds 30°C . During the summer the oceans have a considerable modifying effect, especially in the Arctic. The cool inward air-currents from the ocean which occur on the Pacific coast tend to keep the summer temperatures low.

For vegetative growth, including tree growth, the length of summer is more significant than its intensity. The northern regions have a very short summer, whereas in the south, it is considerably longer. For instance, Archangel has two months summer (July and August), while Yalta and Baku each have six months (May to October). In the higher latitudes, however, the longer daylight hours offer some compensation for the shortness of the summer.

The Great Plain of Eurasia is not a region of high precipitation; few stations in this area record more than 500 millimetres per annum. The area between the Urals and the River Amur averages only about 400 millimetres, the northern shores of the Arctic have about 200 millimetres, and those of Central Asia 100 millimetres or less. The greatest rainfall occurs in the Caucasus on the eastern coast of the Black Sea. Other regions with heavy annual precipitation are the Altay and the Sayan Mountains and some scattered areas in the Far East. As a rule, the rainfall comes with westerly winds from the Atlantic and consequently diminishes from north-west to south-east. The season at which the rain comes, as well as its quantity, is important, and July and August are the wettest months over the greater part of this region. Areas with a winter maximum of rainfall are found only along certain sections of the Black Sea coast.

The seasonal rainfall in the areas near the Pacific coast seems to result from the summer monsoon of south-east Asia. During the summer period, the moist air from the cool Pacific Ocean moves in over the warmer land of Eastern Siberia and rainfall occurs. Cloudiness also plays an important role as a component of the climate. In the Arctic coastal region, clouds are accompanied by humid air and fogs. The western portions of the Eurasiatic plains are cloudiest in winter though towards the east clear skies occur more often. For example, Leningrad has about 39 cloudless days a year, but in the Lake Baikal region 140 days are without cloud, and in Kazakhstan nearly 300. As a rule the steppes are relatively cloudless.

When the temperature at which condensation occurs is below freezing-point snow falls instead of rain and the moister the air, the heavier the snowfall. The snow lies deepest in the forest region, because here it is not blown away, as happens on the steppes. In general, Eastern Siberia receives much less snow than the region farther west. For example, despite the extremely cold winter in the Amur Valley and in the area around Lake Baikal it is often impossible to use sledges (Gray, 1947, p. 48). In the regions of Siberia and on the Arctic coast where the snow cover is thin, there is a permanently frozen subsoil (*merzlotá*). This seems to be associated to some extent with the distribution of the snowfall, and occurs mainly where the snow is absent or is relatively light. As is shown on the map in Figure 1: 1, the approximate southern boundary of permanently frozen ground runs slightly north of the mouth of the River Mezen to Berezhovo on the Ob and continues to the confluence of the Nizhnaya Tunguska with the Yenisey, where it turns southward. The thickness of the per-



Source: Berg, L. S., Die geographischen Zonen der Sowjetunion, Bd. I, 1958

- ▨ Continuous area permanently frozen
- ▤ Permanently frozen areas with scattered thawed "islands"
- ▩ Permanently frozen "islands"
- ▧ Scattered permanently frozen "islands"

Fig. 1:1. Areas of Permanently Frozen Subsoil

manently frozen subsoil varies from one metre near the southern edge of the area, to 400 metres on the coast of the Arctic Ocean. The total permafrost area is estimated at 10 million square kilometres, or nearly 47 per cent of the land area of the U.S.S.R. (Balzak—Vasyutin—Feigin, 1952, p. 62).

In the southern steppe and adjacent forest steppe regions, dry years and devastating winds (*sukhovey*) cause droughts to occur more or less frequently. Droughts have occurred in Russia throughout the greater part of its recorded history, and the oldest authentic records of such occurrences are from the 11th century. In the last 65 years, the lower Volga region has experienced twenty-two droughts; the Voronezh, Rostov, Voroshilovgrad and Volgograd districts have had fifteen of reportable severity. Other regions in the steppe zone have been severely affected more than ten times. The droughts usually come with the strong, dry and hot winds that blow from the arid regions east of the Caspian Sea and occur mostly during May and less often during April and June.

The cause of these dry winds is believed to be the formation of dry air masses in the Arctic. During these winds, the relative humidity

of the air over the Russian steppes often falls below 20 per cent. The velocity of the wind fluctuates greatly, from about five to nearly 40 kilometres an hour, and at the higher speeds it raises clouds of dust and blows away the top soil from land with an insufficient vegetation-cover. The weather characteristics associated with the dry wind are usually cloudless skies, haze, high day temperatures of 25° C to 40° C, low relative humidity (not only during the day but also during the night) and high night temperatures.

Because the soil lacks moisture, these winds are particularly injurious to vegetation. The frequency as well as the intensity and duration of drought in various localities depends upon climatic conditions, but the point at which a drought begins is determined by the weather conditions, and particularly by precipitation in any given year. There is some evidence that the climate in this, the most fertile part of Russia, is becoming drier, and that the danger of drought is increasing. The most significant symptom is the increasing scarcity of water. Perhaps as a result of the forest devastation which has taken place for decades, especially in the neighbourhood of rivers, the water-level in the river channels has constantly and rapidly become lower in summer. A particularly significant sign of the dearth of water and of increasing drought in the south-eastern part of European Russia, is the abnormally rapid lowering of the water-level in the Caspian Sea. This has become a matter of supreme concern to the Soviet Government.

Records of the water level have been kept since 1830 and these show that the fluctuations of the water level have been remarkable. Since 1929 there has been a sharp downward trend. The level is falling almost continually, and between 1929 and 1956 it fell by 2.4 metres (Apollov, 1956, p. 88).

The decrease is caused by the fact that evaporation is in excess of the influx from the Volga, the Ural and all other sources. It should be noted that from 1830 to 1929 the Caspian Sea was on average 2.5 metres below the world mean sea-level.

The causes of this dangerous decline have been much discussed, and the Soviet authorities have assumed that one cause is the extensive cutting which has taken place in the forests in the basins of the rivers which flow into the Caspian Sea. Another factor is said to be the formation of the Rybinsk Reservoir, which has a surface area of 3,200 square kilometres and which was constructed in connection with the Moscow-Volga canal. This reservoir may deprive the Caspian basin of large quantities of water (Buchholz, 1943, p. 147). However, the

main cause of this decline seems to be far-reaching changes which have occurred in the hydrological and climatic conditions (Oguievsky, 1937; *Akademia Nauk SSSR*, 1957).

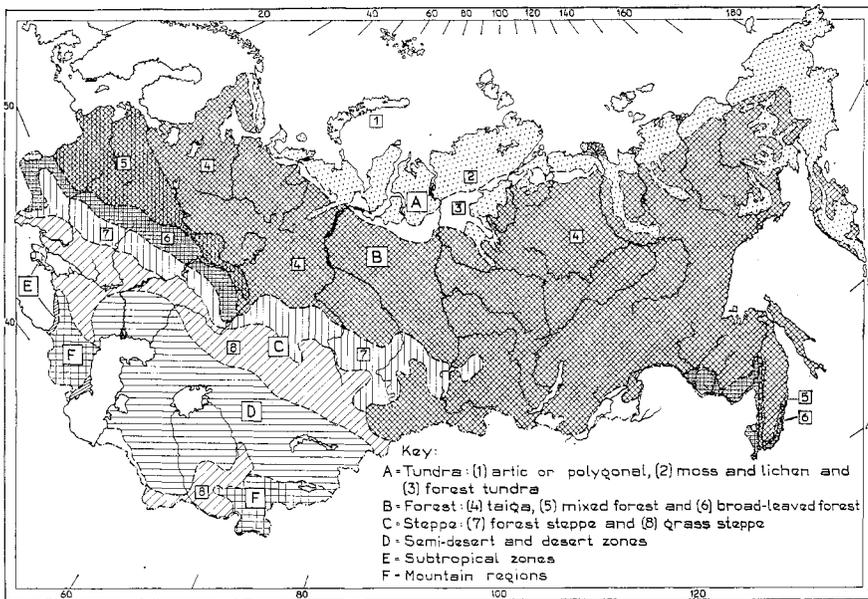
Whatever the cause of this situation, it has seriously alarmed the Soviet Government. New laws and programmes issued by the authorities aim at nothing less than a man-made reversal of climate in this dry region.

1.2 Division into Soil and Vegetation Zones

In the Eurasiatic Plain there is a strong correlation between the distribution of the soil-types and the distribution of the natural vegetation. The natural vegetation cover is dependent on the climate and the kind of soil. The soil itself is derived from the underlying rock formation and depends not only on the climate but also on the covering vegetation, i.e. there is always a constant interrelation between the components climate, soil and vegetation.

In a general way, the major soil and vegetation zones are arranged in roughly parallel belts extending from east to west. Within this scheme there are considerable variations, and a great many "inter-zonal" types occur. The degree of desiccation of the base rock, as influenced by the relief, as well as the destruction of the original vegetation, may create such special conditions. The drier the climate, the less pronounced is the soil-forming process, and the greater the effect of relief and underlying rocks. In general, the character of the major soil type in each zone is not influenced essentially by the parent material but often extends across several underlying rock formations (Gregory—Shave, 1945, p. 104; Wilde, 1946, p. 17). It must be remembered that soil formation is a constant process, and that a static conception of soil-climatic zones will never give a true picture of conditions as they actually exist. If any one of these above-mentioned components changes, a complete cycle of changes takes place in the soil. For example, trees influence the climate and also the soil. When forests are cut down, the soil becomes drier in some places, and in other places wetter. In the first case, high or continuous winds may cause disastrous erosion, and in the second case, the process of swamp formation may be accelerated.

These climatic or soil-climate zones vary considerably amongst themselves with regard to plant cover, and hence the term vegetation or plant-geographical zone is used (Berg, 1958). The natural vegetation of the Eurasiatic Plain may be divided from north to south into the



Source: Tseplyayev V. P., Lesa SSSR, 1961

Fig. 1: 2. Natural Vegetation Zones

following principal zones: (1) Tundra, (2) Forest, (3) Steppe, (4) Semi-desert, (5) Desert. To these lowland zones may be added the subtropical zone and the mountain regions. The division into climatic or natural vegetation zones is shown on the map in Figure 1: 2.

Principally, the division into broad latitudinal belts is based on the work of Berg (1958, 1959), although his classification of mountain regions is not followed exactly in the map presented here. With regard to forest geography, some deviations from the original division into "landscape zones" seem to be necessary; these should take the form already accepted by the forestry scientists. These "landscape zones" cannot be considered as clear-cut or definitely fixed areas because the borders of contiguous zones more or less overlap and are gradually changing. The forests are in competition with the tundra in the north and the steppe in the south. Over a long period it has been noted that the tundra continues to advance slowly but continually toward the south. Opinions as to the eventual outcome of the natural struggle between forest and steppe are divided, especially as man's activity along the border between them has interfered with natural vegetational succession. A considerable area of degraded black-earth soil, typical of the steppe, is visible proof of the former presence of forest.

These black-earth soils are most favourable for settlement, and for many years the forests have been systematically destroyed in this transition zone. Instead of forests there are now numerous and extensive areas of eroded land, drifting sands and severe gully erosion, all of which have contributed to a deterioration both of the landscape and of the climate. Generally speaking, the northern border of the forest zone is retreating as a result of the encroachment of the tundra, in much the same manner as the southern border is retreating before the steppe.

The horizontal zoning of vegetation is perhaps most clearly demonstrated in European Russia, where the territory from the Arctic Circle to the Caucasus includes a very wide range of climate and soil conditions. The same zones of vegetation succeed each other in a definite order as the altitude increases. This vertical zonation of mountains is analogous to the horizontal zonation of the plains. The distribution of different vegetation types in the mountains is greatly affected by the location and exposure. Thus the differentiation into zones is less pronounced in the mountains than on the plains.

1.3 Tundra Zone

“Tundra” is a term derived from a Finnish word “*tunturi*” which means deserted land. The tundra is the northern zone and the climate is generally of an arctic type. The duration of frost in the ground is from eight to eight and a half months, and the amount of available sunshine is relatively small. In the arctic region, the sun appears only after a long period of darkness. Summers are short and relatively cool but have long daylight hours of low-altitude sunshine. Cloudiness is common and fogs are very frequent in the summer months. The maximum of precipitation is in July and August, and the minimum in February and March. The growing season averages from two to two and a half months (60—75 days). The ground is permanently frozen below the surface, and only the upper layer thaws for a short time.

Predominant in the tundra zone are peat-bogs (high moor) and marsh (low moor) soils with weak podzols (latent podzols) scattered in patches. Peat formations often cover the hillock surfaces. The hollows have poorer drainage and their swampy nature is sometimes increased by the impervious layer of frozen subsoil, but more often by a hardpan layer of considerable thickness which underlies the more sandy soils.

The tundra is a vast treeless area, which occupies about 15 per cent

of all the territory of the U.S.S.R. (Balzak—Vasyutin—Feigin, 1952, p. 66). There exist marked differences between the northern and southern sections of the tundra. The arctic or polygonal tundras predominate on the islands off the coast of the Arctic Ocean. These are characterised by the arrangement of the soil and stones into polygon-shaped areas, caused by frost-heaving. Inland, and at no great distance to the south, the next tundra belt is covered with vegetation consisting mainly of moss and lichen. Farther south is the shrub-tundra, characterised by shrub birches and willows. The transition zone between the tundra and the forest is called forest tundra (*lesotundra*), referred to by some authors as “taibola” (Wilde, 1946, p. 26), where a great many tree species are found. These trees are mostly stunted and of low productiveness. The boundary between the forest tundra and the tundra is very uneven. In the northern portions of the forest tundra the tree vegetation is sparse; forest outposts extend northwards along the river valleys, because of the better drainage of the valley slopes, which prevents ice from being formed near the soil surface. In addition, the valley slopes are better protected from winds, and those which face south are warmed by the sun.

The spruces and birches predominate at the northern tree limit, while farther east, larch is also found. On the Kanin Peninsula, for example, birches, aspen, speckled alder and pine grow (Seifriz, 1934). The ground vegetation consists mainly of various peat-forming communities.

The Russian scientists Tanfilev and Pohle have found traces of birches and spruces in deep sections of the peat, and in the underlying substratum. Tanfilev thinks that these tree remains resulted from the destruction of the forest edge by growth of the *Sphagnum* bog and the formation of permanent ice in the moss soil. According to Pohle, this advance of the tundra was largely helped by human destruction of the trees. According to these authorities, the forest extended much farther north in post-glacial times, when the climate was warmer (Keller, 1927, p. 192).

The tundra also occurs in the mountains at high elevations within the forest, the steppe and other “southern” zones. These “mountain tundras” are found on the Kola Peninsula, in the Urals, in Eastern Siberia and, to some extent, in the region of the Altay and the Caucasus.

1.4 Forest Zone

South of the tundra lies the Forest Zone, or *taiga*, which partly merges into it. The climate here is of the cold temperate type. In general, the vegetation is varied, consisting both of conifers and of deciduous species.

The growing season lasts longer here than in the tundra zone. In summer the temperature varies from 10° C in the north to 20° C in the south, on an average. In winter there is a remarkable difference between the western area, which has a damper atmosphere with higher temperatures, and the eastern area, which has dry, crisp air and low temperatures. The annual precipitation is about 500 millimetres on an average, but in some regions it is considerably higher. Towards the west, rain falls mainly in July and August; in the winter the snow cover is quite thick. In the northern, and especially the eastern, portions of the forest zone there is permanently frozen subsoil, usually to a depth of about one metre beneath the surface.

The predominant soil in the taiga zone is podzol or "raw humus soil". The coniferous forest vegetation gives rise to a very acid "raw humus" which decomposes very slowly, and accumulates as a layer of peaty material above the mineral soil. The degree of podzolisation varies greatly.

In badly drained and low-lying areas, especially over glacial clays, where the ground water lies close to the surface, there is a thicker peaty surface layer. Organic soils are found most frequently in the coniferous forest zone north of the latitude 60° North, but are also found much farther south in the low, badly drained areas of the Western Siberian Lowland. In Western Siberia a great part of the subsoil is sand, derived from formations which were formerly sand dunes. The characteristic landscape is now mainly a series of vast swamps; the formation of these may probably be traced back in part to the huge forest fires of the past. However, it is also possible that the silting-up and filling-in of the rivers may also have been partly responsible for the formation of these swamps.

East of the River Yenisey such swampy soils are rare. The land here is higher, and the soils are generally of a weakly developed podzol type. Podzolised soils occur also along the northern limit of the forests.

As is shown on the map in Figure 1: 2, the lowland forest zone has been separated into sub-regions (Tseplyayev, 1961, pp. 50—76) as follows:

1. Coniferous forests or *taiga*,
2. Mixed forests (*smeshannie lesa*),
3. Broad-leaved forests (*shirokolistvennie lesa*).

Pine, spruce, larch and fir grow on the taiga. Some deciduous species are found amongst the conifers, but in the old-growth climax forests they are generally of secondary importance. The main deciduous species are birches and aspen, which after clear-cutting and forest fires very often occupy the areas previously covered by conifers. The permanently frozen subsoil, which is very common in the eastern taiga, is the reason why so few tree species grow there. Generally, the number of tree species and their growth increases towards the south. In the taiga zone the low watersheds are usually very swampy. Roughly 40—70 per cent of the area is covered by swampy forests, swamps and peat-bogs. According to some estimates (Balzak—Vasyutin—Feigin, 1952, pp. 70—71) the actual marshland area in the taiga is about 128 million hectares.

The sub-region of mixed forests comprises two parts. In Eastern Europe, the mixed forests form a broad wedge at the western border of the U.S.S.R., gradually narrowing towards the Urals. In the Far East, these forests form a narrow belt between the taiga and the broad-leaved forest zone. The podzol type of forest soil is usually predominant here also. The forest stands are composed of a greater variety of species, of which the chief are pine, spruce, fir, birches and aspen. There are often other species in admixture with these, such as oak, ash, elm, maple, etc. In natural conditions the mixed forests show relatively good growth.

The sub-region of broad-leaved forests (hardwoods), which is found both in Europe and in the Far East, is adjacent to the mixed forests. The area is very densely populated, and most of the former forest land is under agriculture. In the broad-leaved forests “good soils” (*serie suglinki*) and “degraded chernozems” (*vyshchlochennie chernozemy*) predominate. In the Far East, due to high rainfall, the soils are leached podzols (Gregory—Shave, 1945, p. 110), and oak is the dominant tree, usually mixed with elms, lime, ash, maple and birches.

1.5 Steppe Zone

South of the northern forests are the steppes, which occupy about four million square kilometres or one-fifth of the total land area (Balzak—Vasyutin—Feigin, 1952, p. 74). Forest growth ceases and gives way to the open steppe when the climate becomes too dry and unfavourable. Warm, dry summers are characteristic of the steppe

zone. The rainfall varies from about 250 to 350 millimetres per annum. Precipitation is fairly abundant in spring and early summer when average temperatures are high, so that much is lost through evaporation. There is also a tendency for the rain to run off, rather than to percolate into the soil. In winter, as well as in summer, the atmosphere is dry, the snow cover is thin and the prevailing high winds frequently blow it away. The steppes are wide treeless areas with a predominantly herbaceous vegetation, growing on clay, sand and loess, derived from calcareous rocks and other parent material, which in this particular climatic zone develop into black-earth or chernozem. Near the forest zone, the "degraded chernozems" occur. This is the "forest steppe" (*lesostep*), a transition zone between forest and steppe proper. In the north, there are rather large forested areas intermingled with patches of grassland, while in the south, grassland dominates, and forest occurs only in patches near the water-courses and hollows. The dominant tree in the European part of the forest steppe is the oak, which usually grows in admixture with lime, elm, ash, maple, and hornbeam. In Siberia, where oak does not grow, its place is taken by birch, and occasionally by aspen.

In more arid climates, there can sometimes accumulate easily soluble salts which are injurious to ordinary plants. These form *solonets* and *solonchak* soils. The oak woods which are present in the forest steppe region disappear completely in the grass steppe region. On deep-soiled *chernozem*, the grass is at the height of its growth by the end of May, and the whole steppe looks like a flowering meadow. This "high grass prairie" is the best agricultural land. The *Stipa* Tussock steppes replace the meadow steppe in the south-east. Nearer the desert, the steppe grasses gradually disappear, and xerophytic low shrubs are the predominant vegetation.

On *solonchak* soils, especially along steppe rivers and gullies, aspen thickets cover extensive areas. The character and appearance of these forests is unlike that of the northern aspen forests, which occur mainly on cut-over and burned areas in the forest zone.

These aspen thickets are limited to the area covered by the Quaternary ice sheet, which extended as far south as Volgograd. The characteristic flora of the aspen thickets on *solonchak* soils indicates something of the origin of the "islands" in the dry steppe.

According to Russian scientists, the following factors limit the spread of forests in the Russian steppes (Keller, 1927):

1. Lack of moisture in conjunction with the fine-grained steppe soil.
2. The strong steppe winds, especially the dry fog *mгла*.

3. The presence in the soil of large quantities of easily soluble salts, harmful to the forest vegetation.
4. Competition with the steppe grasses.

1.6 *Semi-Desert and Desert Zone*

The semi-arid and arid areas are a transitional belt from the steppes, and extend to the mountains which border the great lowlands in the south. The desert zone occupies about one-ninth of the total area of the U.S.S.R. (Balzak—Vasyutin—Feigin, 1952, p. 76). In this region the annual precipitation is less than 200 millimetres. The winters are very cold and the summers very hot, with a mean temperature of over 27° C (Tseplyayev, 1961, p. 81). The air is dry and the sky cloudless. The soil of the semi-desert is "grey earth" or *serozem*. In addition, soils with concentrated accumulations of soluble salts, the "salty semi-deserts", occur over vast areas. While in the steppes the vegetation forms a solid cover, in the semi-desert it appears in patches, and in the desert it is found only under special conditions of soil and topography. In addition to xerophytic grasses, there are a number of low shrubs, especially *Artemisia*. In the northern parts of the semi-desert the quasi-herbaceous steppe plants are predominant, whereas in the southern parts the shrubby *Artemisia* plants are most prevalent.

The semi-deserts are important winter pastures. In the northern parts there are areas where agriculture is normally possible, whereas in the southern parts it can only be carried on with the help of artificial irrigation. The predominant tree-species in the desert is the extremely heat-resistant saksaul (*Haloxylon*). However, on the banks of rivers and canals other tree-species have been planted. In the southern part of Turkestan, which probably marks the extreme south of this region, the summers are so hot that almost the whole vegetation is withered as early as the beginning of summer, and it remains in this state until the next spring. However, the winters are rather mild and some vegetation, mostly grasses, can develop from November until May. With the help of artificial irrigation a luxuriant vegetation can be developed in the deserts.

1.7 *Subtropical Zone*

Outside the lowland zones on the periphery of the steppe and desert, there are other areas which differ topographically as well as climatically from the vast Eurasian plains. These are the subtropical and mountain regions. The subtropical regions occupy the

Black Sea coast of Transcaucasus and the southern coastal areas of the Caspian Sea (the Lenkoran Lowland). Characteristic of the subtropical zone are the special climatic conditions, determined by the proximity of the two large bodies of water and by the high mountains of the main Caucasus range. The annual precipitation is very high, from 1,200 millimetres (Sochi) to 2,500 millimetres (Batumi). Owing to the existence of a frost-free period of 240—250 days per year, there is a richly developed vegetation of subtropical type, represented by many broad-leaved species (*Juglans regia*, *Castanea sativa*, *Laurus nobilis*, etc.). The soils are of red (*krasnozemy*) and of yellow (*zheltozemy*) type. The total area of Colchis, the subtropical area near the Black Sea, is about 2.5 million hectares, of which about one-half is covered by forests (Tseplyayev, 1961, p. 82). The climate and the vegetation of the Lenkoran Lowland are different from those of Colchis. The number of tree species is also very great here. The subtropical regions are the base for highly valuable crops, with tea, tobacco and citrus fruits predominating.

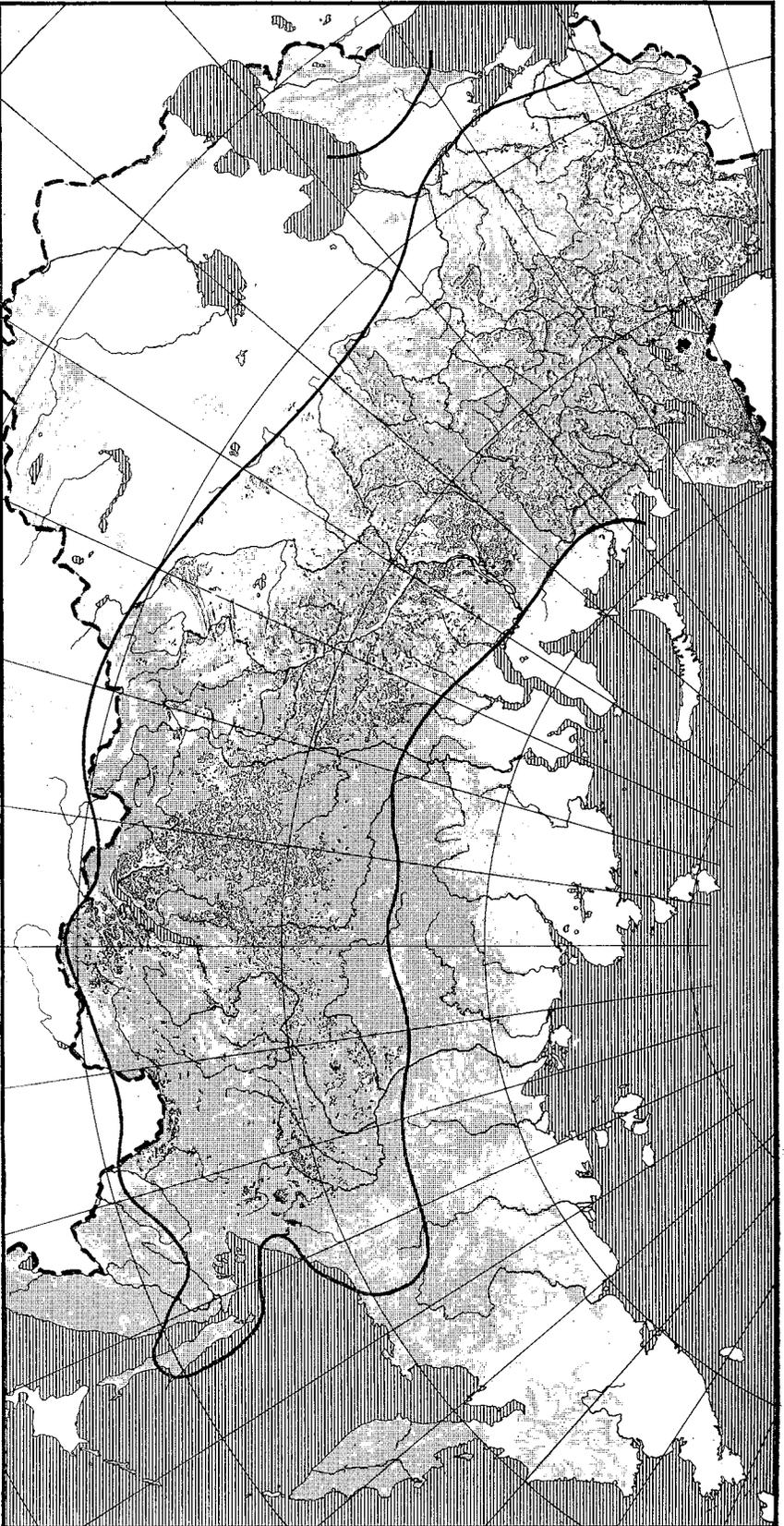
1.8 Mountain Regions

Along the southern border of the U.S.S.R., there is an almost continuous chain of mountains. Depending on their elevation, topography and location, the mountain ranges are of very different character. From the west to the east the main mountain ranges are the Carpathians, the Crimean range, the Caucasus, the Kopet-Dagh—Pamir system, and the Tien-Shan. Richest in tree species of the entire U.S.S.R. are the forests of the Caucasus, where such species as oak, beech, fir, spruces, pistachio, walnut, yew, cherry-laurel, rhododendron and azalea are found. In the mountains of Central Asia, spruce (*Picea schrenkiana* F. et M.) and fir (*Abies semenowi* Fedtsch) form the most valuable forest stands.

2. Natural Conditions for Forest Growth

2.1 Pine Forests

Pine is one of the most valuable commercial tree species of the northern coniferous forest zone. Only two species of the genus *Pinus*, of the 14 native to Eurasia, are commercially important, Scots pine over almost the whole region, and Cembran pine restricted mainly to the Asian part. Other pines have only local significance. The range of Scots Pine (*Pinus silvestris* L., in Russian *sosna*) is perhaps the widest



Source: Karfa lesov SSSR, Glavnoye upravleniye geodesii i kartografi MVD SSSR, 1955

Fig 1: 3. Distribution of Pine Forests

of all Eurasian tree species, and there are many geographical varieties. The species is polymorphic, and a number of distinct varieties are recognised, for instance, forma *erythranthera* Sania and forma *lapponica* Fries, which are found in the north-western part of the U.S.S.R.; forma *Sibirica* Ledeb. in the Altay region, forma *echinata* Link, which grows east of Lake Baikal, and forma *Lamata* Stew in the mountains of the Crimea and Caucasus. The range of Scots pine is shown on the map in Figure 1:3. It is of major commercial and silvicultural importance all over the Russian plains and only in the Far East, particularly east of the upper basins of the Amur and Ussuri rivers, does it not occur naturally (Tkachenko, 1955, p. 228).

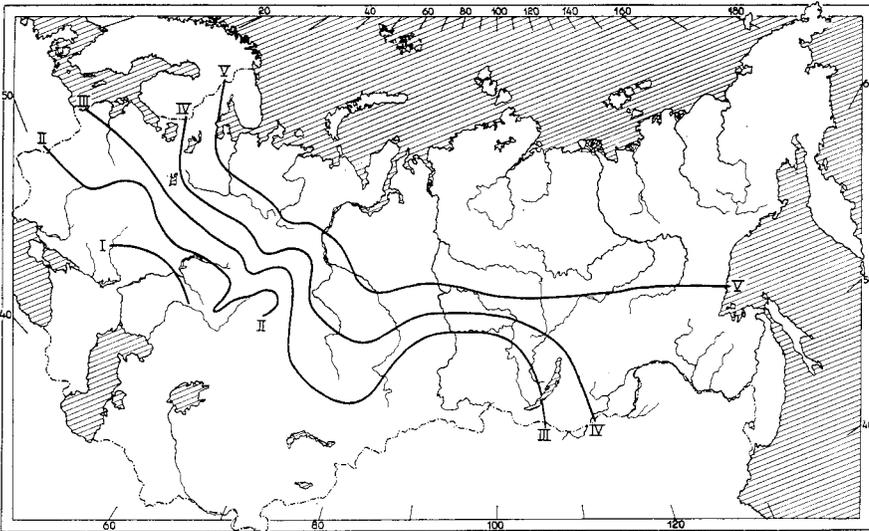
On dry sandy soils, considerable areas are covered with sparse pine stands of poor quality. Underwood is absent or consists mainly of juniper. The ground cover is a more or less interrupted lichen carpet, mixed with forest mosses. On sandy, podzolised soils with more moisture, the pine stands are better. Weakly podzolised soils with a nearly neutral reaction and even podzolic soils with a slightly cemented hardpan frequently have a relatively rich herbaceous flora. On such soils, pine is often found with other tree species, and especially with spruce. Scots pine is able to grow both on the better sites such as the chernozem, and on poor soils such as dry sand-dunes. It also grows well on the moist and cool *Sphagnum* bogs, and in the areas of permanently frozen subsoil.

The character and productivity of pine stands changes from the north to the south in accordance with the climate. Owing to the severe climate in Siberia, pine forests there grow much more slowly than they do in European Russia. For pine forests the average site quality classes (*izobonitety*)¹ are shown on the map in Figure 1:4. It can be seen that in the basin of the River Yenisey at latitude 60° North, approximately the same growth is reached as in Karelia at latitude 64° North. In the maritime climate of Karelia, growth is much better on average than in the continental climate of Siberia (Tseplyayev, 1961, p. 176) at the same latitude. The abrupt extension to the south of the curve for the site quality classes III and IV, where the continentality of the climate is increasing, confirms the above assertion. The curves on the

¹ In Russian forestry practice, five site quality classes, with subdivisions for superior and inferior site conditions, are accepted. The main criterion for the division is the average height of trees at 100 years, which is as follows:

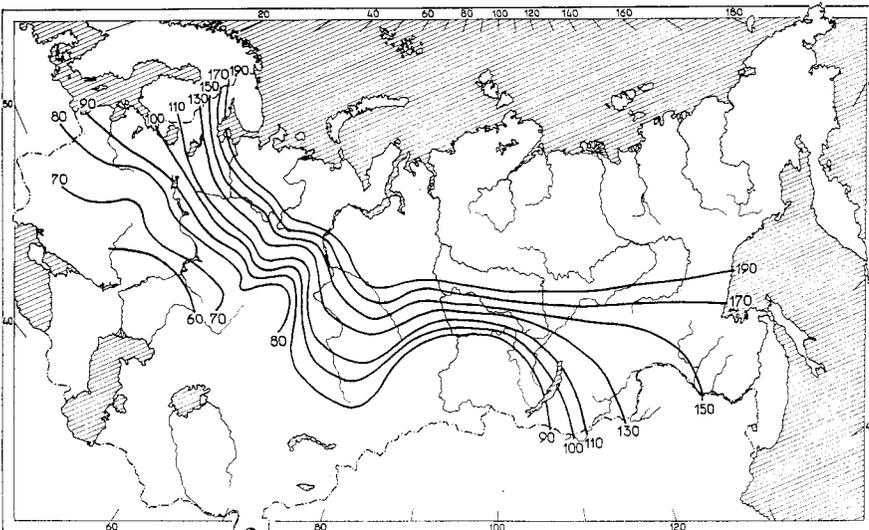
Class:	I a	I	II	III	IV	V	V a
Average height of trees, metres	35—31	30—27	26—24	23—20	19—16	15—13	12—10

Source: Eitingen, 1953, p. 50.



Source: Tseplyayev, V. P., Lesa SSSR, 1961

Fig. 1: 4. Average Site Quality Classes in Pine Forests



Source: Tseplyayev, V. P., Lesa SSSR, 1961

Fig. 1: 5. Average Time for Pine to Reach 24 cm Diameter at Breast Height, Years

map on Figure 1: 5 show the average time needed under different conditions for pine to reach 24 cm diameter at breast height. This representation is schematic, but it gives a clear picture of the forest growth conditions in northern Eurasia. The usual rotation of Scots pine stands

varies from 80 to 120 years, but maturity is not reached for another 100 years or more.

Natural regeneration of pine is often abundant after forest fires, and it is assumed that many mature even-aged, pure pine stands now in existence were established mainly as a result of fire. Scots pine begins to produce cones at an age of about 30—40 years, but good seed production can rarely be expected until the trees are 60—70 years old. Large crops usually occur at intervals of three to five years, but this depends on climatic conditions. In the northern regions, the interval between the seed years may be as long as 10—30 years.

The northern varieties of Scots pine are distinguished in primeval forests by a symmetrical, rather narrow crown with fine branches. As a rule they are slow-growing. The southern varieties are faster-growing, but very often have wide crowns with thick, horizontal branches as characteristics. When grown in the open, these varieties become knotty and develop a bole of low value.

Cembra pine (*Pinus cembra* var. *sibirica* Loud., *Pinus sibirica* Mayr, in Russian *kedr sibirsky*) has a wide range in the Urals, and in Western and Eastern Siberia. The western limit of its range crosses the upper course of the River Vychegda in European Russia, and the eastern limit extends towards Mongolia, east of Lake Baikal. It is found both at the summit of high mountains and along water-courses and in valley peat-bogs. It grows on a variety of soils, but is at its best on deep, rich, well-drained loams. In *Sphagnum* bogs, Cembra pine grows better than Scots pine, and it seems in the main to like more moisture than the latter. Forest fires are its greatest enemy, and may destroy stands of Cembra pine completely; it shows little ability to regenerate directly on burned areas. The natural regeneration of this species seems to be a difficult silvicultural problem. It is accomplished most successfully through the medium of birds and squirrels which have used the seed as food. The seeds of Cembra pine are largely used also by man, and gathering cones or “nuts”, as they are locally called, is a special activity of the Siberian population. From one hectare of old Cembra pine, it is possible to harvest 100 to 200 kilograms of “nuts”, and from one ton can be produced 200 kilograms of oil. The best crop yields come from rather open stands, 80 to 150 years of age. The timber is valuable, and is used for many purposes, especially in joinery and the pencil industry.

Korean or Manchurian pine (*Pinus koraiensis* Sieb et Zucc, syn. *Pinus Manchurica* Rupc., in Russian *kedr koreisky*) grows in the southern part of the Far East, and its range seems to be limited to the

moist climate of this region. This species is the largest of all the pines described here, and on the best sites, according to one authority, it reaches a height of 60 metres or more, with a diameter at breast height of 2 metres (Tkachenko, 1955, p. 241). The general appearance of mature trees is in many ways similar to that of Cembran pine, and similar uses are reported for wood and fruits.

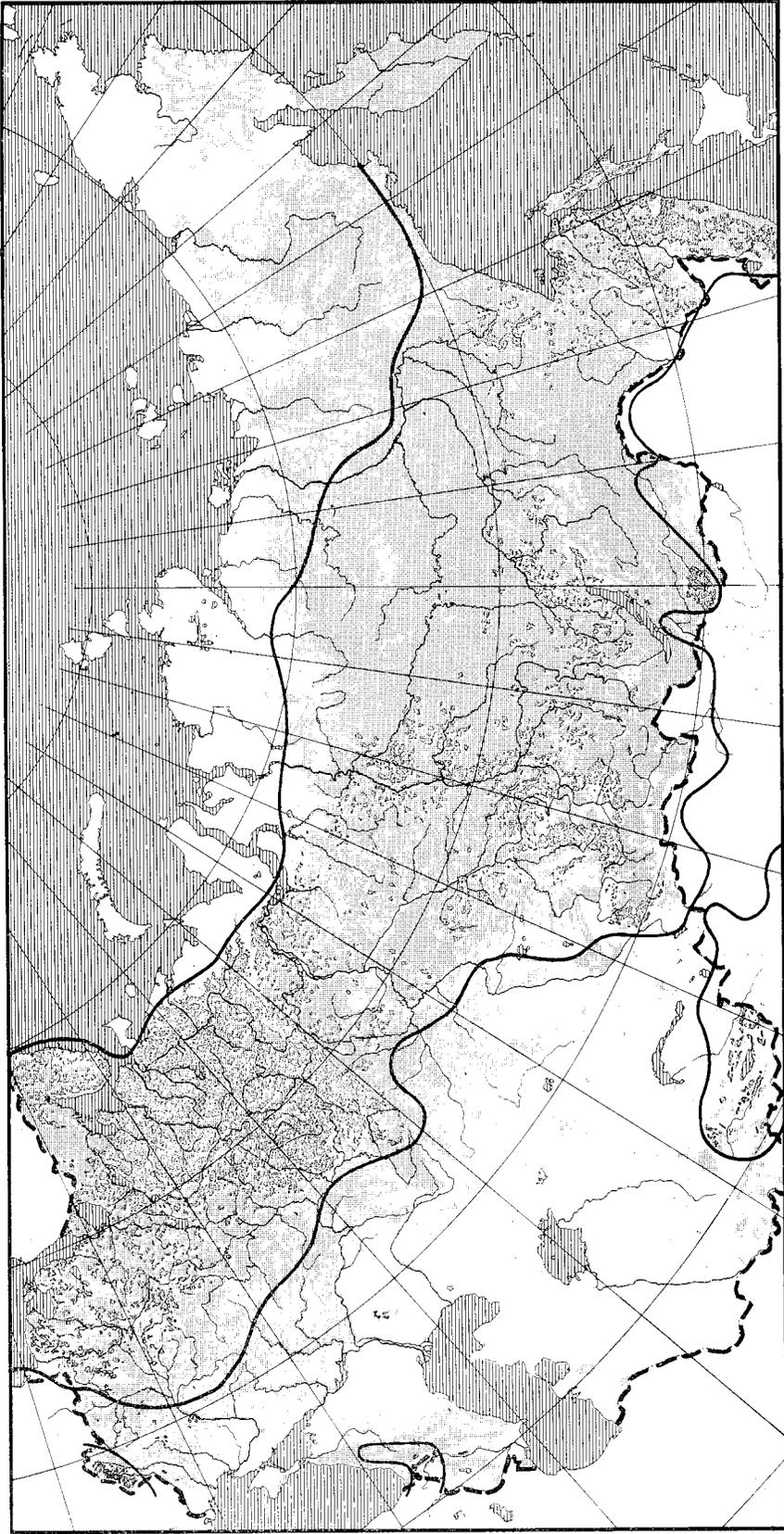
2.2 Spruce Forests

The genus *Picea* is represented in the northern part of Eurasia by only two native species, which are of primary importance: namely, **Norway spruce** (*Picea excelsa* Link, syn. *P. abies* Karst, in Russian *el obyknovennaya*), found only in Europe, and **Siberian spruce** (*Picea obovata* Ledeb. or *P. excelsa* var. *obovata* Blyt., in Russian *el sibirskaya*), which is found both in Europe and in Asia. The botanical characteristics of these two species do not differ radically, except in the form of the cones; and the general habits, ecological requirements and silvical features of the two species are almost the same. In the western part of European Russia *Picea excelsa* is dominant, while in the East *Picea obovata* is more frequent.

The natural occurrence and distribution of spruce forests, both of the European and of the Siberian variety, is shown on the map in Figure 1: 6. The eastern limit of Norway spruce coincides roughly with a line along the Northern Dvina from Archangel southward to latitude 55° North, which is the approximate southern limit of its range. Spruce does not occur in the steppes.

On the Kola peninsula, both species of spruce may be found growing together, and a similar situation is found also in the region of Archangel and Vologda. Siberian spruce gradually increases towards the East. In the Eastern Siberian taiga spruce becomes less frequent, probably because of adverse climatic conditions. In general, the range of spruce is more closely connected with climate, and particularly with precipitation, than is the range of pine. In regions with too dry a climate, i. e. low precipitation and low humidity, spruce does not occur. It grows best on well-drained sandy loam or alluvial soils. Its demand for moisture is in general higher than that of pine, but in some regions, especially in Siberia, spruce stands can be found on rather dry sandy soils, but their growth is poor.

The species is shallow-rooting, and susceptible to windthrow. Both species of spruce are relatively tolerant, and can recover after long periods of suppression. Natural regeneration of spruce is easily ob-



Source: Karta lesov SSSR, Glavnoye upravlenie geodesii i kartografi MVD SSSR, 1955

Fig. 1: 6. Distribution of Spruce Forests

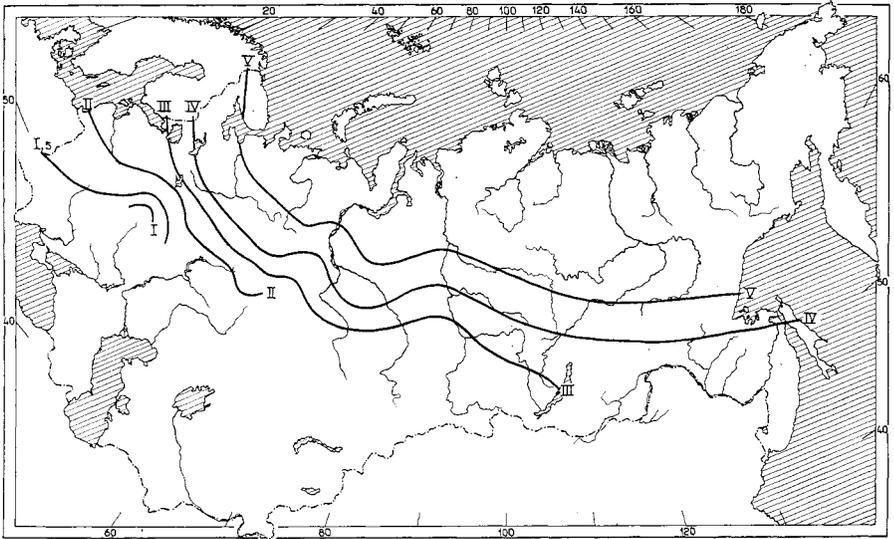
tained under the shelter of an overwood, and a second story of spruce is found almost everywhere in the forests within its range, particularly under better soil conditions. The old spruce generally grows in pure stands. However, admixture with other species is common in immature stands, in which fir, pine, birch and aspen are usually the associates of spruce.

Many varieties of *Picea excelsa* can be recognised. Forma *chlorocarpa* and *erythrocarpa*, “green-cone” and “red-cone” respectively, have allegedly shown variations not only of botanical characteristics, but also of certain silvical features, of which differences in frost resistance are considered to be of some importance. In the northern part of the forest zone, called the spacious taiga (*taibola*) because of the open character of the stands, intolerant tree species such as birch and larch are found growing in admixture with spruce.

Spruce stands of the taiga are higher and denser than those mentioned above. On cut-over and burned areas there is usually some mixing with birches. The “black taiga”, as spruce and fir stands are called in Siberia, is replaced here by “white taiga” (Tkachenko, 1922, p. 24). But under undisturbed conditions birch usually occupies a minor position in the stand.

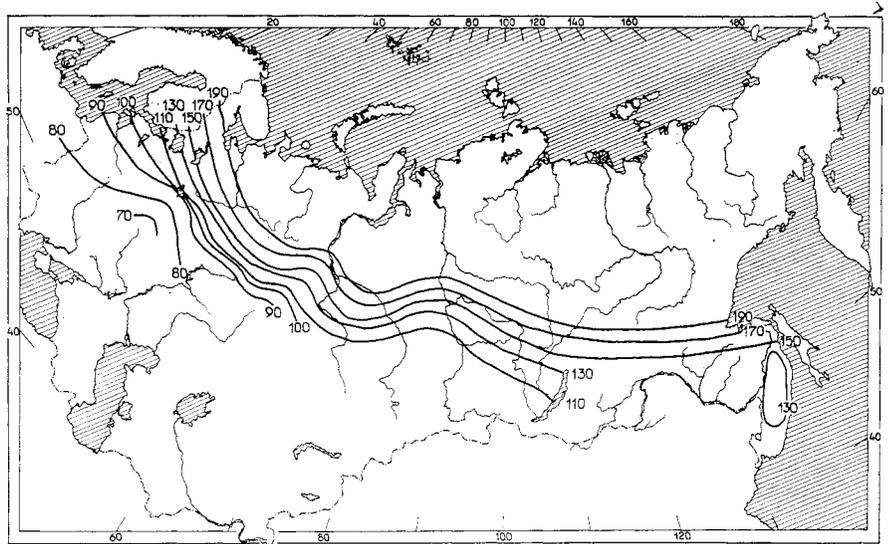
The coniferous forests in the Altay and Sayan mountains are mainly of fir and Cembran pine, spruce being found in admixture with other species only along the rivers. Characteristic of the Altay region is the relatively vigorous ground cover of herbaceous plants. In the south the conifers are frequently associated with broad-leaved species, especially lime and maple. The ground cover in these open stands is luxuriant, and the conifers will eventually be replaced by birch and aspen. The best spruce stands, with the highest yields of timber, grow on weakly podzolised moraines, but this type of soil is one of the most productive for agriculture, and in densely populated areas its availability for forestry purposes is very limited.

It may be pointed out that the spruce forests like the pine forests described in the previous section become increasingly dense and higher from the tundra towards the south, i.e. the productive capacity of the forest land increases from north to south. This is seen from the map in Figure 1: 7, where the average site quality classes of the spruce forests are schematically shown in curve form. The map in Figure 1: 8, showing the average time needed for spruce stands to reach maturity, supplements the curves presented for average site quality classes (*izobonitety*). According to Tseplyayev (1961, p. 218), spruce stands in the different regions may be regarded as reaching maturity, on



Source: Tsepilyayev, V. P., Lesa SSSR, 1961

Fig. 1: 7. Average Site Quality Classes in Spruce Forests



Source: Tsepilyayev, V. P., Lesa SSSR, 1961

Fig. 1: 8. Average Time for Spruce to Reach Maturity, Years



Source: Karta lesov SSSR, Glavnoye upravlenie geodesii i kartografi MVD SSSR, 1955

Fig. 1: 9. Distribution of Larch Forests

average, at 24 cm diameter at breast height, and the curves in Figure 1:8 refer to such a maturity condition. Both of these figures (1:7 and 1:8) reveal the inferior conditions for forest growth in the eastern parts of the U.S.S.R. compared with the western parts, where the climate is more favourable.

Caucasian spruce (*Picea orientalis* Carr.) grows in the high mountains of the eastern Caucasus, where it extends to the tree line on favourable sites. This species is excessive in its moisture demands, and requires an abundance of rain and a high humidity. It is very shade tolerant, but does not endure any sudden change in environmental conditions, particularly the admission of excess light to the forest floor. *Picea orientalis* tends to form pure stands over extensive areas, but more frequently it is found in admixture with *Abies nordmanniana*, *Fagus orientalis* and other species. Forest trees of this species of spruce have a maximum height of 70 metres, and can reach an age of from 500 to 600 years.

2.3 Larch Forests

The genus *Larix* is represented in the western parts of the U.S.S.R. by a native species (*Larix europea* Lam. et DC, syn. *L. decidua* Mill., in Russian *listvennitsa yevropeiskaya*), which is mainly found in the Carpathians. In the north-eastern part of European Russia another species of larch (*Larix sukaczewii* Dyl., in Russian *listvennitsa Sukačeva*) is found, and in Siberia two species, **Siberian larch** (*Larix sibirica* Ledeb., syn. *L. decidua* var. *sibirica* Reg., *L. intermedia* Laws, in Russian *listvennitsa sibirskaya*) and **Dahurian larch** (*Larix dahurica* Turcz, syn. *L. gmelini* Pilger, *L. davurica* Trautv., in Russian *listvennitsa daurskaya*) cover vast areas.

The distribution of larch forests is shown on the map in Figure 1:9. It can be seen that in Eastern Siberia, larch forests cover the most extensive area. The range of Dahurian larch extends eastwards to Kamchatka, and almost coincides with the limits of the permanently frozen subsoil. It extends to the forest limit everywhere in its range. The western limit of larch approaches Lake Onega, but several records indicate that it has reached farther southwest in the past.

The Siberian larch is often found growing also on permanently frozen subsoil and frequently in peat-bogs, but its requirements for soil nutrients are more selective than those of pine. The occurrence of calcium in the soil seems to be of especial importance. On deep,

well-drained soils it develops a deep root-system, but on frozen subsoil the root-system is shallow. Siberian larch is very intolerant throughout its life. Natural regeneration is accomplished easily through direct seeding in open areas and especially on burned areas. However, on these areas, because of the less selective soil demands of pine, there is a tendency for former larch stands to be replaced by pine. On both cut-over and burned areas, birch and aspen are the most frequent pioneer trees, whether subsequently followed by pine or by larch. Seed is produced at an age of 12 to 15 years by single trees of Siberian larch growing in the open, but in closed stands somewhat later, at 20 to 50 years of age. Large crops of seed occur at intervals of three to five years. The boles of mature trees are clean, with considerable clear lengths. The trees often reach a height of 35 metres or more. Maturity is ordinarily reached at an age of 300 years.

The volume production of stands composed of Dahurian larch is usually less than that of Siberian larch. In their natural range, the larch forests occur on the poorest sites, i.e. site quality classes IV and V, with a volume of 100—200 cubic metres per hectare in mature stands, and an average annual increment of 1—1.5 cubic metres per hectare. Only under the most favourable site conditions can the growing stock reach a volume of 300—400 cubic metres per hectare (Tsepilyayev, 1961, p. 254). On the tundra and in the high mountains the trees of Dahurian larch are stunted; here it is not uncommon to find old trees only 50 centimetres in height and not more than 5 centimetres diameter at breast height. On the best sites the trees can attain a height of 20 metres. The best growth is found on gentle, southward-falling mountain slopes. In the northern part of its range, Dahurian larch forms almost pure stands, but in the south it is generally mixed with pine, birch, poplar, spruce and fir.

The stand density and height of larch increases towards the south but this increase of stand density is much less in larch than in spruce, because larch is a very much more intolerant tree than spruce. The vegetation associated with larch stands is increasingly rich in species from north to south.

The wood of the larch is heavy, durable, exceptionally strong and resistant to decay. Because of these characteristic qualities, larch is of high technical value as lumber. The technical characteristics of all species of larch are quite similar.

The heaviness of the wood prevents it from floating, and the tendency of larch logs to sink during transport by floating rather limits the use of larch timber in the sawmilling industry.

2.4 Other Coniferous Forests

Among the commercial tree species, the genus *Abies* includes a considerable number of species which are found in Eurasia. The most common species is the **Siberian fir** (*Abies sibirica* Ledeb., syn. *A. pichta* Forb., *A. heterophylla* Koch, in Russian *pikhta sibirskaya*) which occurs over large areas in both north-eastern Europe and Siberia. The western and southern limits of its range almost coincide with that of the Siberian larch, but the fir does not penetrate as far north as the larch. Siberian fir is most abundant on deep, rich, well-drained soils with sufficient moisture. In mixed stands it is commonly associated with spruce. It has a rather deep, wide-spreading root system, and hence is relatively wind-firm. It attains a maximum height of about 28 metres, but generally its growth is slow. The species is very tolerant, and occurs as an underwood under rather dense shade. Natural reproduction by direct seeding under shade is abundant. It also regenerates vegetatively.

The technical value of the wood is not very high, and it is not used for construction purposes. Its use as pulpwood is increasing slowly. As fuelwood it is low value.

Caucasian fir (*Abies nordmanniana* Spach, in Russian *pikhta kavkazskaya*) is a tree of high elevations, and is mainly confined to the Caucasus mountains. It shows its best growth in Abkhazia and in the vicinity of the Black Sea. The tree reaches the forest limit in the mountains, but requires a high humidity and an abundance of moisture. This fir is relatively long-lived, and trees of 400 to 500 years of age are not uncommon. Under optimum site conditions it reaches 40 to 50 metres in height, and as much as 80—90 cm diameter at breast height; the growing stock in mature stands can reach a volume of 1,600 cubic metres per hectare, and in exceptional cases 2,200 cubic metres (Tseplyayev, 1961, p. 226). Natural regeneration is fairly good in small openings under partial shelter. The wood of this fir was formerly used almost exclusively as a roofing material, but more modern techniques have expanded the demand for this wood, both for pulpwood and for construction material.

As a commercial tree species, **Juniper** is of great importance locally. The genus *Juniperus* includes a number of species of trees and shrubs, widely scattered throughout the Eurasian continent, especially in the Crimea, the Caucasus, Siberia and Central Asia. Juniper forests are found mainly in the Central Asiatic Soviet republics of Uzbekistan, Turkmenia, Tadzhik, about 75 per cent of whose forests consist of

Juniper or "Archa". The species which covers the widest area is *Juniperus sabina* L. (in Russian *mozhzhevelnik kazatsky*).

In the forests of Uzbekistan the following species are found:

Juniperus seravschanica Komar. (*mozhzhevelnik seravshansky*)

Juniperus semiglobosa Reg. (*mozhzhevelnik polusharovidny*)

Juniperus turkestanica Komar. (*mozhzhevelnik turkestansky*).

Not much is known about these forests in general, and very little about the silvical characteristics of these species. The habit and growth of the trees varies widely. On some sites trees can reach a height of 12 metres at an age of 75 years, but the same species often occurs as a shrub in a less favourable environment. The stands are rather open, with a density of 0.3 to 0.5, and the volume of the growing stock is on average about 22 cubic metres per hectare. This rather low volume seems to be partly a result of the activities of man. These forests, however, play a very important role in the soil and water conservation of that dry region, and it is in the mountains that their value is especially high. The wood of the juniper is very valuable, and in the timber-deficient areas of Central Asia it is used both for construction timber and for fuel.

Yew, as a commercial tree species, is of local significance. The genus *Taxus* is represented in European Russia by one species and in the Far East by another.

The English yew (*Taxus baccata* L.) is scattered as single trees or groups along the western seaboard of the Baltic and in the Crimea. However, forests where yew are the dominant species occur only in the western Caucasus, and particularly in the republic of Georgia. In the Bazar valley of Eastern Georgia, a 1000-year-old yew stand covers an area of more than 400 hectares (Tkachenko, 1955, p. 244). The English yew requires a maritime climate and is very shade tolerant. It is found mainly as an understory, especially under beech, and its principal associate is very often *Buxus sempervirens*.

Growth is very slow, and maturity is attained in some cases after 2000 to 3000 years. Such old trees can reach 25 metres in height and one metre in diameter. The wood is of exceptionally high technical value, which is probably the main reason why yew forests have been so completely exhausted in the older settled areas.

The range of *Taxus cuspidata* S. et Z. in the Far East is limited to the basins of the Amur and Ussuri rivers and to the island of Sakhalin. A characteristic common to the two species is their need for favourable soil and moisture conditions, and especially a favourable climate. However, the Pacific species, seems to be the more cold-resistant and fast-growing of the two.

2.5 Oak Forests

The genus *Quercus* has not as many species in the U.S.S.R. as might be expected, considering the vastness of the land area. There are listed 19 species, of which the following are of commercial importance: **summer oak** (*Quercus robur* L., syn. *Q. pedunculata* Ehrh., in Russian *dub chereschaty*), **winter oak** (*Q. petraea* Liebl., syn. *Q. sessiliflora* Salisb., in Russian *dub skalny*), **Grusinian oak** (*Q. iberica*, in Russian *dub gruzinsky*), and **Mongolian oak** (*Q. mongolica* Fisch., in Russian *dub mongolsky*). The distribution of oak forests is relatively limited, primarily because the land which was originally under primeval oak stands is used as agricultural land to-day. According to some authorities, the oak is a tree characteristic of the vicinity of steppes (Keller, 1927, p. 209). The optimum range of oak forests is limited by the good (grey) and melanised (brown) types of soil.

This means that oak is the main species of the deciduous forest zone. It is also known that oak forests occur far to the north on the podzol soils of the coniferous forest zone, but mainly in places where the soil is less podzolised.

Summer oak occurs almost everywhere throughout the western parts of the U.S.S.R. The northern limit of its range crosses Russia roughly along the line from Leningrad to Kirov. The summer oak is not found east of the Urals, but in the Caucasus it is very common.

The growth and general habit of the tree depend largely on local site conditions. The "Volhynia oaks" (probably a variety), for instance, are distinguished by their symmetrical boles, clear for one-half or more of their length. However, the trees of this species which grow near the northern limit of the oak range have as characteristics a short, stocky bole and wide-spreading crown. Growth is rather slow at all times, and maturity is reached at a great age. Oak trees of more than 1,000 years old are not exceptional. Summer oak is found mostly in admixture with other tree species, especially on more fertile soils. Pure oak stands occur mainly on the drier sites. On the Ukrainian steppes, oak forms so-called "gallery-woods" along the river valleys. Towards the south-east, the oak penetrates somewhat into the semi-desert zone, but is restricted to the deep gullies. On the edge of the oak forest nearest the steppe, there are found some trees and shrubs of a peculiar dwarf form, which are the first woody pioneers in forest reversion on the steppe. Therefore, this species of oak plays an important role in shelter-belt planting on the Russian steppes. In Southern Russia two varieties are recognised for strip planting: *Quercus*

robur var. *praecox* and *Q. robur* var. *tardifolia*. The latter is preferred in exposed places, as it is less damaged by late spring frost (Tkachenko, 1955, pp. 261—262).

In its silvicultural features winter oak is somewhat similar to the above-mentioned species. Its range is less extensive towards the north and east, but it is very common in the Ukraine, in the Crimea and in the Caucasus. The natural range of the Grusinian oak is mainly limited to the Caucasus, where it very often forms pure stands. Mongolian oak is found mainly in the Far East, and the northern limit of its range is about latitude 50° North. It prefers dry soils, it is relatively cold-resistant.

Oak timber, in the main, shows high resistance to rot, but in some localities it can be damaged by fungi. The wood is very durable, and is of high technical value. It is widely used as construction wood and in plywood; it is in great demand in the furniture industry and for cooperage. It is also widely used for fuel. Tannin is extracted from oak bark.

2.6 Birch Forests

The genus *Betula* has more than 40 species of trees and shrubs, widely scattered through the Eurasian continent from the Arctic Circle to the southern deserts. Those judged to be of superior commercial value include the following: *Betula verrucosa* Ehrh. (in Russian *bereza borovchataya*), *B. pubescens* Ehrh. (*bereza pushistaya*), *B. ermani* Cham. (*bereza kamennaya* or *bereza Ermana*), *B. dahurica* Pall. (*bereza daurskaya*) and *B. costata* Trautv. (*bereza rebristaya* or *bereza zheltaya*). The first two species mentioned have the widest range, and because of their similar botanical characteristics they are described by some authors as a single species — the **European white birch** (*Betula alba* L. syn. *B. pendula* Roth).

Betula verrucosa occurs in European Russia, and is found over large areas in the Caucasus, Central Asia and Siberia. The range of *Betula pubescens* extends further north to the forest limit on the tundra. In Asiatic Russia, this species is also widespread, and is found as far east as Stanovoy (east of Lake Baikal), in the Altay, and in the Sayan Mountains. The southern limit of its range is on the steppes. The forest islands of the mid-steppe (*kolki*) are mostly of *Betula verrucosa*, which usually occurs under drier soil conditions, while *Betula pubescens* in the southern region is usually found on moist, cool sites, such as steep northerly slopes and the edges of *Sphagnum* bogs. In general, these birches occur on a variety of soils, from podzolised sands to

black earth. Birch (mostly *B. verrucosa*) is largely used as seedlings in the shelterbelt plantations on the Russian steppes (Tkachenko, 1955, p. 247).

Birch is a prolific seeder, usually producing some seed each year and large crops at irregular intervals. The light nutlets are carried long distances by the wind, which is at least one reason for the rapid regeneration of cut-over and burned areas with birch, although birches of old growth may not be found in the near vicinity.

Vegetative reproduction by stool-shoots is not uncommon up to an age of 30 to 40 years. However, this may be influenced by site conditions, and on swampy soils the sprouting capacity may be retained satisfactorily to an age of 50 years or more.

Birches are very shade intolerant, and often serve as a cover under which the more tolerant species, as, for example, spruce, may become established on the site. Birch forest in admixture with spruce and aspen, or all three together with pine, covers large areas. However, birch is usually missing in the climax forest areas of these types, because it is a much shorter-lived tree than any of the associated conifers. On moist sites birch may occasionally form nearly pure stands.

The wood of birch is widely used in joinery and cabinet work, for plywood, and in the chemical industry. As fuelwood, birch has also a very high value. A variety of *Betula verrucosa*, called Karelian birch, is especially prized for its fine wood texture.

2.7 Aspen and Poplar Forests

The genus *Populus* consists of about 26 species native to the northern section of the Eurasian continent. They are characterised by relatively short life and rapid growth, which makes them valuable for wood production, e. g. as in shelterbelts. The following species grow to commercial size and are important in silvicultural practice: *Populus tremula* L. (in Russian *osina obyknovennaya*), *P. pseudotremula* N. Rubtz. (*osina lozhnaya*), *P. sieboldii* (*osina Zibolda*), *P. nigra* L. (*topol cherny* or *osokor*), *P. alba* (*topol bely* or *topol serebristy*) and *P. suaveolens* Fisch. (*topol dushisty*).

Aspen (*Populus tremula*) is very widely distributed in European Russia, in the Caucasus and in Siberia, ranging as far east as Vladivostok. The northern limit of its range extends in some areas as far as latitude 70° North; this indicates the high frost resistance of this species. Its soil and moisture requirements are rather high, and it shows its

best growth on well-drained, sandy loams. It also occurs on podzolised sands, on chernozem, and on moist alluvial soils.

Aspen is a very shade-intolerant species. While it is found mostly in admixture with other species such as birch and spruce, it also occurs in pure stands, but these are usually second-growth in character. Aspen is a prolific seeder; it also produces, and regenerates from, root suckers.

Aspen thickets, which have originated from root suckers, are quite common on recently clear-felled areas of the high forest. Formerly, aspen was considered a weed tree and was not permitted to develop in well-managed forests, but with a more realistic appreciation of its possibilities in recent years, the attitude towards it has changed.

The wood of aspen is subject to damage by the beetles *Saperda carcharias* and *Saperda populnea*. Some fungi, especially *Fomes igniarius*, are also very injurious. It is very difficult to find aspen of old growth completely sound. Aspen wood is widely used in the match industry and as fuel, although as fuelwood it is of rather low value.

Black poplar (*Populus nigra*) occurs mainly in the Ukraine, in the central black-earth regions of European Russia, in the Western Siberia and in Central Asia. It grows close to rivers, but it also occurs on moist, sandy soils and beaches everywhere. This poplar is very fast-growing, and in 50 years it can reach 35 metres in height and one metre in diameter. Its wood is less subject to damage by fungi and beetles than that of other species of poplar, and old trees are commonly sound and healthy. Because of its abundant sprouting ability, this poplar regenerates mainly by vegetative means.

Silver poplar (*Populus alba*) has about the same range as the above species, but it is less cold-resistant. It does not form stands and prefers moist sites.

Populus suaveolens is native to Siberia and the Far East. The northern limit of its range reaches the forest limit. As a rule, it occurs close to rivers.

2.8 Other Deciduous Forests

In the territory of the U.S.S.R., there are a great many other tree species of commercial value, only a few of which will be mentioned.

European beech (*Fagus silvatica* L., in Russian *buk yevropeisky*) occurs only in the western portions of the U.S.S.R. In the Crimea and in the Caucasus the **Eastern beech** (*F. orientalis* Lipsky, in Russian *buk vostochny*) is widely distributed. The Crimean variety is some-

times described as a separate species (*F. taurica*). In the western Caucasus, beech occurs in many different altitudinal zones, including low valleys and high mountain slopes just below the forest limit. It is rarely found on dry southern slopes, and seems to show a definite preference for the cooler northern slopes. One of its requirements is moisture, and in localities with low humidity and a more continental type of climate it does not thrive. It is completely absent from the mountains of Armenia, where the climate is notably drier. The wood is used for furniture, cooperage and flooring, as well as for fuel.

Hornbeam (*Carpinus betulus* L., in Russian *grab obyknovenny*) is found in Belorussia, in the Ukraine and in Lithuania. Although this species has no great commercial value, it is noted for its ability to invade and take over cut-over areas, and the area occupied by it is continually increasing. Its Caucasian variety (*C. caucasica* A. Grosch, in Russian *grab kavkazsky*) is of more commercial value. In their silvicultural features, these species do not differ essentially.

Black alder (*Alnus glutinosa* L. et Gaertn., in Russian *olkha chernaya*) is found on the Russian plains west of the Urals. It is also widely distributed in the Northern Caucasus, but is not found in the steppe zone. It is essentially a species of moist and even wet localities, and makes its best growth on moist, rich, loamy bottom lands. However, this species is found neither on swampy soils nor in *Sphagnum* bogs. It occurs either in pure stands or in admixture with birch, spruce and other species. Under optimum site conditions, the mature stands attain a growing stock of 300—400 cubic metres and an average increment of 4—5 cubic metres per hectare. Maturity is reached at 60 to 100 years. The wood is widely used in the plywood and furniture industries. It is also highly valued as fuel.

Speckled alder (*Alnus incana* L. et Moench, in Russian *olkha belaya* or *olkha seraya*) occurs over a much wider area than the former species extending into Eastern Siberia. As a commercial tree species it is not of great importance but it is of considerable silvicultural value as a pioneer on clear-felled and burned areas, because of the ability of its roots, through the agency of nitrogen-fixing nodules, to increase the nitrogen content of the soil. Thus it prepares the soil for other species. On better soils it is considered an undesirable weed. The wood of speckled alder is used only as fuel.

Within the borders of the U.S.S.R., the lime (genus *Tilia*) is represented by more than 10 species. Few of them have commercial importance. **Small-leaved lime** (*Tilia cordata* L. et Mill., syn. *T. parvifolia*, in Russian *lipa melkolistnaya* or *lipa serdselistnaya*) occurs

almost everywhere in the U.S.S.R., both west and east of the Urals. In the northern regions it acts as an indicator of good soil, because it is usually absent under poor site conditions. In the southern part of its range this is not so, because on the best soils it cannot compete with other species. It makes its best growth on deep, sandy loams with good drainage. Mature trees can reach 30 metres in height. It is a rather tolerant tree, which occasionally forms pure stands, but which usually is found mixed with other species, especially as an understorey. The wood of the lime is widely used for handicraft purposes in Russia, and from its bark are made ropes and even a certain kind of shoe, largely used by Russian peasants. The European **large-leaved lime** (*Tilia grandifolia*, syn. *T. platyphyllos* Scop., in Russian *lipa krupnolistnaya* or *lipa letnyaya*) is native to European Russia. It occurs also in the Caucasus. The growth of this species is somewhat faster than that of *Tilia cordata*.

Tilia amurensis Rupr. (in Russian *lipa amurskaya*) and *Tilia manshurica* Rupr. et Maxim. (*lipa manzhurskaya*) are native to the Far East. Forest stands, with these limes as the dominant tree, cover an area of more than one million hectares in the Amur region. They can reach a height of 25 metres and a diameter of 80 centimetres.

Tilia caucasica Rupr. (in Russian *lipa kavkazkaya*), occurs in the Caucasus. Its distribution follows the mountains, up to fairly high elevations.

Walnut (*Juglans regia* L., in Russian *orekh gretsky*) is found in the Caucasus and Central Asia. This species is especially wide-spread in the mountains of Tien-Shan and Kopet-Dagh. Extensive stands of walnut in the Central Asiatic Republics exceed 30,000 hectares in area. It ascends to 1,500 metres in the Caucasus, and to nearly 2,300 metres in Central Asia. It makes its best growth on deep, moist soils, rich in calcium. On good sites it attains 30 metres in height, in exceptional cases even 35 metres, in trees older than 70 years. This species is rather intolerant. Under forest competition it develops a well-formed bole, clear of branches for a considerable height. In the open, it is characterised by a wide-spreading crown. The root system is extensive, and has a definite taproot.

Large crops of seeds (nuts) occur every two or three years. From a large single tree more than 500 kilograms of nuts can be harvested, which are largely used as food. The reproduction of this species can readily be accomplished by shoots. Walnut produces valuable timber, which is prized especially for its fine figure.

Juglans manshurica Maxim. (in Russian *orekh manzhursky*) is

found in the Far East. Its silvical characteristics are very similar to those of the former species, but it seems to be more cold-resistant.

Saksaul (genus *Haloxyton*) is wide-spread in the deserts and semi-deserts. *Haloxyton aphyllum* Minkw. Ilyin (syn. *Arthrophytum haloxyton*, in Russian *saksaul cherny*) and *Haloxyton persicum* Bge. (syn. *Arthrophytum acutifolium*, *saksaul bely*) are native to Central Asia where according to some authorities (Tsepilyayev, 1961, p. 416), they comprise forests with an estimated area totalling more than 20 million hectares (according to other sources nearly 100 million hectares, Tkachenko, 1955, p. 287). Saksaul is a small tree and reaches only about 10 metres in height, with a diameter at breast height of more than 80 centimetres. It develops no leaves in the usual sense of the word, but assimilates through its green bark. The root-system is extensive and roots 10 metres or more in length are common. Its growth is very rapid. As fuelwood it is of great importance to the native population of Central Asia, and the young twigs of saksaul are eaten by camels and sheep.

3. Statistics of Forest Resources

3.1 Soviet Forest Inventories

Soviet statistics of forest resources differ not only from the international statistics, but differ widely in themselves from one period to another. For this reason, an examination of Soviet inventory methods, the presentation of forest statistics and their interpretation, appears to be highly desirable. This is also important because Soviet experts state that western foresters do not interpret Soviet forest statistics correctly. Writing in this connection, one of the leading Soviet forest economists, Professor Vasiliev (*L. Kh.*, 1963, 6, p. 60), states, "In the World Forest Inventory 1958 large errors were made in using Soviet data because the characteristics and the indicators of our inventory system were not properly understood. In this survey, the world's forest area was put at 4,405 million hectares, instead of 4,110 million hectares, the real figure at the time. Growing stock in forests in use was calculated to be 155,610 million cubic metres, instead of 128,576 million cubic metres. Particularly large errors were made in the data for the area and the growing stock of coniferous forests in use (*osvoyennykh ploshchadyakh i zapasakh kvoinykh lesov*). The growing stock of the latter as a world total was said to be 101,600 million

cubic metres instead of 75,167 million cubic metres, i.e. an exaggeration of 35 per cent. There is no need to enumerate the gravity of such a series of errors." The author adds, however, that "by this time, the compilers of the Inventory have corrected these errors."

Statistical compilations in forestry were begun in Russia at a comparatively early date. The first forest survey of any importance, for example, was started in European Russia in 1881 in connection with the evaluation of some areas of agricultural land (Surozh, 1908, p. 10). It is clear that the statistical surveying of such gigantic areas as those of Russia is very complicated. The compilation of exact acreages of the vast, inaccessible and unknown swamp and water areas is in many cases impossible. The compilations used in the older forest survey reports are for the most part estimates based mainly on general information collected by various expeditions.

Furthermore, these estimates were made by different investigators at different periods and under different social and political conditions; hence the results have naturally shown great variation. If we take into consideration the huge extent of the forest area in Russia, some variation in the estimates is unavoidable even when more sophisticated inventory methods are used. The varying results of these rough appraisals during the early periods are consequently not surprising. With the development of better techniques for survey, the accuracy of statistical data also improved. Aerial photography, when used together with local ground surveys, has greatly improved the accuracy of the information and the estimates of remote forest areas.

The Soviets publish nation-wide statistical compilations and a summary of the data available from these is presented in Table 1—1.

Table 1—1. Forest Area and Growing Stock in the U.S.S.R. according to different Forest Inventories

Forest inventory	Year of compilation	Year of publishing	Total (forest) land area	Forest area	Actually forested area (productive forest land)	Volume of growing stock 1,000 millions of cubic metres
			million hectares			
I	1927	1930	934	618	574	34
II	1956	1957	1,131	836	722	75
III	1961	1962	1,238	910	738	80

Sources: (1) *Materialy po statistike lesnovo fonda SSSR*, Moscow, 1930

(2) *Lesnaya Promyshlennost SSSR, Statistichesky sbornik*, 1957

(3) *Lesnoy fond RSFSR, Statistichesky sbornik*, 1962

(4) Ponomarev, A.D. "Lesnoy fond SSSR", *Lesnoye khozyaistvo*, 1963, 6

In order to find an explanation for the variability of the forest area in the Soviet official statistics, let us look at the background of the statistical compilations. To start with it must be mentioned that the first forest inventory (1927) does not include the land territories incorporated in the U.S.S.R. as a consequence of World War II. Through the annexations listed below, the forest area of the U.S.S.R. has increased approximately as follows:

	<i>Million hectares</i>
Finnish Karelia	3.0
Baltic States	3.5
Eastern Poland	5.5
Bessarabia, Bukovina and the Carpatho-Ukraine	1.0
Southern Sakhalin	1.0
	Total 14.0

The census of 1927 was based on questionnaires directed to all local forestry agencies, enterprises and institutions in the Soviet Union. The data were first gathered and checked by provincial forestry agencies, and later sent to the Bureau of Forest Statistics of the People's Commissariat for Agriculture of the RSFSR in Moscow. After a rather thorough compilation, this institution published the data in 1930 under the title *Statistical Data on Forest Resources of the U.S.S.R. (Materialy po statistike lesnovo fonda SSSR)*. The summary of the data is given in Table 1—2. As can be seen from the table, this census included a considerable area of non-forest land. These "non-forest" areas are:

1. Swamps, rivers and lakes, tundras and other non-productive land areas, "impediments";
2. Arable land, meadows, and other agricultural land.

The non-forest areas mentioned above were included in the total area considered by the forest census, because they were listed as being under the management of the Forest Administration.

To question the accuracy of such data is not without point. In the first place, the information concerning the forest area is based mostly on estimates, especially as far as Asiatic Russia is concerned. For example, the total forest area in Yakutia is given as 180,000,000 hectares, but the fact remains that there are no figures available to support the accuracy of that statement. The area given is deduced from one for the total area of the territory, which according to the Commissariat of the Interior, was 3,900,000 square kilometres, and 46 per cent of the total area of Yakutia was assumed to be covered by forests;

Table 1—2. Distribution of Forest Area of the U.S.S.R., by Soviet Republics, according to 1927 Inventory

Regions	Forest area			Non-forest area (agricultural land, non-productive land)	Total area
	Actually forested area	Cut-over, burned over and semi-permanent openings	Total forest area		
<i>hectares</i>					
Russian SFSR	560,134,814	5,484,572 29,957,173 7,580,777	603,157,336	10,002,745 297,669,758	910,829,839
Belorussian SSR	2,756,371	253,568 34,710 94,371	3,139,020	128,252 451,584	3,718,856
Ukrainian SSR	2,600,742	668,741	3,269,483	184,039 189,028	3,642,550
Moldavian ASSR	34,869	6,346	41,215	3,990 684	45,889
Caucasian SFSR	3,340,477	173,564	3,514,041	599,597	4,113,638
Turkmen SSR	2,800,000	—	2,800,000	6,288,000	9,088,000
Uzbek and Tadzhik SSR	2,001,248	69,147	2,070,395	193,450 480,103	2,743,948
I Under Forest Administration	539,152,924	41,455,528	580,608,452	308,558,552	889,167,004
II Under other agencies	10,273,195	1,036,490	11,309,685	3,279,503	14,589,188
III Local Forests	24,242,402	1,830,951	26,073,353	4,353,175	30,426,528
Total U.S.S.R.	573,668,521	44,322,969	617,991,490	316,191,230	934,182,720

Source: *Materialy po statistike lesnovo fonda SSSR*, Moscow, 1930

a figure based absolutely on local and unproved assumptions to which we cannot attach any practical value.

The Forest Inventory of 1 January 1956, published under the title *Forest Resources of the U.S.S.R. (Lesnye resursy SSSR)* in the statistical compilation *Forest Industry of the U.S.S.R. (Lesnaya Promyshlennost SSSR, Statistichesky sbornik)* in 1957, gives a fairly thorough survey of the data for the forested area, age-class distribution and growing stock, by main regions in the forests under the jurisdiction (*v vedenii*) of the Central Administration of Forest Management and Shelterbelt Planting (*Glavnoye upravlenie lesnovo khozyaistva i polezachitnovo lesorazvedenia*).

The official statistics published in 1957 include neither data for the total forest area in the U.S.S.R. nor for the forest area not covered by

forest, i.e. clear-felled and burned areas, semi-permanent openings, etc. However, these figures could be adapted from other sources which are not directly official publications.

The Forest Inventory of 1 January 1961, published for the Russian Federation in a separate volume entitled *Forest Resources of the RSFSR (Lesnoy fond RSFSR, Statistichesky sbornik)* in 1962, offers the most recent information about the area and volume of forest resources in Soviet Russia. It is maintained that by 1961, aerial photography had covered all the remote forests, and that consequently the forest inventory for the U.S.S.R. as a whole can be regarded as complete. Such data will be dealt with more thoroughly in the following sections of this study. In this connection it will only be mentioned, to emphasise the interesting situation, that according to the results of the 1961 inventory the total forest area and the volume of growing stock, as compared with those of the previous inventories, have considerably increased. The questions which arise here are as follows: has there been in reality an increase in the forest area and the growing stock such as the 1961 inventory indicates, or is the increase a matter of difference in measurement? The answer to these questions can be given only after examination and comparison of the available statistics. As a preliminary hypothesis it might be stated that the differences in measurement, i.e. the method of inventory, seem to have played a decisive part here. There is no reason to believe that the figures show an improvement in forestry conditions and an increase in the productive capacity of the forests during the period of Soviet administration in Russia. The "expansion" of forest area from 618 million hectares in 1927 to 910 million hectares in 1961 is mainly a consequence of differences in the statistics.

3.2 *Forest Area*

There is no doubt that the methods used for making forest inventories and the reliability of forest statistics in the U.S.S.R. have improved. The two latest inventories, namely those of 1 January 1956 and 1 January 1961, should therefore be regarded as being more reliable than that of 1927. However, even these two latest inventories differ quite considerably from each other, despite there being only five years between their compilation. In order to compare the differences and to determine the reliability of the statistics, in so far as this is possible, the data from the two latest forest inventories will be set out side-by-side.

Table 1—3. Composition of the Forest Fund by Land Categories according to 1956 and 1961 Inventories

	1956		1961	
	<i>million hectares</i>			
Forested area (<i>lesopokrytaya ploshchad</i>)		722		738
Thereof (1) forests in use (<i>osvoennie ekspluatiruemie</i>) . .	398		432	
(2) unexploited forests (<i>neosvoennie neekspluatiruemie</i>)	324		306	
Forest land not covered by forest (<i>nepokrytaya lesnaya ploshchad</i>)		114		172
Thereof (1) forests in use	61		94	
(2) unexploited forests	53		78	
Forest land area (<i>lesnaya ploshchad</i>)		836		910
Thereof (1) forests in use	459		526	
(2) unexploited forests	377		384	
Non-forest area (<i>ne lesnaya ploshchad</i>)		295		328
Thereof (1) arable lands (<i>pashni</i>)	1		1	
(2) meadows (<i>senokosy</i>)	9		8	
(3) pastures (<i>pastbishcha</i>)	5		3	
(4) marshlands (<i>bolota</i>)	138		130	
(5) sands (<i>peski</i>)	13		12	
(6) ravines (<i>ovragi</i>), mountain slopes (<i>krutie sklony</i>), etc.	100		121	
(7) service lands (<i>sluzhebnie zemli</i>) or farm lands (<i>usadby</i>)	7		1	
(8) waters (<i>vody</i>)	20		24	
(9) roads (<i>doroggy</i>), lanes (<i>proseki</i>), and ditches (<i>kanavy</i>)	—		13	
(10) not classified	2		15	
Total land area of the Forest Fund		1,131		1,238
(<i>obshchaya ploshchad zemel lesnovo fonda</i>)				

Sources: (1) Tseplyayev, V. P. *Lesnaya SSSR*, 1961

(2) Vasiliev, P. V. "U.S.S.R. Forest Resources and Features of their Inventory", *Unasylva*, 1961, 3

(3) Lesnoy fond RSFSR, *Statistichesky Sbornik*, 1962

(4) Vasiliev, P. V. "Lesnie resursy SSSR v otsenke po pokazatelyam mirovoy lesnoy statistiki", *Lesnoye Khozyaistvo*, 1963, 6

(5) Ponomarev, A. D. "Lesnoy fond SSSR", *Lesnoye Khozyaistvo*, 1963, 6

Table 1—3 shows the composition of the "Forest Fund" (*lesnoy fond*). As a corresponding concept is lacking both in the international terminology and in countries outside the U.S.S.R., it is important that the meaning of this term be clarified. This will be made easier in the first place by looking into its components, and then attempting to define what is involved by making comparison with the concepts accepted in the West. Let us begin this analysis of the concept in the order set out in Table 1—3.

Forested area or forest-covered area means forest land which is in productive condition. In mature stands (usually at 100 years) the volume of timber per unit area is fixed by a certain minimum amount,

which indicates the lowest productive capacity (site quality class V, according to Soviet classification) that can be considered as forest. Theoretically, if the productive capacity is less than the fixed minimum, the forest-covered land must be classified as non-forest area. Actually, the area classified as "forested" also includes scrub-land. According to the 1961 inventory, the areas covered with shrubs (*talnik*), brushwood (*kustarniki*), and other stunted trees, which are found mainly in the transition zone between the taiga and the tundra, occupy 46 million hectares (Perepechin—Filinov, 1964, p. 8).

In the 1956 inventory, such low-production forests were regarded as non-forest area. Here we have an explanation of why the forested area was increased, according to the statistics, from 722 million hectares in 1956 to 738 million hectares in 1961. However, in reality there was a reduction in the area, which is concealed by this "adjustment" of the forest statistics.

It may be pointed out that the concept "forested area" is used in general Soviet statistics as a synonym for forest land in the sense that it denotes the area of the forests. On the basis of the forested area, the forests are calculated as a percentage of the total land area in a region; this in its turn is used as the basis for the calculation of timber stock and growth per unit area. As the forested area is successively reduced in consequence of logging operations, on the one hand, and steadily increasing through forest reproduction on the other, one is not dealing here with a static concept of area; rather, the area undergoes constant changes.

Forest land not covered by forest is the area from which the forest crop has been removed. The main categories of forest land in non-productive condition are: cut-over areas without regeneration (*neoblesivshie lesoski*), burned areas (*gari*), semi-permanent openings (*pustyry*), and sparsely tree-covered areas (*rediny*). The existence of such non-productive areas, which were previously forested, shows that there is a time-lag in forest regeneration. In forestry practice run strictly on the principle of sustained yield this is not permissible, especially if it is on a large scale and cannot be eliminated quickly. As may be seen in Table 1—3, such forest land increased from 114 million hectares in 1956, to 172 million hectares in 1961, a development which needs no comment. However, it should be added that in the instructions for compiling the 1961 inventory, the criteria for "non-forested land" were changed slightly; both these and the demand that the land be made productive, so that it can be regarded as forested, have been made more stringent than before.

Forested area plus forest land not covered by forest gives the total forest area. In the forestry practice of western Europe, as well as in international statistics, that area is usually identified with the term "productive forest land".

To define the concept in such a manner would not be correct from the standpoint of the U.S.S.R., and the view of Professor Vasiliev (*L. Kh.*, 1963, 6, p. 2), that only forested area shall be regarded as productive forest, is not unjustifiable. The general statistical yearbooks (*Narodnoye Khozyaistvo SSSR*) have recently accepted this point of view, and now only "forest-covered area" (*pokrytaya lesom ploshchad*) is regarded as "forest land" in these reference works. However, in other connections the concept of forest land has been interpreted differently. It is quite evident that the recognised international forest statistics differ from those of the U.S.S.R. in this respect. One can see in Table 1—3 that the forest land area (= forested area plus forest land not covered by forest) has increased from 836 million hectares in 1956 to 910 million hectares in 1961. This increase in area is entirely accounted for by the increase in area of the categories mentioned above during this period.

All the categories described above are divided into (1) forests in use and (2) unexploited forests. This division corresponds with the practice of distinguishing between opened-up forest and unopened or reserve forests. The latter group comprises, as a rule, virgin forests. According to the instructions for the 1961 inventory (*Ukazaniya po uchetu lesnovo fonda SSSR na 1 yanvarya 1961 goda, Lesnoy fond RSFSR*, 1962) such forests which are situated far from roads (*raspolozhennye daleko ot dorog*) and which will not be opened up for the next 20 years, will be assigned to the latter group. As is shown in Table 1—3, the forested area in use increased from 398 million hectares in 1956 to 432 million hectares in 1961, but during the same period the forested area of unexploited forests decreased from 324 million hectares to 306 million hectares. This is a direct proof that the process of opening-up virgin forests is progressing in the U.S.S.R.

This development explains to a certain extent why "forest land not covered by forests" in the group "forests in use" has also increased significantly, namely, from 61 million hectares in 1956 to 94 million hectares in 1961. However, the successive inroads of logging operations into the virgin forests do not explain the increase of "forest land not covered by forest" in the group "unexploited forests" from 53 million hectares in 1956 to 78 million hectares in 1961. If this increase cannot be attributed to the "readjustment" or "improvement" of the

statistics, then the explanation may be that 25 million hectares of forest land has been rendered non-productive by forest fires or other natural catastrophes.

As is known, the international statistics distinguish between accessible (*dostupnye*) and inaccessible (*nedostupnye*) forests. "Accessibility" is both technical and economic. "Forested area" in the group "unexploited forests", considering its geographical position and its low productive capacity (average site quality class V, see Figs. 1: 4 and 1: 7), is for the most part to be regarded as inaccessible in both senses. However, the fact is that in the international statistical reports (e.g. *Y.F.P.S.*) the entire forest area of the U.S.S.R. is denoted as "accessible". This seems to be because the Soviets do not wish to recognise this line of demarcation between the technical and economic aspects of the utilisation of the forests. The reason for this negative attitude is given as "the segregation of inaccessible forests by extremely conventional and variable indicators does not seem sufficiently well-grounded or necessary" (Vasiliev, *L. Kh.*, 1963, 6, p. 61). According to the 1961 inventory, inaccessible forests were distinguished only in high mountains (about 2 million hectares), but in contrast to the general practice these were considered at the same time to be forests in use, and consequently as being opened-up for exploitation.

Non-forest areas are a very interesting chapter in Russian forest statistics. The nature of this type of land has been described briefly in the previous section in connection with the report on the findings of the 1927 inventory. Table 1—3 gives a more or less detailed account of the distribution of non-forest area by types of land use. One can see that arable land, meadows, pastures and service lands belong to this category, as do *Sphagnum* bogs, swamps, sandy areas, ravines, rivers and lakes, etc. It is obvious that these categories are not part of the forest land, and to include them in the total forest area and classify them as non-productive forests, would distort completely the meaning of forest statistics. However, it must be emphasised that this method has been used in many instances, mainly outside the U.S.S.R. As was pointed out earlier, such areas have been included in the "Forest Fund", (which in English translation is also referred to as "total area of forest reserve lands"), only because these lands are under the management or supervision of the forest administrative agencies and, at the same time, in State ownership. This seems to be the real reason why these non-forest areas have been included in the forest statistics at all, and have gradually come to be regarded as forest land. In international contexts, the Soviets have asserted that it is wrong to regard

Table 1—4. Distribution of Forest Land by Regions, according to 1956 and 1961 Inventories, in the State Forest Fund of the U.S.S.R.

Main Economic Regions and countries	Total land area of the Forest Fund		Forested area		Forested area as percentage of total land area		Forested area per capita	
	1956	1961	1956	1961	1956	1961	1956	1961
	<i>million hectares</i>				<i>%</i>		<i>hectares</i>	
Regions of the RSFSR:								
1. European North ..		76.29	75.85	69.81	45	42	6.74	6.20
2. Ural.....		81.60	72.98	70.56	32	33	3.74	3.62
3. Western Siberia...		33.22	35.89	29.09	36	32	3.36	2.73
4. Eastern Siberia...		417.89	346.58	335.80	48	56	40.15	38.90
5. Far East.....		157.41	107.34	117.22	34	27	23.94	26.14
6. Central Russia....		396.24	35.85	72.83	22	37	0.54	1.09
Total RSFSR.....	1,059.11	1,162.65	674.49	695.31	40	41	5.53	5.70
7. Baltic area								
Estonia.....	1.77	1.97	1.25	1.38	28	31	1.01	1.12
Latvia.....	2.64	2.85	2.09	2.38	33	36	0.96	1.05
Lithuania.....	1.74	1.88	1.48	1.55	23	24	0.52	0.54
Kaliningrad... (East Prussia)	0.28	(0.28)	0.16	(0.16)	11	(11)	0.25	0.25
Total.....	6.43	6.98	4.98	5.47	26	28	0.72	0.78
8. South-Western area								
Belorussia.....	7.35	8.01	6.37	6.67	31	32	0.77	0.80
Ukraine.....	8.30	9.60	6.85	7.29	11	12	0.16	0.17
Moldavia.....	0.24	0.25	0.21	0.20	6	6	0.07	0.06
Total.....	15.89	17.86	13.43	14.16	16	17	0.24	0.26
9. Transcaucasia								
Georgia.....	2.30	2.91	2.38	2.56	34	37	0.56	0.60
Armenia.....	0.35	0.44	0.27	0.28	9	9	0.14	0.14
Azerbaijan....	1.11	1.11	0.92	0.93	11	11	0.22	0.23
Total.....	3.76	4.46	3.57	3.77	19	20	0.35	0.36
10. Soviet Central Asia								
Kazakhstan....	26.24	26.02	14.29	10.96	5	4	1.31	1.00
Kirgizia.....	2.68	2.62	0.70	0.74	4	4	0.30	0.32
Turkmenia....	8.63	10.04	5.89	6.21	12	13	3.50	3.69
Tadzhikistan...	1.48	1.60	0.23	0.27	2	2	0.11	0.12
Uzbekistan....	6.90	5.32	4.69	1.33	12	3	0.52	0.15
Total.....	45.93	45.60	25.80	19.51	6	5	0.99	0.75
Grand total for the U.S.S.R.....	1,131.12	1,237.55	722.27	738.22	32	33	3.29	3.36

Sources: (1) Lesnaya Promyshlennost SSSR, *Statistichesky sbornik*, 1957
(2) Narodnoye Khozyaistvo SSSR, 1961 and 1963
(3) Lesnoy fond RSFSR, *Statistichesky sbornik*, 1962
(4) Ponomarev, A. D. "Lesnoy fond SSSR", *Lesnoye Khozyaistvo*, 1963, 6

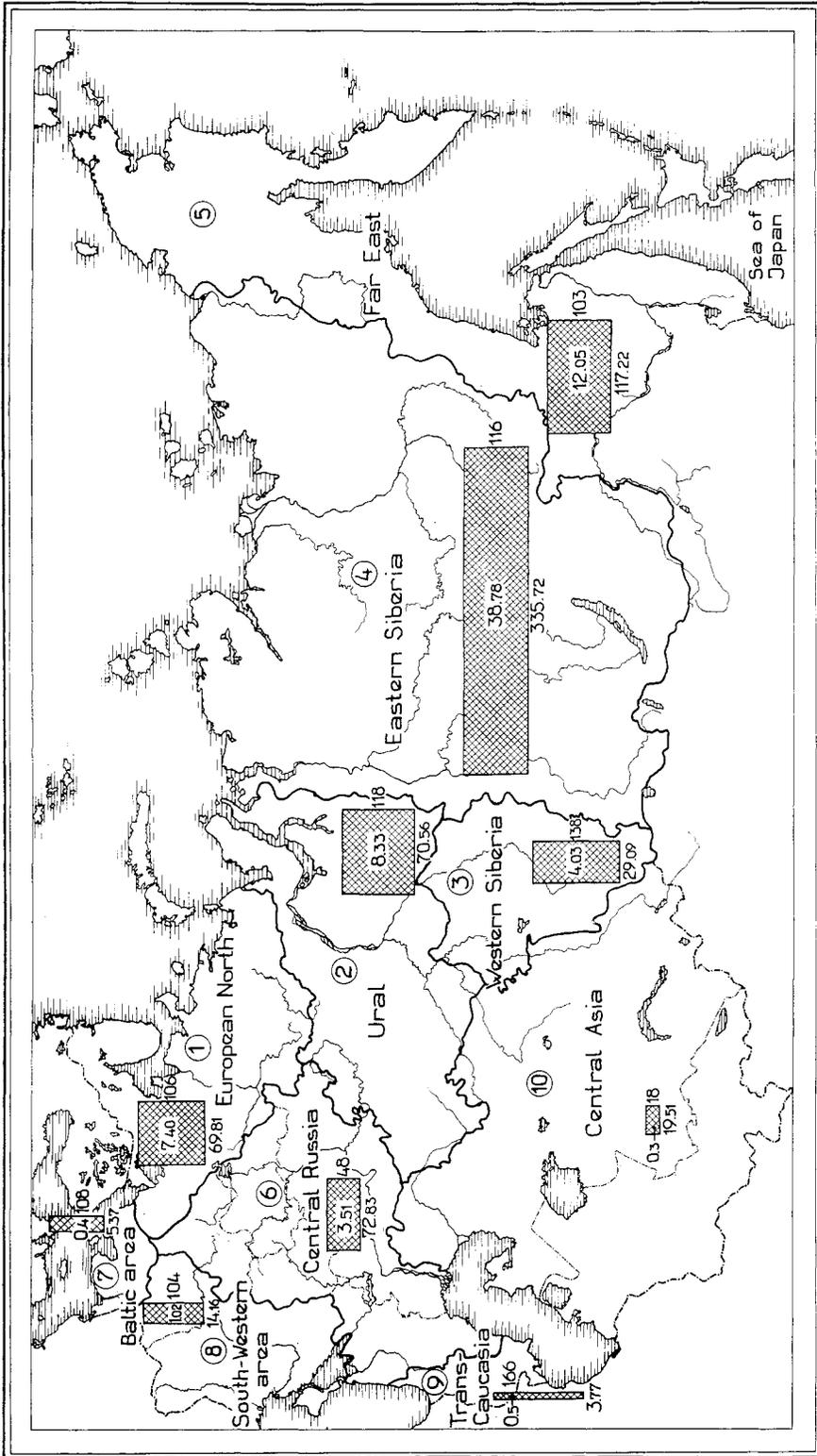
them in this way. This is confirmed by a statement of Professor Vasiliev (*Unasylyva*, 1961, 3, p. 120) that the "total area of forest reserve lands includes over 295 million hectares of non-forest area. It is not the total area of forest reserve lands, therefore, which should be compared with the total forest areas of other countries in reports on world forest resources...". In fact the category "total area of forest reserve lands" (1,131,116,000 hectares) is never used in the U.S.S.R. to classify forest resources in the country's forest statistics. Clearly it cannot be used as a basis for determining, for example, forests as a percentage of land area, average growing stock per hectare or net growth per hectare.

There is no reason to dispute this statement or to criticise it. It is completely correct, and one can fully accept this line of thought. Despite this, the international forest statistics persist in including in the forest area of the U.S.S.R. the non-forest areas which are the subject of the above criticism. Thus the forest area of the U.S.S.R. is still stated to be 1,131,116,000 hectares by the Yearbook of Forest Products Statistics (Rome, 1964, p. 109). It is outside the scope of this work to establish why this persists.

The relative distribution of forests in the U.S.S.R. varies greatly. Some regions are natural grasslands and deserts, while others are deforested as a result of unrestricted land clearing. A clear understanding of this is needed as a background for discussion of the problems involved in the forestry and the forest industry of the U.S.S.R.

The distribution of forest land by main economic regions and countries is shown in Table 1—4 and on the map in Figure 1:10. It can be seen that the percentage of forested area varies among the different regions, from two per cent in Tadzhik SSR to 48 per cent in Eastern Siberia. When different vegetation zones are compared, the range of percentages of forested areas is seen to be even greater.

The distribution and extent of forest areas are in approximately inverse ratio to the density of population. This, in the main, is a result of the long history of settlement of the country. As a consequence of the uneven distribution of settlement, the forest area *per capita* is as low as 0.01 hectares in Ukraine, as compared with about 250 hectares per capita in Yakutia, Eastern Siberia. This uneven distribution of the forests leads to a rather sharp distinction, in terms of available timber resources, between the sparsely populated northern regions with a timber surplus, and the densely populated southern regions with a timber deficit.



Sources: (1) Lesnoy fond RSFSR, Statistichesky sbornik, 1962 (2) Ponomarev, A. D., Lesnoy fond SSSR, Lesnoye Khozaystvo, 1963, 6

Fig. 1: 10. Distribution of Forest Resources by Main Economic Regions

Table 1—5. Composition of Forests by Dominant Tree Species, according to 1956 and 1961 Inventories, in the U.S.S.R.

Species	Area				Volume of growing stock according to 1956 Inventory			
	1956 Inventory		1961 Inventory		All stands		Mature stands	
	thousand hectares	per cent	thousand hectares	per cent	million cubic metres	per cent	million cubic metres	per cent of total volume
<i>Conifers</i>								
Pine	109,496	16.1	107,944	15.7	15,040	20.0	10,525	18.7
Spruce	72,105	10.6	81,312	11.8	10,579	14.1	8,657	15.4
Fir	23,100	3.4	12,092	1.8	4,182	5.6	3,507	6.2
Larch	274,261	40.2	264,097	38.4	28,450	37.9	21,755	38.8
<i>Pinus cembra</i> . .	32,120	4.7	33,407	4.9	5,835	7.8	5,098	9.1
Juniper	695	0.1	633	0.1	16		7	
Total conifers . .	511,777	75.1	499,485	72.7	64,102	85.4	49,549	88.2
<i>Deciduous</i>								
Oak	8,511	1.2	9,081	1.3	704	0.9	235	0.4
Ash	565	0.1	688	0.1	64	0.1	38	0.1
Maple	459	0.1	470	0.1	36	—	28	—
Hornbeam	904	0.1	848	0.1	97	0.1	39	0.1
Beech	2,464	0.4	2,539	0.4	517	0.7	368	0.6
Elm	490	0.1	428	0.1	50	0.1	34	0.1
Birch	91,794	13.5	92,104	13.4	6,788	9.0	4,169	7.4
Aspen	14,497	2.1	15,799	2.3	1,631	2.2	1,052	1.9
Alder	2,084	0.3	2,100	0.3	154	0.2	48	0.1
Lime	1,949	0.3	2,213	0.3	210	0.3	105	0.2
Poplar	1,306	0.2	970	0.1	118	0.2	90	0.2
Saksaul	19,815	2.9	12,772	1.9	35	—	24	—
Total deciduous	144,838	21.3	140,012	20.4	10,404	13.8	6,230	11.1
Shrubs and stunted tree species	24,330	3.6	47,284	6.9	579	0.8	405	0.7
Grand total	680,945	100.0	686,781	100.0	75,085	100.0	56,184	100.0

Forested area in the State Forest Fund.

Sources: (1) Tseplyayev, V. P. *Lesa SSSR*, Moscow, 1961, p. 21.

(2) Perepechin-Filinov *Lesopolzovanie v SSSR 1946—1962 gg.*, Moscow, 1964

3.3 Classification of Forests

Because of the enormous size of the territory of the U.S.S.R., the stand composition is extremely varied. Species commonly found in the northern part of European Russia, for instance, are missing in the Caucasus and the Far East, and *vice versa*. But such variation in species is conspicuous not only in regions geographically distant, but can sometimes be noted also in stands of local and restricted extent.

The classification of stands by dominant tree species, according to the 1956 and 1961 inventories, is presented in Table 1—5. From this it can be seen that the conifers are very prominent, and that the total coniferous forest area is more than three times as great as the deciduous forest area. The area of mature conifer stands is almost six times greater than the area of mature deciduous stands. Larch is the most widespread tree species, in the U.S.S.R. in terms of area followed by Scots pine, birch, spruce, Cembran pine, fir, etc. Remarkably widespread are shrub pine and saksaul, but these are not counted as commercial tree species. The differences between the two inventories are considerable, as is evident from the table. One can see that where spruce and pine are predominant, the area of stands has increased; and the same applies to birch and aspen; while in the case of larch and fir, the area has shrunk by almost half during the period 1956—1961. Attention should also be drawn to the fact that the stands of saksaul have decreased by almost one-third, according to the 1961 inventory.

Of special interest are the changes of area in the group under the sub-heading “shrubs and other stunted tree species”. In the 1956 inventory only scrub pine (*Pinus pumila*) was listed separately, while in the 1961 inventory this group included shrubs (*talniki*), brushwood (*kustarniki*) and other tree species (*prochie drevesnie porody*). Such a group should probably include areas covered with scrub pine, but considerable areas of other stunted tree species which, according to previous inventories, are not regarded as species of stand type, have nevertheless been included. This might mean that quite large errors could occur in the lists of composition by tree species contained in these inventories.

Aerial photography is not always completely reliable, as has been discovered by the surveying authorities, when it is a question of determining the percentage of the various tree species in mixed stands. For example, in the Amur district, where according to the 1956 inventory pine was the predominant species, it was found later that it had been over-estimated almost four times, and in certain other cases eight times, compared with what was later found by ground surveys carried out for regulation purposes (Vasiliev, 1963, p. 172). The great revisions concerning the percentages of certain tree species contained in the two inventories seem to indicate that the methods of calculation used were not ideal; thus all data concerning the composition by tree species should be accepted with reserve. This also applies to the 1961 inventory.

Table 1—6. Distribution of Age Classes, according to 1956 and 1961 Inventories, in the State Forest Fund of the RSFSR

Groups of tree species	Young stands (age classes)		Stands of middle age	Stands approaching maturity	Mature stands	Over-mature stands	Total
	I	II					
Inventory 1956							
<i>Conifers</i>							
million ha.	16.91	16.18	61.54	59.16	188.29	179.29	521.37
%	3.2	3.1	11.8	11.4	36.1	34.4	100.0
<i>Deciduous</i>							
million ha.	13.45	13.33	24.41	14.86	30.40	22.27	118.72
%	11.3	11.2	20.6	12.5	25.6	18.8	100.0
<i>All species</i>							
million ha.	30.36	29.51	85.95	74.02	218.69	201.56	640.09
%	4.7	4.6	13.4	11.6	34.2	31.5	100.0
Inventory 1961							
<i>Conifers</i>							
million ha.	18.72	17.05	63.12	45.51	344.91	(169.57)	489.31
%	3.8	3.5	12.9	9.3	70.5	—	100.0
<i>Deciduous</i>							
million ha.	12.22	13.26	25.93	13.25	54.34	(23.53)	119.00
%	10.3	11.1	21.8	11.1	45.7	—	100.0
<i>All species</i>							
million ha.	30.94	30.31	89.05	58.76	399.25	(193.10)	608.31
%	5.1	5.0	14.6	9.7	65.6	—	100.0

Sources: (1) Lesnaya Promyshlennost SSSR, *Statistichesky sbornik*, 1957
 (2) Lesnoy fond RSFSR, *Statistichesky sbornik*, 1962

Owing to the extended utilisation of the forests, and the intensity of the silvicultural measures applied, there is a marked unevenness in the distribution of forests by age-classes in the various parts of the country. The virgin forests of the northern belt of forests, which are dominated by old trees ready for harvesting, are for the most part over-mature. As can be seen from Table 1—5, coniferous species almost always predominate in the stands ready for harvesting. In the tracts where timber has been harvested, and especially in European Russia, young and medium-aged stands are more prominent. However, this cannot be seen directly from the Soviet forest statistics, as about half the coniferous forests have been reforested with deciduous trees after clear-cutting (Kovalin, 1959, p. 24). One can see on examining Table 1—5 that more than half the stands of birch and aspen are not mature. The reason for this is that these deciduous stands, which are not sufficiently mature for harvesting, are growing on ground where the earlier forests consisted of conifers. Here a conversion from conifers

to deciduous forests—from spruce and pine to birch and aspen—has taken place on an enormous scale, and may well have far-reaching economic consequences.

The distribution of age-classes, by percentage of area, in the centrally managed forests of the Russian SFSR, according to 1956 and 1961 inventories, is shown in Table 1—6. This table confirms what has been said above about the predominance of the deciduous species in young stands. However, before any conclusions can be drawn, it is necessary to comment on the compilation of this table. Firstly, let us state the principles on which the distribution into age-classes is based. Under the old system, age-classes of 20 years' interval were applied for conifers (*khvoynie*) and hardwoods (*tverdolistvennie*) in high forest systems, and for other deciduous species, including hardwoods in coppice system, an age-class interval of 10 years. Mature stands (*speliie*) have an age which corresponds to the accepted rotation period, over-mature stands (*starshe spelykh*) an age which exceeds this. Stands approaching maturity (*prispevayushchie*) are one age-class under the rotation period, i.e. immediately below the age-class of mature stands. Between these and young stands (*melodnyaki*), which are divided into two age-classes, are the stands of medium age (*srednevozrastnie*). In the instructions for the 1961 inventory (*Lesnoy fond RSFSR, 1962*) it was required that such a segregation of age-classes must be applied, and strictly followed everywhere. However, there is no evidence to show how the segregation of stands by age-classes was carried out. A comparison between the results of the 1956 and 1961 inventories in terms of age-class distribution (Table 1—6), would make one suspect that the drawing-up of the age-classes for these two inventories has not been consistent, or that there have been other circumstances which have caused considerable deviations in the age structure. It is evident that the percentage of mature and over-mature stands increased during the period 1956—1961, although one would have had expected a reduction in over-mature forests owing to the intense clear-cutting activity.

Table 1—7 shows the percentage distribution of the age-classes in the State Forest Fund, according to the 1956 inventory, by major economic regions. In the table, the coniferous and the deciduous forests are put together; this distorts to some extent the actual age distribution, but, despite this, the table gives a general picture of the situation in the various parts of the country. An interesting fact disclosed here is that in the western and southern regions the young forests predominate, while there is a lack of mature forests. In the northern and eastern parts the age pattern is exactly the opposite. Here it may be

Table 1—7. Percentage Distribution of Age Classes, by Regions, according to 1956 Inventory, in the State Forest Fund of the U.S.S.R.

Main Economic Regions and countries	Young stands (age classes)		Stands of middle age	Stands approaching maturity	Mature stands	Over-mature stands
	I	II				
Regions of the RSFSR:						
1. European North.....	5.4	5.4	10.2	7.7	27.5	43.8
2. Ural.....	5.3	4.9	14.1	12.6	39.7	23.4
3. Western Siberia.....	2.4	3.6	16.5	16.3	33.7	27.5
4. Eastern Siberia.....	3.6	3.5	13.4	11.7	34.2	33.6
5. Far East.....	3.6	4.4	11.8	10.8	40.1	29.3
6. Central Russia.....	21.3	16.2	21.9	14.3	16.4	9.9
Total RSFSR.....	4.7	4.6	13.4	11.6	34.2	31.5
7. Baltic area						
Estonia.....	24.2	16.3	28.0	12.3	15.5	3.7
Latvia.....	26.9	19.1	26.5	12.9	12.2	2.4
Lithuania.....	34.3	24.1	28.7	7.8	3.9	1.2
Kaliningrad (East Prussia).....	18.1	19.8	22.1	19.6	15.0	5.4
Total.....	28.2	20.1	27.6	11.5	10.5	2.1
8. South-Western area						
Belorussia.....	35.2	21.2	23.9	13.3	6.0	0.4
Ukraine.....	29.3	23.0	24.6	11.7	7.4	4.0
Moldavia.....	28.7	20.1	37.0	9.6	4.0	0.6
Total.....	32.0	22.1	24.5	12.4	6.7	2.3
9. Transcaucasia						
Georgia.....	4.9	6.6	17.9	12.9	29.8	27.9
Armenia.....	1.3	6.1	18.1	14.3	36.5	23.7
Azerbaijan.....	5.3	9.3	26.6	16.5	31.1	11.2
Total.....	4.7	7.3	20.2	13.9	30.7	23.2
10. Soviet Central Asia						
Kazakhstan.....	3.3	4.4	23.7	15.1	47.1	6.4
Kirgizia.....	3.9	10.1	40.6	16.6	16.4	12.4
Turkmenia.....	14.6	1.4	16.0	16.7	19.3	32.0
Tadzhikistan.....	4.1	19.7	30.7	19.8	22.0	3.7
Uzbekistan.....	15.6	16.6	9.8	22.2	34.9	0.9
Total.....	8.2	6.2	19.9	16.9	37.3	11.5
Grand total for the USSR	5.3	5.0	13.9	11.8	33.8	30.2

Source: Lesnaya Promyshlennost SSSR, *Statisticheskyy sbornik*, 1957

emphasised once more that the cut-over areas are not included in the statistical data provided. If cut-over areas were included, the percentage distribution of the age-classes would be different. However, the necessary basic material is not available for all regions of the U.S.S.R.

3.4 Volume and Growth

Soviet timber resources have been estimated quite differently at various times. As can be seen from Table 1—1, the total growing stock in 1927 was estimated at 34,000 million cubic metres, in 1956 at

Table 1—8. Distribution of Growing Stock and Growth, by Regions, according to 1956 and 1961 Inventories, in the State Forest Fund of the U.S.S.R.

Main Economic Regions and countries	Volume of growing stock						Volume of growth				
	1956			1961			1956		1961		
	Total		Average cu.m. per ha	Total		Average cu.m. per ha	Total million cubic metres	Average cu.m. per ha	Total million cubic metres	Average cu.m. per ha	
	million cubic metres	per cent		million cubic metres	per cent						
Regions of the RSFSR:											
1. European North.....	7,055	9.4	102	7,396	9.7	106	} 154.6	72.5	1.1	77.9	1.1
2. Ural.....	7,972	10.6	118	8,334	10.9	118		2.0	101.5	1.4	
3. Western Siberia.....	4,009	5.4	135	4,025	5.3	138		1.4	47.5	1.6	
4. Eastern Siberia.....	38,670	51.5	114	38,783	50.8	116		379.6	1.1	379.5	1.2
5. Far East.....	11,636	15.5	110	12,053	15.8	103		116.9	1.0	102.7	1.1
6. Central Russia.....	3,688	4.9	104	3,513	4.6	(48)		84.3	2.8	80.0	2.9
Total RSFSR.....	73,030	97.3	114	74,104	97.1	107	807.9	1.3	789.1	1.3	
7. Baltic area											
Estonia.....	80	0.1	110	88	0.1	113	1.8	2.5	1.8	2.3	
Latvia.....	139	0.2	100	170	0.2	108	3.7	2.7	3.7	2.3	
Lithuania.....	82	0.1	78	111	0.2	100	2.3	2.2	2.8	2.6	
Kaliningrad (East Prussia)	22	—	137	(22)	—	137					
Total.....	323	0.4	97	391	0.5	108	7.8		8.3		
8. South-Western area											
Belorussia.....	335	0.5	77	365	0.5	80	10.2	2.3	10.8	2.4	
Ukraine.....	611	0.8	123	638	0.8	127	15.3	3.1	15.4	3.1	
Moldavia.....	12	—	64	16	—	90	0.5	2.6	0.5	3.0	
Total.....	958	1.3	101	1,019	1.3	104	26.0		26.7		
9. Transcaucasia											
Georgia.....	367	0.5	192	371	0.5	192	3.6	1.9	4.0	2.0	
Armenia.....	25	—	102	31	0.1	125	0.2	0.8	0.3	1.3	
Azerbaijdzhan.....	94	0.1	122	98	0.1	136	1.1	1.5	1.3	1.7	
Total.....	486	0.6	166	500	0.7	166	4.9		5.6		
10. Soviet Central Asia											
Kazakhstan.....	240	0.3	17	286	0.3	27	5.5	0.4	4.5	1.7	
Kirgizia.....	22		32	21		31	0.3	0.4	0.3	0.5	
Turkmenia.....	10	0.1	19	10	0.1	17	0.5	0.4	0.1	0.7	
Tadzhikistan.....	5		23	5		21	0.1	0.1	0.1	0.3	
Uzbekistan.....	11		2	8		8	0.6	0.1	0.1	0.6	
Total.....	288	0.4	11	330	0.4	18	7.0		5.1		
Grand total for the USSR.	75,085	100.0	110	76,344	100.0	121	853.6	1.3	834.8	1.32	

Sources: (1) Lesnaya Promyshlennost SSSR, *Statistichesky sbornik*, 1957

(2) Lesnoy fond RSFSR, *Statistichesky sbornik*, 1962

(3) Perepechin-Filinov *Lesopolzovanie v SSSR 1946—1962 gg.*, Moscow, 1964

(4) Ponomarev, A. D. "Lesnoy fond SSSR", *Lesnoye Khozyaistvo*, 1963, 6

(5) Tseplyayev, V. P. *Lesnaya SSSR*, Moscow, 1961

75,000 million cubic metres, and in 1961 at 80,000 million cubic metres. These figures are not entirely comparable, particularly those of the 1927 inventory, as this dealt with the U.S.S.R. as limited by its old borders, but nevertheless the differences are surprisingly large. The period 1956—1961 will be subjected to a closer examination, because during this period the timber resources, according to the official statistics, increased by 5,000 million cubic metres, or on average by 1,000 million cubic metres a year. Such an increase seems to be excessive. Let us therefore begin by finding in which part of the U.S.S.R. this increase in volume has taken place. In Table 1—8 is shown the distribution of growing stock, according to the 1956 and 1961 inventories, by major economic regions and countries. The data for 1961 can also be seen in diagrammatic form on the map in Figure 1: 10. The table deals only with the centrally managed forests in the State Forest Fund. Together with granted forests (*pripisnie lesa*) and *kolkhoz* forests (*kolkhoznie lesa*), the total volume of growing stock, according to the 1961 inventory, is estimated to be 80,154 million cubic metres, and the average annual growth to be 874 million cubic metres.

It should be added that the data given in the 1956 inventory, in the form in which it was originally published (*Lesnaya promyshlennost SSSR, 1957*) concerning timber resources, apply only to forests under the jurisdiction of the Central Administration for Forest Management and Shelterbelt Planting within the Ministry of Agriculture (*v vedenii Glavnovo upravleniya lesnovo khozyaistva i polezashchitnovo lesorazvedeniya Ministerstva selskovo khozyaistva SSSR*). In the general statistical yearbook (*N. Kh. SSSR, 1961, p. 296*) almost the same timber volume (75,559 million cubic metres instead of 75,085 cubic metres which was given in the original 1957 publication) was said to apply to all forests within the State Forest Fund (*obshchy zapas lesonasazhdeniya goslesfonda*).

It is evident here that there is some discrepancy in the data, or to be more precise, a careless handling of the statistics involved. A comparison between the data for 1956 and for 1961 might be of questionable value in the light of this, but nevertheless some idea of the changes can be derived from such data, and especially data for the various regions of the country. However, it must be emphasised from the beginning, that the deviations in volume and increment seem to depend largely on the methods and the exactness of the assessments. In any case, there is no reason to assume that during the five-year period the timber resources and the increment in the various parts of the country have actually undergone changes such as those indicated in Table 1—8.

Largely, the changes can be regarded as unrealistic statistical manipulations.

The volume of growing stock per unit area as an average for the U.S.S.R. as a whole, and for the separate regions, is based on the forested area. The same applies also to average annual increment. If the area of forested land is reduced—and this is a process which is going on continuously as a consequence of cutting-over and forest fires—this has hardly any effect on the volume per unit area, which is determined on the basis of the remaining forest area. Such a procedure does not give a clear picture of the actual changes which are taking place in the forests, and such statistical averages are of no great value even as indicators of productivity. Consequently, the Soviet forest economists (Vasiliev, 1963, p. 159) consider that calculations of the average volume of the timber resources and the increment should be made on the basis of the total forest land, which also includes non-forested areas.

As to the increment in the virgin forests of the north, the estimating method applied in the U.S.S.R. seems to give rather dubious results. The figures cited for timber increment in the five regions of the Russian SFSR (see Table 1—8), which include great areas of virgin forest, thus seem exaggerated, as one can find hardly any increment in over-aged stands. The over-aged virgin forests, which are not being exploited, actually make up a permanent “forest capital” where growth and natural drain balance each other. If regard is paid to this, the actual increment in the forests of the U.S.S.R. is considerably less than that indicated by the official statistics in Table 1—8, i.e. 854 million and 836 million cubic metres respectively. The current annual increment in the U.S.S.R. as a whole cannot be greater than 450 million cubic metres, according to a Soviet expert (Sprintsyn, *L.P.*, 1958, 4). This figure seems to be within the bounds of reason, and therefore can be accepted with greater confidence than the official figures cited above.

Without basic material, which is lacking at present, it is not possible to provide more detailed information about the current increment and the actual net timber growth among the various tree species. However, it can be assumed that the more common deciduous species, primarily birch and aspen, make up an important part of the total increment in second-growth forests. It is a fact that as a result of cutting-over, the coniferous forests are being superseded by the more common deciduous forests. This is particularly the case in the central and northern parts of European Russia. The composition by tree species of the second-growth forests will be quite different from that of the forests which they replace, and this in its turn will affect the future yield of timber.

4. Settlement and Population

4.1 Historical Outline of Settlement on Russian Plains

Russian history is a story of river colonisation. Rivers served as transport arteries which linked the whole country together. Portages and canals linking the individual rivers were established in the triangle between the Baltic, the Black Sea and the Volga, and boats were sailing from the Black Sea to the Baltic more than a thousand years ago. By the beginning of the 10th century A.D., numerous settlements had been established in the forests (Gregory, 1945, p. 143), but always close to the rivers, this being convenient both for fishing and for communication. The migration northwards and eastwards took place along the rivers, leading finally to a conquest of Siberia.

In contrast to the Finno-Ugrian peoples, whose way of life is individualistic, and who live on small individual farms dispersed all over the vast forests, the Russians are gregarious; they have always lived, and still live, in village communities. There is no doubt that this inclination towards collectivism, characteristic of all Slavs, has turned them into efficient tools and obedient servants of the Russian rulers — the Czars as well as the Soviets—and has often induced them to try to conquer vast territories. This characteristic has also proved to be very useful in the colonisation of areas where the climatic conditions are severe. An individual settler in the vast northern forests, for example, often succumbs to nature, but a whole village of settlers usually manages to survive. This is also an explanation of the permanent and effective Russian expansion to the remote northern and eastern territories, which had never been settled before. Because of the size of the country and the severity of the climate in certain remote areas, there are still vast territories in Russia which are either very sparsely populated or unpopulated, despite the many efforts to change this.

The Russian drive to the east and the colonisation of Siberia have always been an integral part of the Government policy. The settlement of this territory started on a large scale after the construction of the Trans-Siberian Railway. Most colonists settled in its immediate vicinity. It might be added that in Western Siberia, this railway runs along the border of the forest zone and the steppe, traversing an area very suitable for farming. Industrialisation of the territories east of the Urals was accompanied by a rapid growth of the cities, coupled with a decline of the rural population in many areas in Siberia and Central Asia (Kulischer, 1948, p. 112).

In Czarist Russia, the settlement of the more remote parts of Siberia

could only be achieved by force, i.e. by compulsory settlement of prisoners. A similar policy has been carried out by the Soviet regime: the "migration for the opening up of new areas" is attained mainly through compulsory deportation of civilians, and by a large-scale use of forced labour (Cole—German, 1961, p. 53). Vast territories in the northern parts of European Russia and Siberia are inhabited exclusively by prisoners or former prisoners, who are not permitted to leave the territory (Albrecht, 1939; Ameel, 1941; Dallin—Nicolaevsky, 1947). Mass resettlements of certain population groups have also been carried out for strategic reasons (Lydolph, 1964, p. 278).

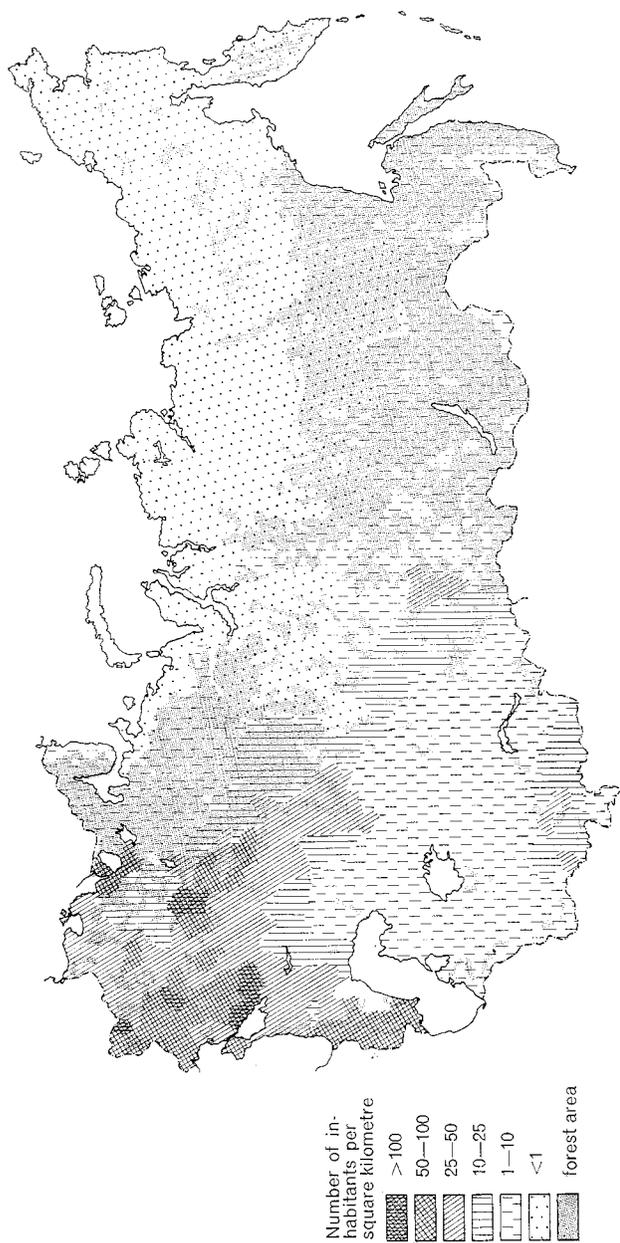
While formerly the majority of the migrants were engaged in agriculture, at present most of them are recruited as industrial workers, including logging and wood-manufacturing industries, which are being established in accordance with the plan for the industrial development of the eastern regions.

4.2 *Statistics of Population Increase*

Any map of the distribution of the population in the Eurasian plains to-day still represents the situation of the past two centuries. Most of the population is settled in European Russia, and is densest in a triangle or wedge, the narrow apex of which lies on Lake Baikal to the east, and which is bordered in the west by the Baltic and by the Black Sea. The most densely settled rural areas, as shown on the map in Figure 1: 11, are to be found between the forest zone and the steppe, and it is here that the clearing of the forests for settlement was most extensive.

At the beginning of the 18th century, the population of Czarist Russia was only about 15 millions, rising to 76 millions by 1863, and to 128 millions by 1897. By 1913, the population within the present frontiers of the U.S.S.R. numbered 159 millions. The first Soviet census in 1926 registered a population of 147 millions; according to the 1939 census, the population had increased to 171 millions, and according to the most recent census, in 1959, to 209 millions. The Soviet statistical estimate of the total population for 1 July 1964 was 228 millions (*N. Kh. SSSR*, 1965, pp. 7—8).

The increase after World War II is not attributable solely to an excess of births over deaths, but also to territory gained. However, the natural growth rate of the Russian population is very high, and the total increase was formerly a serious problem from the viewpoint of the carrying capacity of the land. Rural overpopulation has now



Sources: (1) Narodnoye Khozyaistvo SSSR v 1963 godu, 1965
 (2) Karta lesov SSSR, glavnoye upravleniye geodesii i kartografi MVD SSSR, 1955

Fig. 1: 11. Density of Rural Population and Forest Distribution

decreased considerably through urbanisation, and through the increasing recruitment of labour for industry.

In 1939, 32 per cent of the population lived in the cities, and 68 per cent in the country. In 1964, 53 per cent lived in the cities, and only 47 per cent in the country. This change in the proportion between the urban and the rural population in only 25 years is remarkable. In fact, the urban population has doubled, from 60 millions in 1939 to 120 millions in 1964, while the rural population has declined by 22 millions (*N. Kh. SSSR*, 1965, p. 8).

Due to a favourable age structure, the percentage of those gainfully employed is relatively high.

4.3 Clearing of Forest Land for Settlement and Agricultural Uses

Czarist Russia was primarily an agricultural country. The demand of the growing population of Russia for food led to a continuous increase of grain production. This increase resulted from an extension of areas under cultivation, mostly at the expense of forest land in European Russia.

The population pressure on the forest was much harder in the older agricultural regions of the south than in the northern and eastern parts of the country. This is illustrated by Table 1—9, which records the decrease of the forest area, expressed in percentages of the total land area, by selected geographical regions, in the years 1725—1914. The figures show that during about two centuries under Czarist rule, the clearing of forest land was rapid in the more sparsely forested regions, especially in the forest steppe zone which was populated most densely.

The deforestation of the southern regions, more particularly the Ukraine, progressed very rapidly after the 1917 Revolution. It is recorded by Ivanovsky (1928) that the forest area in this particular region decreased by slightly more than one million hectares from 1880 to 1914. According to Ivanitsky (*Z.f.F.J.*, 1928, p. 6), about two million hectares of forest land were cleared and settled between 1914 and 1927, or twice as much as during the preceding period.

Not all forest land turned into agricultural land was used for arable purposes. Much of this land was used as pasture, especially in the northern regions, where cattle-rearing predominated over grain production. Undoubtedly this method of using land was rather inefficient.

Since the agricultural collectivisation, and more particularly since World War II, the forest land has increased in the densely populated

Table 1—9. Forest Area as Percentage of the Total Land Area, by selected Geographical Regions and Years, 1725—1914

Regions	1725	1741	1763	1796	1861	1868	1887	1888	1914
Northern Region (Archangel, Vologda, Olonets provinces) . . .	72.7	72.6	72.4	72.3	72.8	72.9	69.6	69.5	66.9
Ural Region (Perm, Orenburg, Ufa provinces)	62.7	60.9	58.8	55.2	55.0	56.8	42.4	42.5	43.7
Central Region (Moscow, Vladimir, Kaluga, Ryasan, Smolensk, Tver, Tula, Tambov, Pensa provinces)	47.5	45.9	43.5	39.3	30.2	29.2	27.9	27.7	20.7
Forest Steppe Region (Orlov, Chernigov, Kiev, Voronezh, Kursk, Poltava, Kharkov provinces)	21.1	20.0	18.4	17.7	14.9	14.7	13.0	12.9	10.3

Source: Tsvetkov, M. A. *Izmenenie lesistosti Yevropeiskoy Rossii s kontsa XVII stoletiya po 1914 god*, Moscow, 1957, p. 125.

farming areas in the central and western parts of the U.S.S.R. A comparison of the data of the 1927 forest inventory with those of the 1956 and 1961 inventories shows that the growing stock has generally decreased, but that the forested area has increased in many districts. It is probable that this is partly a result of the fairly extensive forest-planting work carried out since World War II in certain areas poor in forests. The main cause of this change, however, is certainly agricultural collectivisation combined with industrialisation. As pointed out above, the rural population has declined as a result of the industrialisation; collectivisation has forced it to move into the *kolkhozy*; this has made it practically impossible to till the more remote fields, which have gradually been covered by forest. A contributory cause here is the decline of the livestock on the *kolkhozy*.

5. Forest Industries

5.1 General Outline of Development

The forest industry in Czarist Russia served mainly timber exports, and was, therefore, largely concentrated in the western and northern parts of European Russia. The industry underwent a particularly rapid development immediately before World War I, when logging

operations began in the immense forests on the White Sea. Before World War I, 20 major sawmills were working in Archangel alone; most of these were owned by foreigners. It is estimated that half of all forest industries in Czarist Russia belonged to foreigners.

The number of forest industries, and the manpower employed in them, developed as follows in the beginning of the 20th century (Zinghaus, 1929, p. 15):

Year	Number of Enterprises	Number of Workers
1900.....	1,430	74,000
1908.....	1,882	92,300
1911.....	2,196	112,500
1912.....	2,319	117,000

The above table illustrates the rapid growth of the Russian forest industry: the number of enterprises increased by 62 per cent, and that of the workers by 58 per cent, in 12 years. The value of the share of the timber and plywood industry was estimated at 2.5 per cent of the total industrial output of Russia in 1912.

There is no doubt that the pre-revolutionary Russian forest industry had low technological standards. The enterprises were mostly small sawmills with one or two frame-saws, as often as not private, one-family enterprises. However, this comparatively low technological standard was largely compensated for by the personal care and efforts of the owner, with the result that the enterprises functioned more or less satisfactorily (Gagarin, 1942, p. 148).

In 1913, the Russian forest industry attained a new peak of development, and Russian timber exporters gained a more important position in the world markets.

The outbreak of World War I cut the Russian timber products off from the world markets, and the output declined. The Civil War which followed the Revolution led to the complete closing-down of very many enterprises. The result was that many skilled workers were obliged to take other jobs. Furthermore, the former private owners of the enterprises were liquidated (that is, killed, deported, or, in the best cases, simply deprived of their property) and the factory buildings and machinery fell into disrepair.

A restoration of the forest industry became possible only after the end of the Civil War, in 1921.

In the beginning of the Twenties there was hardly any modernisation and expansion of the industrial enterprises worth mentioning; neither

had the pre-war output level been attained by that time. The situation changed radically in 1927/1928, when the "industrialisation of the country" began with the implementation of the first Five-Year Plan.

This entailed also a rapid development of the forest industry, and a number of large new enterprises were established. It should be stressed that the expansion and modernisation of the forest industry was not an end in itself. The industry was to have a subordinate role: it was to provide the country with foreign currencies, which could be used to import machinery and thus to build up the heavy industry. For this reason, the new enterprises were not located at places where they would have been best justified geographically, but at places which were most convenient for export purposes, that is, in the northern and northwestern parts of European Russia, and in the Far East (Gagarin, 1942, p. 149).

Before World War II, some of the forest industries had already been transferred from areas where the timber resources had been exhausted, to areas where forests were abundant. This transfer was accelerated for strategic reasons after the outbreak of war. A number of the enterprises in the West were dismantled in time and transferred to the forest areas in the North, in the Urals and in Siberia, where they gradually attained better production results than they had ever shown in their old locations. It is evident that they remained in their new locations after the war and contributed considerably towards the economic progress in the northern and eastern parts of the country (Petrov, 1952, pp. 95—96).

Most of the non-evacuated forest industries in the western and southern parts of the country were destroyed during the war. After the war, the pulp and paper mills, as well as the furniture factories, were restored in these areas, but it was not proposed to establish fresh wood-processing industries there. Instead, plants were to be established closer to the raw materials, in the first place on the Northern Dvina, and on the Kama. This programme of transfers could not be followed, and wood-processing plants were established also in areas lacking raw material; this had to be transported to the factories over long distances. But it cannot be denied that a considerable capacity increase and an extensive mechanisation and modernisation of the production process has in fact taken place in the forest industry in the post-war years. A production increase in all branches of this industry is indisputable. It has been maintained, on the other hand, that the industrial expansion of the wood-manufacturing industry has not been satisfactory, and that the geographical locations of the in-

dustrial enterprises are not adapted to the geographical distribution of the forests. This problem will be discussed in more detail later.

Even before World War II, there was a clearly discernible trend in the planning of new enterprises of the forest industry, in that a number of different wood-processing factories, forming a combine (*kombinat*), was established within a town or settlement. Sawmills, linked directly with other wood-working enterprises, are not infrequent. To make use of the sawmill waste, the bigger sawmills have in recent years been linked with factories manufacturing wood-chemical products, or with pulpmills. The building of such big integrated wood-processing *kombinaty* is perhaps the most characteristic feature of the development of Soviet forest industries.

The forest industry employs 14 per cent (2.8 million men) of the total industrial manpower of the Soviet Union (20.2 millions in 1962, *N. Kh. SSSR*, 1963, p. 130). The share of the forest industry in the "productive funds" of the country is estimated at 6.6 per cent, and the value of its production at five to six per cent of the total production value (Zheludkov, *P. Kh.*, 1963, 7). This leads to the conclusion that the technological equipment of the workers in the forest industry is only half that of the overall industrial average.

It is not known how these figures have been calculated. Information on the total number of workers in the forest industry must be treated with special caution, because it is not known which wood-processing industries are classified as forest industries and thus included in this figure. It is not impossible that the workers in the logging industry are also included, which would mean that the total number of workers in the forest industry quoted here would not be comparable with the corresponding figures for the manpower in Czarist Russia, quoted at the beginning of this section.

It must also be emphasised that it is not quite clear what is meant by the "productive funds" and how the "value of the production of the woodworking industry" has been calculated. A comparison with the "capitalist" term "value added", which ought to correspond more or less with the term "production value" in the central planning system, is rather difficult without a previous thorough investigation.

5.2 Sawmilling Industry

The oldest and most important branch of Russia's wood-processing industry is the sawmilling industry. Sawmills are located throughout

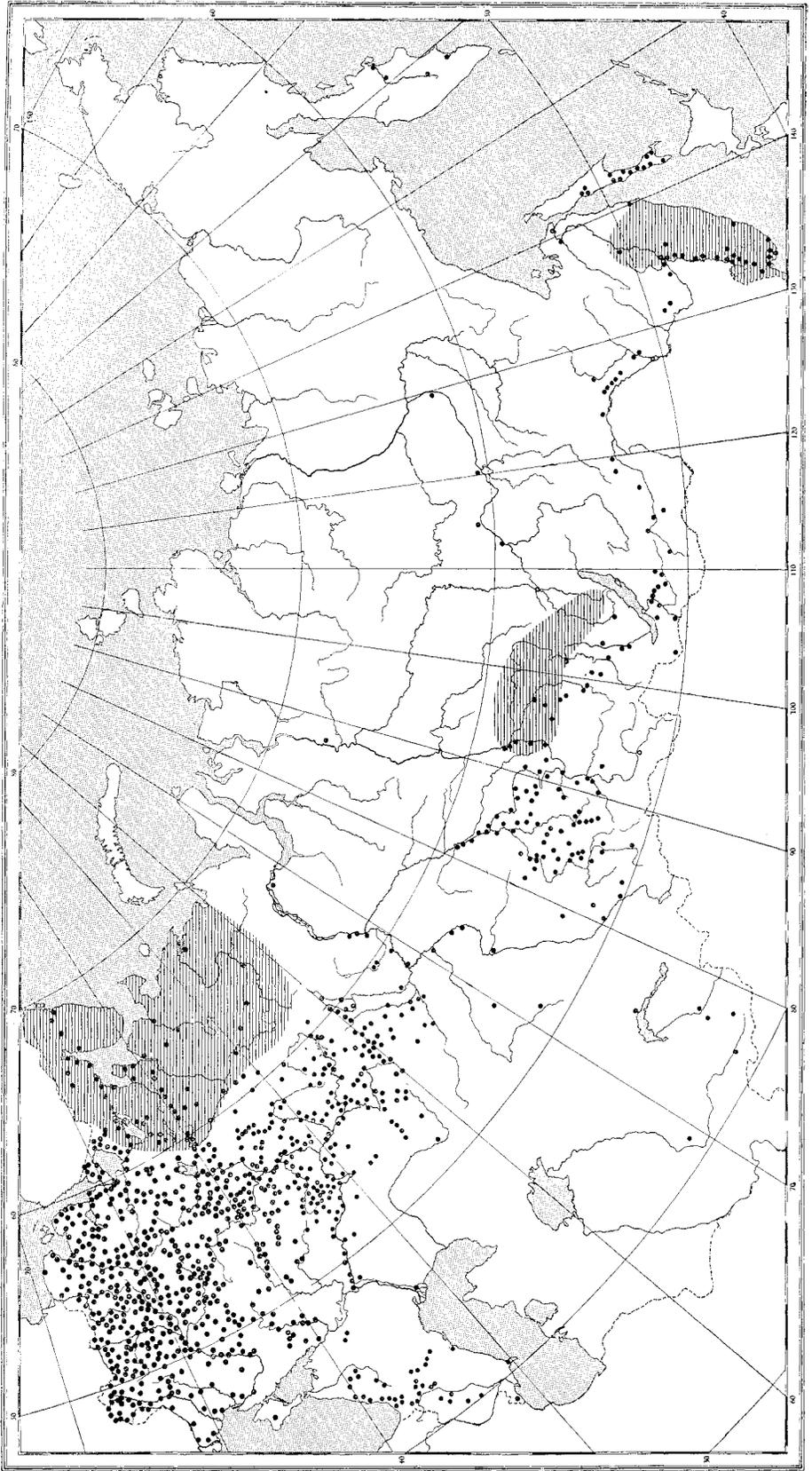


Fig. 1: 12. Location of the more important Sawmills and the Main Export Regions for Lumber (hatched)

the country, as shown on the map of Figure 1:12; they are to be found not only in the forested areas, but also outside the forest belt proper. Before World War II, the total number of frame-saws was estimated at about 6,400 by Buchholz (1943, p. 154) and at 6,500 by Gagarin (1942). These figures are borne out by Soviet sources of a later date (Krylov, *L.P.* 2 Aug. 1962). It is probable that these estimates comprise all the frame-saws then in existence, including the unusable ones. The proportion of these was estimated at about 35 per cent.

A great many of the above frame-saws were doubtless destroyed during the war.

However, data on the Sixties report that the local number of frame-saws in the U.S.S.R. is estimated at 70,000, of which 65,000 are actually in use; 55,000 are located in stationary establishments (Zheludkov, *P. Kh.*, 1963, 7). This indicates a quite remarkable expansion of the sawmilling industry after World War II. The total capacity of the above frame-saws is estimated at 600 million cubic metres (= 128 million standards) of sawnwood annually. The actual production of sawnwood has increased from 35 million cubic metres in 1940, to 104 million cubic metres in 1962 (*N. Kh. SSSR*, 1963, p. 181) and 106 million cubic metres in 1963 (*N. Kh. SSSR*, 1965, p. 177).

However, it is maintained that only 10 per cent of all the frame-saws installed are up to date; the others have reportedly a quite low capacity. Only 300 of all the sawmills can be regarded as large enterprises, while 1,800 can be classified as medium-sized enterprises. The average annual output per worker in the big sawmills is 450 cubic metres of sawnwood, while the average output in smaller sawmills is only 160 cubic metres (*L.P.* 2 Feb. 1965).

It must further be considered that the location of the sawmills is, as a rule, very unfavourable with regard to the raw material supplies. It is estimated that 70 per cent of all frame-saws are located in regions poor in forests. They are worked to less than 50 per cent of their capacity (Gavrilov, *D.P.*, 1965, 4). The geographical location of the sawmilling industry thus differs considerably from what is desirable in view of the timber supplies. Only 2.5 per cent of the sawmills, with 4.2 per cent of all frame-saws, are located in areas where the sawlogs are harvested. By far the greatest part of the sawmills (97.5 %) is located far from the raw material sources (timber must be transported to them over 1,500—1,600 km), and consists mostly of small enterprises, employing only six workers on average (Zheludkov, *P. Kh.*, 1963, 7).

In 1961, almost 12 million cubic metres of sawlogs were carried long

distances by rail to these small sawmills. In Moscow and its environs alone, there are 1,700 frame-saws consuming about five million cubic metres of sawlogs annually (speech by G. M. Orlov, Chief of the Timber Sector in the *Gosplan*, at a meeting of the Central Committee of the Communist Party of the U.S.S.R. on 23 Nov. 1962; *L.P.* 24 Nov. 1962).

According to the plans, the sawmilling centre is to be transferred to Siberia. The output of lumber is to be concentrated into large integrated enterprises. It has also been decided to increase the sawmill capacity considerably in the regions rich in forests during the next five or six years, to rationalise the distribution of the sawmilling industry (Gavrilov, *D.P.*, 1965, 4). At the same time, many sawmills in the areas poor in forests will gradually be dismantled.

An interesting question, which should be answered in this connection, is this: How can one explain the establishment of sawmills in areas poor in forests on such a large scale, although under a regulation of 1952, new sawmills could be established only in areas rich in forests? The reasons for this are numerous and cannot all be discussed in the present context. One circumstance should be stressed, namely, that this large-scale expansion of the sawmilling industry was partly due to the increasing output of sawmilling equipment by the machine-building industry. The annual output of frame-saws is 7,000 to 10,000, for which some use must be found; hence the widespread establishment of new sawmills (*L.P.* 2 Aug. 1962). As a result, 100—200 new sawmills were constructed annually in villages on the Ukrainian steppes throughout the Fifties. This also explains how Moscow became the sawmilling centre of the country.

Another factor which has had an unfavourable influence on the development of the sawmilling industry is its divided administration. The existing sawmills are divided between various State and co-operative enterprises, so that uniform direction is difficult, despite the central planning system. What is more, a certain rivalry and competitiveness between various Government agencies has arisen, primarily because all of them want to obtain more easily accessible raw material bases or priority in the timber supplies, with the result that public interest is largely ignored or even actively thwarted.

Large and powerful branches of industry, such as the metal industry, coal industry, oil industry, etc., which are the largest timber consumers, have established sawmilling industries of their own, parallel with the regular sawmilling industry. They have acquired old sawmills and constructed new sawmills which have rapidly consumed the

available raw materials in their immediate vicinity. To keep these sawmills going, timber must now be transported long distances to them. What is worse, the timber comes in part from areas where the existing sawmilling capacity is not fully exploited, because of a raw material shortage. For example, about two million cubic metres of sawlogs are annually exported from the Archangel district, although its own sawmills are suffering from a timber shortage (Ganelin, *L.P.*, 1964, 9).

It may be added that the practical production planning for lumber does not comprise the whole of the output. The plans provide detailed regulations only for the output for export, for certain high-quality and special assortments for the more important sectors of the economy. This is why the consumers try to solve their problems by organising their own output of sawnwood, and it also explains the development of the existing autarchic trends.

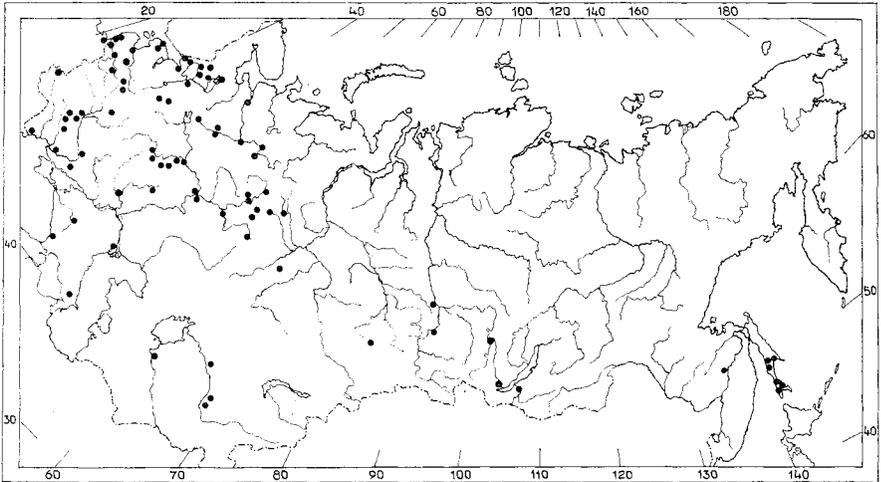
5.3 Pulp and Paper Industry

The first pulpmills in Russia were constructed at the beginning of the 19th century. Papermills using rags as their raw material existed even earlier. According to Surozh (1908, p. 24), Russia had at the turn of the century (1900—1903) 48 pulpmills producing mechanical pulp and seven producing chemical pulp.

Most pulpmills were in the western parts of the country, so that, following the territorial changes after the war, they were no longer Russian, but lay in the new states of Estonia, Latvia, Lithuania and Poland. In Russia proper there were few cellulose factories at that time.

The pulp and paper output of Czarist Russia could not cover the demand of the country, so considerable amounts of pulp and paper had to be imported. The export of pulpwood, on the other hand, was considerable under the Czarist regime, and this continued also under the Soviets, while at the same time paper and pulp were imported.

As late as in the Twenties, about half of the existing papermills in the U.S.S.R. used rags as raw material, while some 40 per cent of the mechanical pulp needed for paper manufacture was imported from Finland (Buchholz, 1961, p. 184). This abnormal situation, particularly if we consider the abundance of Russia's forests, persisted until the drive for the large-scale industrialisation of the country started. During the five-year plans of the Thirties, a number of relatively large pulp and papermills were constructed, such as Balachninsk in the Gorki province, Kamsk, Solikamsk and Vishersk in the Perm province, Segezha and Kondopaga in Karelia, and Archangelsk and



Sources: (1) Bumazhnaya Promyshlennost, 1961,1
 (2) Unasylyva, 1965, 77 (2)

Fig. 1: 13. Location of Pulp and Paper Industry

Solombalsk in the Archangel district. These new industries were located in areas rich in forests and favourable for transport purposes, the aim being an integration or concentration of combined or related industries (from which is derived the Russian term *kombinat*).

Machinery for the new factories was mainly imported, because the Soviet output of machinery used in the pulp and paper industry was negligible in the beginning. The manufacture of papermill machinery began in the U.S.S.R. as late as in 1934.

During World War II, a great many pulp and papermills in the western parts of the U.S.S.R. were destroyed. These were rebuilt after the war. Apart from this, the Soviets acquired a number of pulp and paper factories during and after the war, as a natural result of the territorial gains in the west and east. The Baltic territories conceded to the U.S.S.R.—Finnish Karelia, Estonia, Latvia, Lithuania, East Poland, East Prussia—all had relatively well-developed pulp and paper industries, which sold their output to the West before the war.

In the southern part of Sakhalin, which the Soviets acquired from Japan, there were many up-to-date pulp and papermills. South Sakhalin was probably the most important pulp-producing centre within the pre-war Empire of Japan, and practically all its output was shipped to the mother country.

It can thus be stated that after World War II, the U.S.S.R. almost

doubled the capacity of its pulp and paper production, thanks to the territories gained—an increase which surpasses that of all other branches of industry.

In 1961, the Soviets operated altogether 177 pulp and papermills. The location of the main pulp and papermills is shown on the map of Figure 1: 13.

The geographical location of the pulp industry must be considered unfavourable. Only half, or 51 per cent, of the industry is located in timber-surplus areas, of which 41 per cent is in European Russia and 10 per cent in Asia. The other half of the pulp industry (49 %) is in timber-deficit areas, almost exclusively in the European parts of the country.

The paper and paperboard output is also concentrated in areas which, in most cases, are at considerable distances from the raw material. Only nine per cent of the paper and paperboard produced in 1961 came from Siberia and the Far East; the remainder came from the European parts of the U.S.S.R., of which 64 per cent was either from timber-deficit areas or from completely unforested areas (Zheludkov, *Pl. Kh.*, 1963, 7). It is remarkable that most of the newly planned factories will also be far from the timber-producing areas.

5.4 Other Wood-Based Industries

The plywood industry is one of the relatively well-developed branches of the wood-processing industries which have quite a long history in Russia.

Before World War I, there were 49 veneer and plywood factories in Russia, with an annual output of 175,000 cubic metres. Most of the output (about 60 %) was exported, and Russia had almost a monopoly in the world plywood market.

Many of these factories were in the western provinces which seceded from Russia after World War I. In 1922 the Soviets had only 27 veneer and plywood factories in the Soviet Union, some of which had been destroyed, while the others were in bad shape (Zinghaus, 1929, p. 48). As a result, the plywood output was relatively low in the Twenties, and things began to improve only in the Thirties when the old factories had been restored and a number of new ones had been built under the first Five-Year Plan.

In World War II, many of these factories were destroyed. The centre of the Soviet plywood industry—the Leningrad district and Belorussia—suffered particularly heavy damage. It is, therefore, reasonable to

suppose that the veneer and plywood output immediately after World War II was considerably lower than that before the war, although the total number of factories had increased following Russia's territorial gains.

The geographical location of the plywood industry is also unsatisfactory. For example, only one per cent of the total output came in 1961 from Siberia. However, most of the new factories will be erected in Siberia where it is planned to establish some relatively large factories, e.g. in Yeniseisk, Chunksk and Asinovsk, (Smirnov, *D.P.*, 1965, 7).

An important wood-consuming industry in Czarist Russia was the match industry. There were altogether 251 match factories, producing 4.2 million boxes of matches annually and employing 14,700 workers. Almost all of these factories were in the western provinces; at the end of World War I, most of them lay outside the new Soviet frontiers. The new factories within the Soviet frontiers were either destroyed or badly damaged during the Revolution and the consequent Civil War, so that the 1920 match output was only 15 per cent of the pre-war output. The great demand for matches in the home market led to a relatively rapid reconstruction and even expansion of the match factories, so that the pre-war production level was reached again by 1925. Manufacturing was mainly concentrated in big factories, while a number of smaller factories were closed down. In 1927, for example, there were only 27 match factories, by 1936 their number had decreased to 18, and by 1955 to only 14. However, the output increased at the same time. For instance, in 1940 the annual match output in the U.S.S.R. was 10 million boxes, and in 1960 it was 14 million boxes (*N. Kh. SSSR*, 1961, p. 300). Thus the production has been gradually concentrated in bigger production units, and probably also the production process has become increasingly automated.

The urgent need for the reconstruction of dwellings after World War II caused the Soviet Government to establish a great number of combines producing standardised blocks of flats. The output of pre-fabricated wooden houses has been increasing ever since and was equivalent, in 1960, to more than six million square metres of floor space (*N. Kh. SSSR*, 1961, p. 300). A total of 130 factories was working in this field.

The manufacture of fibreboard and particle board, parallel with the pulp output, has been the part of the wood-processing industry which the Soviet authorities have tried most to increase. In 1962, 46 fibreboard factories, with a total annual capacity of about one million cubic metres, and 13 particle board factories, with a total annual capacity

Table 1—10. Percentage Distribution of Freight Traffic, by Main Forms of Transport, in the U.S.S.R., selected years, 1913—1963

Year	Total freight traffic in 1,000 millions of ton-kilometres	Percentage of				
		Rail	Domestic maritime	Inland waterway	Pipeline	Highway (lorries)
1913	126	61	16	23	—	—
1932	218	77	9	12	1	1
1940	488	85	5	7	1	2
1950	713	84	6	6	1	3
1955	1,165	83	6	6	1	4
1960	1,886	80	7	5	3	5
1963	2,302	76	10	5	4	5

Source: *Narodnoye khozyaistvo SSSR v 1963 g.*, 1965, p. 373.

of 63 million square metres, were being constructed. These factories are located almost exclusively in the western parts of the U.S.S.R.

6. Main Elements of Transport Network

6.1 General Remarks

Transport has always been one of the most difficult problems in Russian economy because of the size of the country. The enormous distances that must be covered have been the greatest factor among the many natural and economic hindrances which have prevented the development of a satisfactory transport system. One must remember that the U.S.S.R. stretches approximately 11,000 kilometres from east to west. Moreover, the U.S.S.R. has the longest coastline of any country in the world, but at the same time it is one of the most useless, because the seas surrounding the northern part of Eurasia are frozen for the greater part of the year and thus only navigable to a very limited extent. It is only in the extreme north-west corner of the U.S.S.R., at Murmansk, that there is access to ice-free ocean navigable all the year round.

According to the official statistics (*N. Kh. SSSR*, 1965) the total freight traffic (*gruzooborot vseh vidov transporta*) has increased from 126,000 million ton-kilometres in 1913, to 2,302,000 million ton-kilometres in 1963. The distribution of the aggregate freight traffic between different forms of transport, in percentage terms by selected years, is shown in Table 1—10. It indicates that rail transport predominates greatly.

The Soviet export trade between the two World Wars was transported up to 90 per cent by sea (Maslennikova, *V. T.*, 1963, 9, p. 41). After World War II, the share of sea transport decreased considerably, and in 1962 sea transport covered only 51 per cent of the export freight, while the corresponding percentage for railway transport was 43 per cent (*V. T. SSSR*, 1963, p. 18).

The composition of the freight traffic also changed considerably between 1913—1963. According to a special study (Williams, 1962, p. 78), forest products took the following percentage share of the total freight traffic, by selected years:

1930	1935	1940	1945	1950	1955	1958
19.3	15.6	11.1	11.1	11.0	8.7	8.6 per cent

The above figures indicate that the share of forest products—construction and industrial roundwood, sawnwood, and fuelwood—in the total freight traffic is decreasing. This is probably not because of a decrease in the volume of the forest products transported, but because the volume of other commodities transported has risen more rapidly than that of the forest products.

The most important logging areas lie north of a line drawn from Leningrad roughly via Vologda, Vyatka and Perm to the Ural Mountains, where it turns south via Tyumen, Tomsk and Krasnoyarsk to Lake Baikal. The most important wood-consuming areas lie, as a rule, south of this line. Timber is transported from the former to the latter mainly via waterways or by rail.

Timber transport moves generally from north to south and from east to west. Here, however, great changes have taken place, resulting from an urgent demand for timber in certain provinces. The construction of industrial settlements in Kuzbas and Karaganda (Western Siberia), for example, resulted at that time in timber transport eastwards, mainly from the Urals. The development of the "Second Baku" north of the Caspian Sea and the construction of new industrial settlements in Central Asia also led to a redirection towards the east of the timber floated down the Volga. Finally, timber was requisitioned from the western parts of the U.S.S.R., including western Ukraine and the Baltic countries, for the post-war restoration of industrial centres in southern Russia (Donbass, Krivoy-Rog, etc.), northern Caucasia (the Grozny oilfields, etc.) and on the Crimean Peninsula (Benenson, 1951, p. 83).

Consequently, timber transport in the U.S.S.R. cannot be regarded as stable and uniform, following a fixed pattern of even development. Despite this, however, there exist certain predominant directions in the flows of timber, as depicted on the map of Figure 1: 14. The main purpose of this map is to show the distribution of the transport system in the U.S.S.R., as well as the interlinking of the railways with waterways. As a rule, forest industries, or at least roundwood assemblage places, are located at the junctions of these two routes. In general, the location of timber-processing industries is adapted to the transport network, and the latter determines also, next to the accessibility of forest resources, the location of logging industry.

6.2 River Transport

The waterways, although the most important carriers of timber, play only a limited role as means of immediate communication between the logging areas in the north and the wood-consuming areas in the south. The most important rivers flow from south to north into the Arctic Ocean, like the Yenisey and the Lena. Only the Volga, flowing south, plays a decisive role in supplying southern Russia with timber. On the other large rivers, which flow north into the White Sea, the Barents Sea or the Kara Sea, timber must as a rule be floated north and then transported south by other means of transport in order to reach its domestic consumers.

European Russia has also an extensive inland canal network in combination with the river systems. The first canals were constructed in Czarist times and the Soviets have considerably extended the network. The White Sea-Baltic Canal was completed in 1935. It provides a connecting waterway between Leningrad and Belomorsk on the White Sea. The Moscow-Volga Canal, with its huge reservoir at Rybinsk in the immediate vicinity of the capital, was opened in 1938. Later (in 1964) the canal was extended, and now links the Volga with the Baltic Sea. The Volga-Don Canal was inaugurated in 1952.

The advantages of river transport, compared with other forms of transport, are primarily that it is cheaper and therefore particularly suitable for a bulky commodity such as timber. About half the volume of freight traffic in river transport consists of timber (Baransky, 1956, p. 86). The volume of timber transported via inland waterways in 1950—1963 increased as follows, according to the official statistics (*N. Kh. SSSR*, 1965, p. 395):

Years	1950	1958	1960	1962	1963
	<i>Millions of tons</i>				
Timber floated,	42.5	67.4	72.2	69.7	73.8
Timber transported in vessels (river barges) . . .	8.1	15.1	17.1	16.6	17.9
Total timber transports on waterways	50.6	82.5	89.3	86.3	91.7

The above figures indicate that timber floated in the U.S.S.R increased considerably in volume during the observation period, while timber transport in vessels was more than doubled. The total timber transport on waterways before World War I, according to Soviet sources (Lydolph, 1964, p. 404), was only 11 million tons, which means that the total volume has increased more than eight times under the Soviets. Soviet data concerning statistics in Czarist Russia are not always correct, and in the present case, too, we should question the reliability of figures on the timber freight carried in 1913 in river traffic. But in this connection the exactness of the figures submitted is less essential, because our main object is to determine the general trends. The average length of haul for water transport of timber increased from 392 kilometres in 1946 to 495 kilometres in 1955 (*Lesnaya Promyshlennost SSSR*, 1957, p. 114). No data are available for later years, but it is reasonable to suppose that the average length of haul increased at a slower pace after 1955.

It should be emphasised that the above figures are averages for the whole country. In certain areas the timber transport is likely to have decreased somewhat, owing to a relocation of the logging operations.

6.3 Rail Transport

The U.S.S.R. holds second place in the world, after the U.S.A., in length of railways. However, when measured in relation to the area or to the population, its length of railway track is one of the lowest in Europe. Russia's first important railway, St. Petersburg-Moscow, was built in 1842. Between 1891 and 1904 the construction of the Trans-Siberian Railway was undertaken and completed. In the inter-war period and later the Soviets extended the existing railway network considerably. The railways built in the northern forest zone play an especially important role from the viewpoint of forest utilisation.

A considerable hindrance to railway construction in the North is the permafrost, i.e. the frozen subsoil. In some areas of Siberia, for example, heavy-duty railway construction is considered impracticable

because of the permafrost. This seems to be one of the reasons why there are still vast areas in the Siberian North without any railway communications.

According to the official Soviet statistics (*N. Kh. SSSR*, 1965, p. 377), the Soviet railways transported the following quantities of timber, in selected years, during 1950—1963:

	Years				
	1950	1958	1960	1962	1963
In 1,000 millions of "tariff" ton-kilometres (<i>tarifny tonno-kilometer</i>).....	72.2	178.4	213.6	198.4	219.1
In millions of tons.....	72.4	121.5	140.7	132.3	139.4

This shows that the volume of timber transported by rail almost doubled in the Fifties, but then stagnated at about the same level. However, in terms of ton-kilometres the timber transport by rail has almost trebled. Here some clarification is necessary.

A ton-kilometre reflects both the volume loaded and the distance over which it is moved. The aggregate of ton-kilometres gives, therefore, a more complete picture of the freight traffic output than the simple volume. Moreover, the Soviets use two different series or scales of ton-kilometres: "tariff" and "operating" ton-kilometres. The former are not a direct measure of the physical work actually done by the railways (Williams, 1962, p. 35), but seem to be a planning measure. The "operating" ton-kilometres, on the other hand, show the actual freight traffic performance.

While recognising that the statistical data may contain errors, it seems that a comparison of the above figures indicates that the distance of timber haulage increased considerably in the period 1950—1963. This is discernible directly from the following figures, which show the average length of haul for timber, according to the same official source (*N. Kh. SSSR*, 1965, p. 378):

Years	1950	1958	1960	1962	1963
Kilometres.....	998	1,469	1,519	1,500	1,572

It is evident that the average length of haul for timber has increased during the observation period, to a degree which is hardly possible anywhere else in the world under normal conditions. If we compare this series of figures with a corresponding figure for Czarist Russia, which was 415 kilometres in 1913, according to Soviet sources (Lydolph,

Table 1—11. Average Length of Haul for selected Timber Products, 1940—1957
(kilometres)

Year	Pitprops	Sawnwood	Roundwood	Average for forest products, excl. fuelwood
1940.....	1,362	1,182	734	1,019
1950.....	1,329	1,193	862	998
1952.....	1,407	1,269	1,075	1,172
1953.....	1,390	1,332	1,091	1,193
1954.....	1,446	1,379	1,059	1,187
1955.....	1,494	1,492	1,135	1,274
1956.....	1,515	1,490	1,145	1,293
1957.....	1,501	1,614	1,230	1,373

Source: Nevzorov, N. V. *Osnovy i puti razmeshchenia lesozagotovitel'noy promyshlennosti v SSSR*, Moscow-Leningrad, 1959, p. 204.

1964, p. 402), we see that the average haul for timber transport by rail has become almost four times longer.

This increase is a result of the development of new logging areas in the European North, in the Urals and in Siberia. The heaviest flow of timber moves southward from the European North, but considerable quantities of timber are also transported over much longer distances, from Siberia.

In 1940, roundwood constituted about 60 per cent of all timber transported by rail; in 1955 the corresponding percentage was 70. Most of this roundwood is sawlogs, at times transported by rail over almost 5,000 kilometres (Nevzorov, 1959, p. 297).

The average length of haul for all timber products is less than for sawnwood, as is evident from Table 1—11. In other words, lumber is transported over the longest distances from the production site to the consumer.

6.4 Motor Transport on Highways

The truth of the matter is that road construction, with a few exceptions, has never enjoyed much attention in Russia. There are very few roads in the U.S.S.R. equal to the motorways in western Europe. Natural dirt roads, covered with deep mud in spring and autumn, and shrouded in dust clouds during the summer, are the prevailing type of road in Russia. The Never-Aldan-Yakutsk and the Magadan-Kolyma motorways, however, deserve to be mentioned as two of the major highways in eastern part of Siberia.

The total length of highways in Czarist Russia (within the boundaries

of the U.S.S.R. after World War II) was estimated at 24,300 kilometres. The corresponding figure in 1937 was said to be 87,500 kilometres (Baransky, 1956, p. 94). The reliability of the former figure is somewhat in doubt, but it is unfortunately not possible to check it. According to the official Soviet statistics (*N. Kh. SSSR*, 1965, p. 421), the road network in the U.S.S.R. at the end of 1963 consisted of 330,400 kilometres of hard-surface roads (*dorogi s tverdym pokrytiem*) and 107,700 kilometres of concrete and "black-top" highways (*dorogi s tsementno-asfaltobetonnyim pokrytiem i chernoye shosse*).

The average length of haul by lorry in 1960, was estimated to be 11.6 kilometres (Lydolph, 1964, p. 396). Long-distance timber haulage by lorries does not exist in practice; lorries are used mainly for short-haul movements of forest products.

6.5 The Northern Sea Route

Many efforts have been made, both by the Czarist regime and by the Soviets, to develop navigation routes east and west along the Northern Siberian Arctic coast, so that the enormous forest resources of Siberia can be made more accessible, both for the domestic and for the world market. Particularly important is the possibility of an ocean shipping link with the Yenisey river basin, where virgin timber of the highest grade is to be found. Nordenskiöld was the first person to reach the mouth of the Yenisey from the west, and in 1878—1879 he also made the first voyage eastward along the coast of Siberia to the Pacific (Armstrong, 1952, p. 6).

Jonas Lied of Norway was the first man who broached the idea of timber exports from the Yenisey area, and he succeeded in carrying out his plan. In 1913 the first ship, carrying a cargo of timber (including logs of *Pinus cembra*), crossed the Kara Sea (Nansen, 1914, p. 68), thus opening the way for freight transport along the Northern Sea Route. Imports going to Siberia by the Kara Sea in 1920—1924, exceeded by far the volume of exports from Siberia. Later, the volume of outgoing shipments increased, and on an average the Kara Sea shipments to and from Siberia maintained more or less a balance in the Twenties (Krypton, 1956, p. 30). Later still, sawnwood from the Yenisey basin became the main export cargo shipped via the Northern Sea Route. The quantities of exported lumber have increased successively, rising to about 0.8 million cubic metres in 1963 (*L. P.*, 3 Dec. 1964). It seems fairly probable that the Kara Sea route will become even more important for timber exports in the future.

The reason why this specific question is being discussed here in more detail is that the sea route along the Siberian coast is a difficult one, owing to the shortness of the navigation season (2—3 months) and to the movements of sea ice. Even during the summer, ice conditions can be so unfavourable as to make navigation impossible without the assistance of icebreakers.

The break-up of ice and the freeze-up of the sea near the mouth of the Yenisey (at Dudinka) coincide approximately with the beginning and end of the navigation season in the Kara Sea. According to reports, the ice break-up occurred between 26 May and 17 June in the years 1741, 1900, 1903, 1905—1907, 1932 and 1934—1936, while the freeze-up began between 22 October and 3 November in the years 1843, 1904—1907, 1932 and 1934—1937 (Armstrong, 1952, pp. 39—40).

It should further be taken into account that during the short navigation period thick fogs are frequent, seriously hampering all shipping on the Northern Sea Route. The figures below indicate the average number of foggy days per month:

	Years	June	July	August	September	October
Yugorsky Shar (Novaya Zemlya)	1913—1935	15	17	17	10	7
Dikson Island (north of the Yenisey delta)	1916—1935	14	19	15	12	5

The above data show how short is the navigation period, and how difficult are the conditions on the Northern Sea Route. A more detailed knowledge of the ice and weather conditions is, therefore, imperative for all shipping in these waters.

The ice conditions vary greatly from section to section of this waterway, and considerable navigation aid and direct assistance are continually given to the ships by wireless, lighthouses, aircraft and icebreakers, if necessary. Weather forecasts have been obtained, from the Thirties onwards, by regular aerial observations, and by a close network of wireless and weather stations along the Northern Sea Route.

According to Armstrong (1952), there are indications that the climate on the coast of Siberia has grown a little milder, beginning with the early Twenties; this seems to have played a decisive role for the development of the Northern Sea Route. The further fluctuations of the climate or, to be more precise, of the temperature, in the near

future seem to be of a decisive importance for navigation on this route. Setbacks resulting from changes in climate are not impossible. One must also take into account technological progress, because this may bring about the transformation of the Northern Sea Route into a normally functioning seaway.

Part II

**MANAGEMENT OF FOREST
LAND UNDER DIFFERENT
ECONOMIC SYSTEMS**

Management of Forest Land under Different Economic Systems

1. Introduction to Part II

1.1 Formulation of the Problem

Russian forest management presents a very interesting problem in its historical development. Primarily this is because Russia has been a country with organised forestry for more than 150 years, but also because great changes have taken place in the social system of the country, which have had a tremendous effect on the development of its forest economy. It provides an example of how the capitalist system has been changed into what the Soviets call the socialist system.

In a comparison between the different economic systems which have succeeded each other in Russia, it is appropriate to refer to the Marxist development model as the basis for analysing the course of events. As is known, this model starts from the assumption that the political, social and cultural characteristics of societies are a function of how the economic process is conducted. It is assumed that history moves forward by a series of class struggles, and that the historical sequence of different societies which replace each other follows a certain pattern. After the feudal society there comes the capitalist industrial society, which in its turn will be replaced, after the working class has seized power, by the communist society.

Karl Marx (1914, p. 31) characterised the main features of the transition phase in the following terms: "Between the capitalist and the communist societies there occurs a period of revolutionary change from one into the other. This also corresponds to a political transition period in which the State cannot be anything other than the revolutionary dictatorship of the proletariat." The main economic objectives of the dictatorship of the proletariat were summarised by Marx and Engels (1951, p. 42) as follows: "The proletariat will use its political power for the purpose of removing by degrees from the bourgeoisie all capital and to centralise all instruments of production in the hands of the State, that is the proletariat organised as the ruling class, and to increase as quickly as possible the total productive

power." There seems to be evidence that the U.S.S.R. has not yet passed through this transition period, and it is asserted that true communism will become possible at the next stage of development, when socialism under the Dictatorship of the Proletariat has removed all the remnants and the inner contradictions of capitalism (Eaton, 1958, p. 18). However, there is no evidence that the actual development of historical events has followed such a pattern. Thus, it seems that the Marxist model of historical sequences is an inadequate basis on which to account for the performance of the social and economic structure in Russia.

However, there are other "models" which one could consider using as a basis for analysing the course of historical events. The American economic historian W. W. Rostow (1960, p. 4) classifies all societies according to stages in economic growth, into five categories: the traditional society, the preconditions for take-off, the take-off, the drive to maturity, and the age of high mass-consumption. He assumes, contrary to Marx, that the behaviour of societies is not uniquely determined by economic considerations.

Russia, at the turn of the present century, was placed by Rostow in the take-off stage, and he presumed that the maturity stage had been achieved there by the latter half of the 1950s. However, this interesting model for economic development cannot in the main be applied for the purpose of classifying the changes in forestry over the years. Rostow has placed the emphasis on industrial development. Development in forestry, particularly in forest management, has no direct connection with industrial expansion in individual countries—indeed, the opposite is often the case. It is not rare for highly industrialised countries to neglect the development of their forests; in certain cases it is actually the backward countries (backward as far as industry is concerned) which can show forestry practice of a relatively high standard. With certain reservations, even Czarist Russia can be placed in this category.

The more realistic method of approaching seems to be to analyse the development of forestry practice in Russia in two major historical sequences, namely before the October Revolution of 1917, and after that event.

What is of special interest here is the Soviet type of economy, and particularly the changes involved in the conversion to this system. One might wonder what is new in Soviet forestry practice and forestry science, and what reforms have been made in the forestry sector under the Soviets. In order to set out the problem, it is appropriate to try to

explain how the Soviet experts themselves regard the changes in conditions and the standpoint taken in this question by Soviet research workers. Here it can be a matter of quoting only the most prominent Soviet forest economist, Professor P. A. Vasiliev, former deputy director of the Forest Institute of the U.S.S.R. Academy of Sciences, who, writing on this subject, states (in free translation), "The forest economy of the U.S.S.R. is a new type of social organisation of forestry. Its basis and source of development is a socialistic method of production which is new in principle. Such a system of forest management has been impossible under any other regime" (*T.I.L.*, 1950, p. 5).

"An exceptionally important quality of the Soviet forest economy is the complete unity of its economics and techniques, and the indissoluble bond between science and production. It is certain that under conditions of capitalism authentic forestry science and forestry practice were developing, as a rule, on completely different, not coinciding lines (*ne skhodyashchimsya putyam*). Science, represented by small groups of true appreciators of forests (*tseniteley lesa*) and enthusiasts in forest activities (*entuziastov lesnovo dela*), has been cooped up (*yutilas*), and is still cooped up (*yutitsya*), in laboratories and experimental forest districts, being powerless to influence in any way the spontaneous process of forest destruction (*stikhynny protsess lesoisrebrenia*). Bourgeois practice, even if it is using 'science', does it only in a crude way, directed towards the increase of profitableness in forest management (*uvelichenie dokhodnosti lesnovo khozyaistva*) and towards veiling the real situation of forest exploitation (*zavyalirovanie deistvitelnykh otnosheny eksploatatsii*) in the interests of forest owners and forest industrialists . . .¹

"As a consequence, the technical level of development in forest management and logging operations is extremely low under conditions of capitalism (*uroven razvitiya lesnovo khozyaistva i lesoeksploatatsii v usloviakh kapitalizma kraine nizok*).

"It is different in the U.S.S.R., where thanks to radical changes in all social relations, the science of forestry is the basis and an organic part of all integrated government measures for the development of forest economy . . .

"The socialist method of forestry production in the U.S.S.R. . . . has immense advantages if compared with the capitalist system of forest management (*kapitalisticheskoye lesnoye khozyaistvo*). The advantages are those characteristic also of the entire socialist econo-

¹ The transliteration of Russian is based on the A.C.L.S. (American Council of Learned Societies) Scheme with some modifications.

my. Most important in practice amongst them is that in the U.S.S.R. it has been possible for the first time in history to surmount the difficulties in the development of forest management which are connected with the specific biological characteristics of production—the extreme slowness of timber growth and the consequent long production period . . .

“This characteristic of forestry production was, and will remain, an insurmountable barrier under capitalism in the development of forest management (*byla i ostayetsya nepreodolimoy pregradoy v razvitií lesnovo khozyaistva*). No single capitalist or capitalist organisation, with a few exceptions, will invest, or is able to invest, substantial means in the long-range process of primary forest production, as long as capital is reproducing itself in any other branch and is growing several times faster there. Because the socialist State is directing its economy according to plans which are compiled for long periods . . . The prolonged period of forest production is . . . not an obstacle for silviculture” (*T.I.L.*, 1950, pp. 19—20).

“The organisation of Soviet forestry, not only in the wide economic sense, but also in the concrete operational sense, is in a way a fundamentally new phenomenon in the history of the development of forest management (*v istorii razvitiia lesnovo khozyaistva*), as is also the very socialist character of its economics (*sotsialistichesky kharakter evo ekonomiki*) . . .

“Between our socialist organisation of forest management (*sotsialisticheskaya organizatsia lesnovo khozyaistva*) . . . and the system of practices which in bourgeois forestry are known as ‘organisation’ and ‘forest regulation’ (*lesoustroistvo*), is a deep abyss: they have nothing in common” (*T.I.L.*, 1950, p. 24—25).

“Because in capitalism the criterion of all economic activities (*mera vsekh otnosheny v khozyaistve*) . . . is the pure interest in achieving profit (*‘goly interes’ polucheniia pribyli*), a heartless cash attitude (*besserdechny ‘chistogan’*), the importance of forest management is economically realised only in so far as it yields . . . profit . . .

“The capitalist economics of forests management are, as a rule, not based on the reproduction of forests (*ne na vosproizvodstve lesov*), but mainly on the exploitation of ready, naturally mature forests” (*T.I.L.*, 1950, p. 26).

“In principle, there is no antagonistic contradiction between the Soviet forest management and the logging industry, such as is characteristic of the relations of these branches under capitalism. Forest management and the logging industry in the U.S.S.R. are two ‘guilds’

(*tsekha*) of one and the same socialist 'enterprise' (*predpriatie*), working according to one general economic plan, to achieve the same government targets" (*T.I.L.* 1950, p. 31).

"Socialist production excludes, by its very nature, the possibility of the development of one branch or another of the economy at the expense of the destruction or exhaustion of natural resources which are indispensable to the society for its further development... The rapacious principle of capitalist society, 'after us the deluge', is changed by socialism into a really human formula 'we are living better than before, and after us they must live even better' " (*T.I.L.*, 1953, pp. 25—26).

The above quotations from academic papers, which have been published by the U.S.S.R. Academy of Sciences in its proceedings *Trudy Instituta Lesa* and which have been written by the leading Soviet authority on forest economics, say quite a lot on the problem. The statements advanced are undoubtedly very daring and far-reaching. However, the question may be asked whether they are objectively correct in the scientific sense or whether they have been made for the purpose of propaganda. Professor Vasiliev's standing as an academic authority is such that one cannot merely dismiss these statements; indeed, they should be taken very seriously. It may be added that his standing in the U.S.S.R. can be compared to that of Professor M.M. Orlov in Czarist Russia, if one takes an historical view of the course of developments. The latter, who is called by Vasiliev (*T.I.L.*, 1953, p. 19) "the eminent representative of bourgeoisie and landlords in pre-revolutionary Russian forestry science" (*vidneishy predstavitel burshuazii i pomeshchikov v dorevol'yutsinnoy russkoy lesnoy nauke*), can be regarded as one of the leading scientists of Czarist Russia in the field of economics of forest management. The name of Orlov should be cited here because his line of thought is identical with the ideas and principles which are still behind the management of forest land in the western world. This is also one of the reasons why the Marxist forest economists have directed their most devastating ideological criticism at him.

When it is a question of principles and ideas behind economic systems—and this also applies to the systems of forestry—one cannot avoid mentioning names, because ideas are created by people. However, the problems which arise here concern not only the world of ideas but also how these ideas are put into practice and their results in practice. With regard to the present conceptions and methods of working in economic research, it should be obvious that in a comparison of the

different systems of forestry, one must first define and then evaluate the ends and the means which are involved. One should determine what the purposes of forestry operations are under the different economic systems, and what the differences are between targets. One must analyse in a similar way the means which are available, or which have been used to achieve these ends. The questions which can be put in this connection are these:

1. What changes do the applied means in forestry practice undergo when the ends or objectives of primary forest production are changed?
2. How does one assess the result in forestry practice, and which criteria can and should be used for this purpose?
3. Are the Soviet system of forest management and the results of its forestry practice actually superior to "capitalist" methods?

There is no single answer to these questions. The problem is too complicated and extensive for it to be solved solely on the basis of data contained in the literature, which is the only source available to us. However, such an analysis can give certain points of view and definitions concerning both the economic theory and the practice of forestry under different economic systems, and this in itself can be regarded as a contribution to the international discussions about the contrasting relationship between the two dominant economic systems of the world.

1.2 Identification of Ends and Means in Forest Management

It is quite obvious that under private enterprise it is the individual forest owner—the capitalist—who himself decides the goal for his business activities. The consequence of this is that a very wide range of goals occur, and this makes a survey extremely difficult. Even so, it can be assumed that there are certain common features in the targets set—features that can be identified and, to a certain extent, classified. However, such an approach would require extensive research, and in view of the lack of basic material, particularly that dealing with the past, the results obtained from such a method would still be rather questionable. Whether one likes it or not, such a survey of individual targets in private forest ownership must thus be rejected as impracticable.

Consequently, this paper will deal only with those objectives worked for in the public interest, i.e. the goals for forestry operations set by the Government. Considering that all forests in the U.S.S.R. nominally belong to the State, and that even in Czarist Russia the State owned

nearly 95 per cent of the forests, such an approach is quite justified. In the Soviet type of economy the interests of the State are the main consideration. Even during the capitalist era, the State forest policy determined in general how forestry was practised in the country.

One must not forget that all the objectives set—broad goals as well as operational targets—are subject to changes. As the setting of goals in the sense used here is a matter of political decision, revision of targets set and changes in courses of action are very usual occurrences. Thus, only in broad outline and with great simplification can the setting of forestry goals—which should be representative of a certain phase of development in an economic system—be defined and its specific features be described.

When the broad goals and the means for the attainment of these goals for forest management are considered, a distinction must be made between the production function and the protective function of the forests. In fact, in this case the main emphasis is placed on the production function of the forests.

The means-ends model of forest management under different economic systems could be outlined, in very broad and simplified form, as follows:

Czarist Russia

Pre-capitalist era

Objective for forest management:

Satisfying of special (shipbuilding) timber requirements.

Means for goal attainment: partial cutting restrictions.

Capitalist era

Objective for forest management:

1. Reasonable profit,
2. Sustained yield.

Means for goal attainment:

1. Cutting regulation by working plan,
2. Organised forestry practice in forests in use.

U.S.S.R.

Central planning system

Objective for forest management:

1. Satisfying of wood requirements,
2. Expanding yield (reproduction on an enlarged scale).

Means for goal attainment:

1. Cutting regulation by General Economic Plan,
2. Organised forestry practice in timber-deficit regions,
3. Forest exploitation in timber-surplus regions.

A further explanation is needed of the terms used in the above summary.

The satisfying of wood requirements is the objective set for forestry operations, and, as can be seen from the above scheme, this applies to Czarist Russia under the pre-capitalist era and to the Soviets with the central planning system. Nominally the concepts are identical, but the great difference in time which separates these two systems makes it difficult to equate the wood requirements of a primitive society in 18th-century Russia with the wood requirements of the industrialised type of society which exists in the U.S.S.R. at present. During the early period, the State wished to ensure a supply only of certain kinds of timber (oak for shipbuilding), while other timber products were largely outside the interests of the State and thus were not subject to any form of felling restriction. Circumstances are different in the U.S.S.R., where the central planning of the State determines both the supply and the demand.

In the Soviet type of economic system, the operational goal for timber production is derived from the general production plan for the economy. The latter in its turn depends on the general objective of economic development or, in other words, on the planned growth rate for the economy. Consequently, the objective for forest management cannot be identified independently but only as a part of the general objective which forms the background for the functioning of the planned economy. Actually, the ends and means in the Soviet planning system are closely interlinked.

“The most important feature of the Soviet type of forest management”, according to Vasiliev (*T. I. L.*, 1950, p. 15), “can be found in that its whole development . . . is guided by the socialist State. The socialist State determines its objectives (*tseli*), tasks (*zadachi*) and the speed of development (*tempy razvitiia*), its connections and relations with other branches of the economy; it solves the problems of its supply of materials and its technical development.”

In other words, this means that forestry as a specific branch of the economy is completely integrated in the central planning system of the State, and that the main purpose of forestry operations is to meet the timber requirements of an expanding economy with regard to the production function of the forests.

Reasonable profit, not maximised profit, has been the goal of forest management, not only in public ownership but also in large private forests in the capitalist environment of Czarist Russia. The evidence for this is that the fixed stumpage prices in the State forests were changed only after long intervals. Only in cases where the forestry practice could be characterised as forest exploitation or liquidation cutting, practised primarily in the smaller forest holdings in private ownership, was the aim perhaps to get the highest possible cash income as soon as possible. Maximised profit in organised forestry practice, i.e. in forests put under management with a formal working plan, should be considered merely as a fiction.

The concepts of "sustained yield" and "expanding yield" will be dealt with in more detail in a later section. However, some definition of the concepts is probably desirable at this stage.

To apply "sustained yield" principle means to ensure continuous production of the forest crop on the existing forest area in use. Sustained yield management is thus synonymous with continuity in timber production, at least on the previous level, and avoids situations in which proper use is not made of the productive capacity of the land. The application of "expanding yield" principle, a deduction from the Marxist theory of "reproduction on an enlarged scale" (*erweiterte Reproduktion, rasshirennoye vosproizvodstvo*), should mean a progressive expansion of the productive capacity of forest land in terms of timber output. The content and significance of this concept as a general goal for forest management are formulated by Vasiliev as follows: "As with all branches of socialist production, Soviet forest economy owes its success to the fact that the Soviet Government has established it and increased its importance as an organic part of the socialist economy, which is developing according to the Marxist plan of reproduction, on the principle of expanding socialist reproduction" (*T. I. L.*, 1953, p. 7).

"The substantial material process of expanded reproduction in forest economy ... indicates the increasing results in every cycle of production ... on the one hand, quantity and quality of forest products and other utilities, which are brought by forest economy into the development of the economy, and, on the other, material values which are existing in forest economy itself as means of production, such as forest area, growing stock, etc. ...

"Reproduction in forest management, even if regarded from the purely material aspect, is not only the renewal or growing of the forest crop in relation to forest utilisation, but a whole cycle of the reproduc-

tive process in its entire extent and all factors of the system" (p. 30).

The definitions quoted here cannot be regarded as being particularly illuminating. The true meaning of the concept of expanded reproduction, and especially its ideological background, will be subject to a more thorough analysis later. All that is emphasised here is the difference between the "capitalist" concept of sustained yield and the "socialist" concept of expanding yield as main objectives which are pursued, or are alleged to be pursued, in forestry practice.

A more thorough explanation is needed of the concept of organised forestry practice, as well as of its content and performance, as a means of attaining the end. However, let us first explain the meaning and scope of the term "forest management" (*lesnoye khozyaistvo*), which up to now we have used very frequently, although its content is ambiguous and thus liable to give rise to misunderstanding. One can define the term "forest management", in the sense in which it is used here as the application of forestry operations on the first or biological phase of forest production, i.e. growing trees. Its main components are: (1) forest administration, (2) forest regulation and (3) silviculture. The application of these components to a suitable extent and in appropriate proportions with regard to the natural conditions and the economic accessibility of the forests is understood as organised forestry practice.

Traditionally, as far as the forestry which was practised in Czarist Russia and is still practised in most of the countries of western Europe is concerned, the concept of organised or intentional forestry practice can be identified with working plan management. This means that forestry is practised according to a management plan (= working plan) which includes recommendations for cutting practices and silvicultural measures. It also means that there exists a proper administrative apparatus to fulfil the recommendations of the management plan.

In a means-ends analysis, the aggregate result of means used for the goal attainment is most important. In an analysis of a special kind such as this, which aims at a comparison of means used in forest management under different economic systems, a more detailed description of these means, broken down into their main components, seems to be necessary. This is particularly so because the meaning and functions of the above factors can be interpreted, and in reality are interpreted, in very different ways. A brief explanation of the meaning of the concepts used in this connection will be given below.

"Forest administration" (*upravlenie lesnovo khozyaistva*) usually

means the institutional setting and organisational structure of forest management in its broadest meaning. It comprises all the managerial functions connected with forestry practice. In principle, in the Soviet type of economy, the institutional setting of forest management must be widened to comprise also, to some extent, the administrative apparatus of general planning. The distinction between forest administration and the administration of other branches of forest economy—logging and wood processing industries—cannot be made with sufficient accuracy, as these branches of forest economy are integrated at the highest management levels. However, this fact does not prevent forest administration from being treated as a distinct part of forest management.

The next component as a means in managerial activities—forest regulation—needs a more thorough explanation. Originally, the term “forest regulation” (*lesoustroistvo*) was synonymous with the term “forest management” in its more limited meaning, i.e. the organisation of forest management (*organizatsia lesnovo khozyaistva*), which in its practical application means the drawing up of working plans. However, the term in question has been used also to indicate the part of forest policy that concerns cutting restrictions in private forests.

Forest regulation as a means of organising forest management in the Soviet type of economy is very closely connected with planning. Therefore all planning activities associated with primary forest production, including harvesting, will be considered under this heading.

Silvicultural measures, as a means of attaining a goal in forest management, seem not to need special explanation. The significance of these activities is equal under all economic systems. Here it can be added that silviculture in the present sense also includes cutting practices and, to some extent, forest protection. However, it must be emphasised that in this connection the cutting amount and method are not regarded from the viewpoint of timber procurement. As a means of increasing productivity, which ideologically is playing an outstanding role in forest management, silvicultural activities are paramount. In brief, the structure of the administrative organisation, forest regulation and silviculture are in practice the means which, for the purpose of a comparative analysis of forest management performance, will be considered in this part of the investigation. Policies and the attitude of policy-makers in regard to forest management can be considered to hold an important place in this. However, it should be added that political questions are much more difficult to grasp and to analyse correctly than the purely technical ones. A

means-ends analysis must take both into account; thus it is only a matter of judgement to what extent the technical side of forest management performance shall be included in an economic analysis.

2. Development in Czarist Russia

2.1 Functioning of Forestry on the Background of General Economic Thought

2.1.1 Some Features of the Economic System

The economic system which dominated in western Europe from the beginning of the 16th century until the middle of the 18th was mercantilism. During this period, owing to the intellectual awakening and to fundamental changes in attitudes and ways of thinking, the feudal institutions of the Middle Ages gradually disappeared, and an economic expansion of a different kind from that existing previously made its entrance (Heckscher, 1955).

The economic and social institutions in Russia, however, developed differently from their equivalents in the West. Old Russia had a system in which the land was divided into princely appanages, the boundaries of these being determined by rivers. However, the status of the appanage prince was a personal one and did not depend upon his ownership of land. Moreover, there was no relation between the prince and his subjects corresponding to a feudal relation (Mavor, 1914, p. 23). Some historians maintain that "in Russia there had never been European feudalism" (Pares, 1947, p. 282), i.e. the feudal system as a social institution and juridical conception in the form in which it existed in western Europe (Struwe, 1952, p. 221). The historical background was, therefore, different. This had its clearly evident consequences, but it cannot be denied that the strengthening of the power of the State was regarded as a primary objective in pre-capitalist Russia in the 17th and 18th centuries. It was also maintained that trade would be difficult, if not impossible, without a powerful navy.

Strict regulation of economic life was necessary in order to ensure the strength of the nation. A complex system of regulations regarding industrial development, foreign trade, navigation and other fields of economic activities was generally enforced, all of which were directed towards the achievement of the accepted common goal.

According to this philosophy, the welfare of the common man had nothing to do with national wealth pursued by the Government. The poverty of the common man was, in fact, regarded as a national asset, and the way to make people work hard was to keep them poor

(Ellsworth, 1958, p. 36). However, an abundance of labour was a necessary condition of national wealth and power.

In Russia, these policies reached their peak as a means of controlling and directing economy under Czar Peter the Great. The freedom of action of the subjects of the Czar was much more limited at that time than was generally the case in western Europe. Moreover, it should not be forgotten that the abolition of serfdom took place in Russia as late as in 1861. An exception to this rule were the Baltic provinces, where emancipation became a reality much earlier, in Estonia, for example, in 1816. Peasant serfdom should be considered as the main reason for the economic backwardness of Czarist Russia (Gerschenkron, 1962, p. 18). In a certain sense, this seems to be the reason why the Russian Government, moved by its interest in territorial expansion, has been forced to assume the role of the primary agent for promoting economic progress in the country. Therefore, it cannot be asserted that the pure form of capitalism, such as it is for instance described by Sombart (1925, pp. 27—30), has ever existed in Russia.

The abstract model of the capitalist system or free-enterprise type of economy has been implemented in practice with considerable modifications. It is questionable whether it would be at all possible to describe the system in a uniform manner, taking into account all its variations and describing its functions from different aspects. The system as a whole has changed considerably, and 19th century capitalism, analysed by Marx, is not the same as the system applied in the middle of the 20th century. In fact, the term "capitalism" is so worn-out politically that it should no longer be used at all. The system obtaining to-day is not "capitalism" in the sense once defined by scholars (Predöhl, 1964, p. 10). But as the term is still generally in use and no one, not even its severest critics, has proposed a better word (Shonfield, 1965, p. 3) its use is justifiable for the time being.

Only basic features of capitalism will be emphasised in the present context. These are that resource allocation is made by the consumer at the circumference, and that initiative rests with the enterprise, not with the Government. It has freedom to produce, to set prices and to choose techniques. The ownership pattern of the means of production deserves our special notice. The theoretical or *de jure* owner does not always get the lion's share of the profit, as is asserted by the Marxist economists, but very often he delegates most of his powers and the chances of higher profits to a new *de facto* owner.

According to Wiles (1962, p. 4), three ownership models could be constructed as follows:

1. Primitive capitalism, in which the private individual manages what he owns by inheritance or personal accumulation. This model is characteristic of a purely peasant economy.

2. Managerial capitalism, which is typical of a large limited liability company with anonymous shareholders. The *de facto* owner or manager is, as a rule, someone other than the body of the shareholders, the *de jure* owner.

3. Managerial socialism, in which a public board or government agency operates independently on a free market. This type is characteristic, for instance, of the public ownership of the forests in a capitalist economy.

The necessity of having a free market is highly important. The distinction is made between the Free Market or *laissez-faire* economy, and the Regulated Market or controlled economy. Both these types together are usually defined as "market economies" as opposed to the models of the "planned economies". The distinction between these broad groups of economies is not clear, however, and there is a discrepancy between the hypothetical models.

In Czarist Russia, before the communist Revolution, primitive capitalism undoubtedly dominated, but a type of managerial socialism, applied, e.g. to the forest ownership category of Crown Appanages, was firmly established in the economy.

2.1.2 Forest Regulations of Peter the Great

Several well-known foresters have described the history of Russian forestry in the past. First we must mention N. V. Shelgunov, whose criticism and outspokenness, particularly in his publication of 1857, led to a conflict between him and the Czarist authorities (Prokhorchuk, *T.I.L.*, V, 1950, p. 176); presumably this has enhanced his reputation in present-day Russia. In their publications, later forest historians such as Krause (1891), Arnold (1895) and Gershman (1911), have not made any new contributions or presented views which have diminished the value of Shelgunov's works as historical sources. The influence of mercantilist thought on forestry, the effects of compulsory regulations and directives on timber exports, timber cutting and the forest industry have been described most thoroughly by A. K. Krause (1891). We shall not, therefore, refer in detail to the sources in the following account.

The earliest attempts to protect forests in the interests of the community go back as far as the 16th century in Russia. It is apparent from the Code of Laws (*Ulozhenie*), issued by Czar Alexis originally

in 1557, and amended in 1607 and in 1649, that even at that time a person who was convicted of trespass for wood cutting, or who caused forest fires purposely, was called to account. However, the regulations in the field of the secondary forest uses, such as wild bee-keeping and hunting, which provided the main income from the forests at that time, were the primary subject of the Code of Laws mentioned above.

To the peasantry, the unoccupied forest, as well as that belonging to monasteries and the nobility, was still common property, shared and used by everybody. Therefore, the early legislation was mainly directed towards the establishment of private ownership in land use and the protection of the rights of the legal forest owners.

The more serious attempts to establish definite regulations for forest management in Czarist Russia were started on the initiative of Peter the Great (1689—1725). He passed several acts of legislation because he realised the importance of naval construction and shipbuilding for his growing country, and as a true adherent of the prevailing western ideas he considered the State to be the best regulator of all matters of forestry. His main model in this respect seems to have been the France of Colbert, and more particularly the French forest legislation of the 17th century. At that time France was already taking steps to secure forest regeneration, and Peter took over its model of forest regulations without investigating whether this was at all justified in the conditions prevailing in Russia at that time.

To preserve timber suitable for shipbuilding, decrees were passed which prohibited the cutting of certain tree species within specified distances from navigable rivers. Such forests were declared reserves. The purpose of this legislation was also to limit the uncontrolled consumption of wood. Thus, timber which was suitable for satisfying more important national needs was not to be used for some insignificant purpose where less valuable timber might have been as satisfactory. This principle has been behind several specific regulations: timber that was fit for shipbuilding was not to be used for any other purpose, construction timber was not to be used as fuel, and only wood of inferior quality could be used for charcoal burning.

The penalties for forest trespass were very severe. The cutting of oaks without permission in reserved forests was punishable by death; penalties for smaller forest offences were also severe, and included corporal punishment, slitting of the sides of the nose, and banishment to Siberia for life, all for what to us seem minor offences.

The main purpose of these measures was to protect forests and to

restrict cuttings in the vicinity of navigable rivers. The general objective, the ultimate goal towards which the adapted means were directed, was the image of a strong navy. All Peter the Great's ideas, motivated by his military interest, were concentrated on trees suitable for shipbuilding, and they underlie most measures taken by him to implement cutting restrictions and controls.

Peter the Great held the view that if the forest was needed for the purposes of the State, the forest belonged to the State. Private persons could, for their own needs, fell only trees not needed by the State (*Gosudarevykh del*), even in their own private forests.

It goes without saying that such regulations encountered considerable opposition and that they were seldom obeyed, because people in general were used to unrestricted exploitation of their forests, and could not see any purpose in these rigorous restrictions. At the same time State control was too weak and ineffective to make people observe the regulations.

In 1722 the "Forest Ranger Instruction" (*Instruktsia obervaldmeistra*) was issued, which prescribed that posts of forests rangers (*valdmeister*) and forest guards (*nadziratel*) be established on the more important river systems of European Russia for purposes of inspection and control. With the enactment of this instruction all forests were put under the control of an Admiralty Collegium (*Admiraliteiskaya kollegia*), a fact which again emphasises the importance of forests for naval purposes.

During the reign of Catherine I (1725—1727), who succeeded Peter I, the institution of the Forest Rangers was dissolved, but the Admiralty Collegium still retained its functions as the central government body for forest administration.

The cutting restrictions in general were annulled. The forest reserves were retained on a few rivers only and their width, i.e. distance from the river bank, was reduced from 30 versts to 15 versts.¹ However, this was only a temporary concession. The reduction of the penalties for forest trespass and the relaxation of control over the forests brought about a strong wave of forest devastation in the vicinity of the larger cities. Under Czarina Anna (1730—1740) the "valdmeister" posts were re-established and the old forest regulations which had been in force before 1726 were again enforced in full.

Supplementary forest legislation followed broadly the lines set up by Peter I. The basic idea behind Anna's forest regulations was that

¹ Verst, an old Russian length unit, approximately 1.067 kilometres or 0.663 English miles.

all forests are in fact State property. However, the forest does not yield any revenue to the State. Therefore, in areas where the State has no direct need to utilise the timber, trees in the State forests can be cut free of charge by anybody. The State Exchequer will obtain revenue from the forests indirectly—through customs levies (*tamozhenny sbor*).

Limitations on the utilisation of wood were gradually extended, and the use of saws for the felling of trees and the processing of wood was made obligatory. Another regulation was introduced which found more popular support with the passage of time. Its purpose was the regeneration of cut-over areas through the establishment of new plantations.

The Instruction of 1732 includes detailed prescriptions to forest officials regarding the establishment of oak stands. For this purpose a few foreign foresters were employed. More or less legendary in the forest activities of that time was a forester of foreign origin called "Fokel", often referred to in contemporary Russian literature as a "forestry expert" (*lesnoy znatel*). He was active in Russia for 30 years, during which period he undertook many long and arduous journeys through the forests. His observations are recorded in a book which was published in St. Petersburg in 1766, and which is generally accepted as the first textbook on forests and forestry in Russia (Orlov, 1895, p. 300).

A monument to "Fokel" is the well-known larch forest at Raivola (*Lindulovo*) in Finnish Karelia, some 60 kilometres from St Petersburg, established from Siberian larch seed in 1738.

2.1.3 Reversal of Policy by Catherine the Great

The early development of Russian forestry, although it had started full of promise, was quickly stopped under the regime of Catherine the Great (1762—1796) when a complete reaction took place. In 1767, the cutting restrictions of Peter the Great were substantially cancelled, although government supervision of forests was retained until as late as 1782. Forests under the administration of the Admiralty Collegium were placed under the authority of a Government Board (*Kazyonnaya Palata*), where the Directors of Housing (*domovodstva*) took charge of the supervision of the forests. A decree (*ukase*) was passed (1782) releasing all private forests from the supervision of government authorities. The decree stated that the administrative bodies for forestry had hitherto been employed more to restrict private ownership by the Czar's

subjects than to serve the needs of the Admiralty, for which purpose they had originally been established (Shelgunov, 1857, p. 178).

Therefore the following order was issued:

1. "All forests growing on the land belonging to the gentry shall be the full private property of the owner, even if they have been marked and registered as reserves.

2. "Everyone shall be entitled to sell forest products both at home and abroad after having paid the levies fixed by the State.

3. "Henceforth it shall be forbidden to cut timber without the permission of the estate owner for the cutter's own use or even for the use of the Admiralty, and a reasonable price shall be paid for the timber" (translation from Arnold, 1895, p. 213).

In fact, this decree placed the forests under the sole and complete control of the owner, regardless of whether they had been forest reserves before or not. At the same time all restrictions on trade with forest products both at home and abroad were abolished.

Under the earlier legislation, private citizens, including merchants, were entitled to utilise the timber of the State forests free of charge under certain conditions. The State merely demanded export duty (*poshlina*) in the ports of shipment. This regulation was in force until 1781. Afterwards all merchants and entrepreneurs (*podryadchik*) who utilised the timber of the State forests were obliged to pay to the State the stumpage value of the felled timber. Only the timber requirements of the Admiralty were exempt from the stumpage payments.

The motives cited in support of the abolition of the restrictions on the right to exploit the forests are significant, as they indicate a sudden penetration of the Russian economy by liberal principles. It is certainly no coincidence that Catherine the Great passed the decree releasing all private forests from government control (1782) only six years after Adam Smith published his *Wealth of Nations* (1776). The explanation is that cutting restrictions, as applied in Russia of that time, were exaggerated and unrealistic in view of the immense forests of the country.

Another explanation is that the Russian nobility had gained more influence on the Government under Catherine the Great, and that it was in their interest to obtain full control over their lands. Moreover, not all forest regulations were abolished under Catherine, and after her death certain regulations were reintroduced governing the trade in timber products and partially forbidding their export (1798 and 1810). Thus it is not correct to say that the State regulations of Russia's economy were all abolished. But the fact remains that from

the time of Catherine II until 1888, when Alexander III passed the Forest Protection Law, the forest owners were practically unrestricted in the handling of their forest properties. Many historians (Shelgunov, Arnold, Gershman) see in the *ukase* passed by Catherine the main reason for the great decrease in the forest area of European Russia.

2.1.4 General Remarks on Forestry in the Environment of Capitalism

The general concept is that the actions of individual forest owners and entrepreneurs are guided primarily by the price system under the conditions of the *laissez-faire* economy. It means that the interplay of demand and supply on the market guides the decision-making process in all forestry activities, and that no kind of government interference is exercised. There exist a great many different forest owners, who can be classified into certain groups according to their special characteristics, but who all act in one direction and with a single fixed goal—the obtaining of financial gain.

Critics of *laissez-faire* capitalism have many reservations. They observe that private interest in profit of the enterprise or of the forest owner may collide with the interests of society. Since the advent of liberalism into economic thought in the beginning of the 19th century, it has been generally agreed that one must distinguish between private interest and the interest of society. It has been maintained that a clash between the two is something natural and inevitable. The cause of this is said to be the so-called social costs which “as often as not are not reflected in money costs and consequently not taken into account in the businessman’s calculations” (Leeman, 1963, p. 4). According to Kapp (1950, p. 14), “The term ‘social costs’ refers to all those harmful consequences and damages which third persons or the community sustain as a result of the productive process, and for which private entrepreneurs are not easily held accountable”. Social costs in forest enterprises consist mainly of forest devastation or are due to the enterprise’s neglect of forest regeneration. But society cannot tolerate the transference to it of part of the costs of the enterprise, and must therefore intervene.

These are the reasons why the State plays an important role in forestry, although the capitalist economy is characterised mainly by private enterprise. In the interest of public welfare the government can stimulate, influence or control private productive efforts. The maintenance of the existing forest resources and the prevention of forest devastation is generally considered important to the interest of

the country, and for this reason laws have been established to limit the actions of private forest owners.

Public ownership of forest land, moreover, is an important stabilising factor in a competitive economy. As a rule, State forests are managed on the same basis as private forests, i.e. production must be carried out in accordance with economic principles, but it cannot be denied that the welfare of the population in the long run is more pronounced in the decisions of enterprise policy. Here it is important to emphasise, however, that in most cases State forest enterprises act in the same way as private forest enterprises on the market, i.e. they sell forest products in competition with private sellers. This is a characteristic feature in a competitive capitalist economy, compared with a centrally directed economic system in which the price mechanism has been thrown out of gear. However, the government is able to influence the market situation by adjusting the sales of timber from public lands, and to contribute in this way towards economic stability.

Conditions in Czarist Russia were roughly in accord with this sketch of basic economic relationships affecting forestry. Certain peculiarities should, however, be emphasised. One should in fact distinguish between three separate phases of development during the time here described as the era of capitalist economy, namely:

1. The period before the abolition of serfdom or peasant emancipation in 1861;
2. The period between the peasant emancipation of 1861 and the enforcement of the Forest Protection Law of 1888;
3. The period from 1888 to 1914.

The beginning of the first period is hardly traceable for the economy in general, which is characterised by the transition from the pre-capitalist system to a more or less *laissez-faire* economy. During this period, the State gradually withdrew from active promotion of economic development, and the nobility freed itself from its service obligations to the State (Gerschenkron, 1962, p. 18). For forestry in particular, however, the period began with Catherine the Great's *ukase* of 1782, which released all private forests from government control. The forests were then considered to be of greater importance economically, primarily as a source of revenue for the exchequer, and the purpose of forestry was no longer the production of raw materials for shipbuilding. Thus policy towards the State forests during the initial stage led to an administrative decentralisation (Krause, 1891, p. 34). Later (from 1834) a trend towards administrative centralisation became noticeable again. At that time timber exports were relatively small, as a result not

only of a restrictive trade policy but also of a modest demand in the world timber market.

The second period was characterised by great reforms. It was then, as a direct effect of the Emancipation, that Russia began in fact to pass into a period of capitalism (Pares, 1947, p. 422). Government policy favoured the rapid construction of railways, and this was accompanied by feverish speculations and activities in other fields of economy. This state of things was characteristic not only of Russia but also, to an even greater degree, of the industrial countries in western Europe. The dominating feature there after the 1850s was the transition to mechanised mass production known as the Industrial Revolution. At the same time the demand for forest products in these countries increased tremendously, and with the rapid spread of the ideas of free trade (Söderlund, 1952, p. 12) the economic conditions for timber exports became more favourable than at any earlier period. Russia, too, now began to increase its timber exports, but it was not until the 1880s that exports began to be more prominent. This led to a devastation of the most easily accessible forest areas to a degree which was disturbing and which caused certain reactions. Excessive cutting took place particularly in the forests that were turned over to new owners as a result of the emancipation of the peasants, and which were located mainly in districts sparsely covered by forests.

The passing of the Forest Protection Law in 1888 marks the beginning of the third period. By this law the excessive cuttings in private forests were substantially stopped, and a new attitude towards forestry in general came into being in the whole Russian society. As regards the economy in general, on the other hand, there was a revulsion in the direction of *laissez-faire* (Pares, 1947, p. 454). Railway construction by the Government now assumed unprecedented proportions, and became the main lever of a rapid industrialisation policy. The Government was primarily interested in large-scale industrial enterprises, and favoured private persons who were establishing these. The point of interest in this connection is that in contrast to countries in western Europe, the initiation of activities in the private sector very often could be traced back to the Government, which was the main promoter of industrialisation in conditions of economic backwardness (Gerschenkron, 1962, p. 20). In this context it should be stressed, however, that Czarist Russia could hardly be characterised as backward in regard to its forest management.

2.2 Categories of Forest Ownership

2.2.1 Land Ownership

In the original Russian State of Moscow during the 16th and 17th centuries, ownership of the land was divided between the Crown (*dvortsovia zemli*), lands belonging to monasteries and churches (*monastyrskia i tserkovnia zemli*), State estate lands (*pomestya*) held temporarily by the gentry as pay for military service, patrimonies of the landed gentry (*vochina*), peasant community land (*chernia zemli*), and unsettled lands (*pustoporozhnia zemli*).

Pomestya and *vochina* were originally awarded, as pay for their services, to persons attached to the Court who had certain service obligations towards the State. The former category of land was originally awarded for the period of service only and could not be inherited. The latter category of land was the private property of its owners, and could be inherited and sold. Gradually, however, the rights of the nobility increased, and in 1762 they renounced their service obligations to the Government. As a result, *pomestya* and *vochina* were merged into a common ownership group of the landed gentry (Gershman, *L. Zh.*, 1911, 3—4, p. 493; Pares, 1947, p. 282).

Chernia zemli, the peasant community land, underwent a different historical development. From the reign of Czar Peter the Great onwards, this land was regarded as State property. The old communal form of ownership by this group of peasants was no longer recognised. Originally, in old Russia, the peasantry of all classes were divided into two main groups in respect of the method by which they met their obligations to the landowner. These were the peasants paying a kind of rent (*obrok*), and those who rendered obligatory labour (*bartshina*). In European Russia, at the time of Catherine II, 55 per cent of the peasants paid *obrok* (Mavor, 1914, p. 194). On these lands, which were recognised as being in the State ownership, the peasants were now called "State peasants" (*gosudarstvennie krestyane*) and had to pay a rent to the State for their rights of land use. After the secularisation in 1764 of properties belonging to monasteries and churches, the peasants who were settled on these lands were merged with the above category and became State peasants also.

The vagueness of the boundaries gave rise to perpetual conflicts between landowners. The Government tried to solve this problem on several occasions, e.g. in 1680, 1731 and 1765. In 1765 began the so-called "General Land Survey" (*generalnoye mezhevanie*), which was far from complete by the end of the century.

The most complicated disputes concerned ownership of land by peasants and their rights of land use.

2.2.2 Distribution of Forest Land

Before the General Land Survey was begun and the forest boundaries were determined, there was no information about the distribution of different forest ownership categories (Surozh, 1908, pp. 148—150).

However, the General Land Survey was not carried out simultaneously all over Russia; it was a task which took decades, and embraced only the European parts of the country. At the same time the forests continually changed hands from one ownership category to another, both before and after the abolition of serfdom (1861). Thus it took a long time before any more detailed information on the distribution of forest ownership between the different categories was available.

According to Arnold (1893, p. 58), in 1888 the distribution of forest ownership in 50 provinces (*gubernia*) of European Russia was as follows (in millions of dessiatines):¹

State forests (<i>kazennie</i>) and Crown Appanages (<i>udelnye</i>)	116	68	per cent
Private forests (<i>tsastnovladelcheskie</i>)	41	24	” ”
Peasant community holdings and farm woodlands (<i>krestyanskie</i>)	14	8	” ”
	Total 171	100	” ”

As far as the State forests are concerned, we have accurate data for only between 22 and 23 million dessiatines, comprising that which had been surveyed and put under management with a formal working plan. The area for the rest of the State forests is derived mainly from estimates which seem to be relatively reliable. The data concerning private forests were secured mostly “from reports made by local agencies”. These reports were often based not only on maps, but also on statements made by informed persons who reputedly knew the area. The general conclusion of one authority is that “most of the figures are inaccurate” (Arnold, 1893, p. 29).

Most of the State forests were located in Northern Russia. In the Archangel and Vologda provinces alone, the State owned 73 million dessiatines of forests, in contrast to the area of private forests in those regions: of a little more than two million dessiatines. In these northern provinces, about 53—95 per cent of the total forest area was State-

¹ Dessiatine, a Russian unit of area, approximately 1.09 hectares or 2.7 acres.

owned. In the southern provinces, an entirely different distribution was found; the majority of the forest area consisted of private forests held mainly by large estates. In the southern and central provinces, private forests amounted to 50 or 75 per cent, and State forests to 16—20 per cent, of the total forest area (Kurdychko, 1940).

The Siberian forests, although they had not even been surveyed, were almost without exception in State ownership.

2.2.3 State Forests

About 86 per cent of the total forest area in Czarist Russia was owned by the State. The regional distribution of State forests was as follows:

Asiatic Russia	99 per cent
Caucasia	83 " "
European Russia	66 " "

On 1 January 1904, the total forest area administered by the Forest Department (*Lesnoy Department*) was 353 million dessiatines (385 million hectares) and its percentage distribution was as follows:

Asiatic Russia	68 per cent
European North (Archangel and Vologda districts)	21 " "
North-Eastern Regions, the basins of the Upper Volga and the Kama	5 " "
The other 67 provinces of European Russia	6 " "
Total	100 " "

Over and above this, the State owned 410 million dessiatines in East Siberia, according to rough calculations, but this land had not yet been turned over to the Forest Department (Surozh, 1908, I, pp. 5—6).

About 81 per cent of the total forest area administered by the State (313 million dessiatines) was situated in unpopulated or sparsely populated areas, and constituted large forest massifs (the Archangel, Vologda, Tobol, Tomsk and Amur provinces) while the remaining 19 per cent was in agricultural districts, scattered between private forests and arable lands, and was therefore in parcels of varied size.

The area of productive forest land under the administration of the Forest Department, however, was much smaller than the above-mentioned total area, if we deduct unproductive forest land. According

to the data of 1899, for example, the Forest Department administered, excluding East Siberia and the Amur district, altogether 138 million dessiatines, of which only 53.1 per cent was considered productive forest land, while 0.5 per cent was agricultural land and 46.4 per cent unproductive forest land. In Siberia productive forest land constituted only 29.1 per cent of the total (Surozh, 1908, I, pp. 12—13).

2.2.4 Forests in Other Public Ownership

Apart from the Forest Department, which administered the greater part of the forests in public ownership, there were other State and communal agencies which administered certain forests. Among these agencies the following may be mentioned: the Administration of Crown Appanages (*Udelnoye vedomstvo*), the Cabinet of the Czar (*Kabinet Yevo Velichestva*), the Administration of Mining Industry (*Gornozavodskoye vedomstvo*) and the Cossack Army (*Kazatskie voiska*), as well as various towns (*goroda*).

The Crown Appanages, the revenues from which were spent on the upkeep of the Imperial family, were separated from the other State lands in 1797. These estates lay in 34 provinces, mainly in European Russia, and originally consisted of 2.2 million dessiatines of forests. Through purchases and grants, the forest area continually increased, and in 1897 the total area of the Crown Appanages was 7.8 million dessiatines. Amongst these estates we might mention the world-famous natural reservation of Bialoviesheskaya Pushcha, near the Polish border.

Apart from these forests, the Cabinet of the Czar had at its disposal 19 million dessiatines of forest in the Altay region in Siberia, the revenues of which went to the Czar personally.

The forests of the mining industry (*gornozavodskie lesa*) lay to a great extent in the Urals (in the provinces of Perm, Vyatka, Ufa, Orenburg and Vologda); their total area was 4.6 million dessiatines, of which 3.8 million dessiatines were actually under forest.

The Cossacks of the Amur and Ussuri districts had at their disposal about 12.7 million dessiatines of forest area in Siberia (Surozh, 1908, pp. 104—105).

As regards the municipalities (cities and townships) these owned comparatively little forest land in Russia. The towns having at their disposal forest resources of commercial value lay mainly in the western provinces.

Table 2—1. Changes in Land Ownership, by Provinces, 1877—1905

Province (<i>gubernia</i>)	Merchant ownership		Large Estates of the Landed Gentry	
	1877	1905	1877	1905
	<i>percentage of the total land area</i>			
Archangel	0.1	0.5	0.1	0.0
Vologda	3.5	8.1	17.3	4.8
Vyatka	2.6	4.5	7.0	3.3
Novgorod	12.3	19.1	37.6	18.5
Tver	4.2	6.1	27.7	13.0
Kostroma	10.7	16.5	38.9	18.7
Moscow	8.4	11.9	27.8	17.4
Kaluga	6.7	10.2	29.9	17.0
Smolensk	6.1	13.3	44.5	21.0
Vitebsk	3.4	7.1	49.9	34.2
Minsk	3.0	4.7	65.2	56.1
St. Petersburg	9.4	14.7	48.2	33.4
Pskov	5.2	12.6	37.4	17.7
Yaroslavl	2.9	6.2	29.3	14.5
Vladimir	12.1	14.5	22.0	12.2

Source: Gershman, I. "Ocherk istorii lesovladenia, lesnoy sobstvennosti i lesnoy politiki v Rossii", *Lesnoy Zhurnal*, 1911, 3—4, p. 517.

2.2.5 Private Forests

According to Surozh (1908), the total area of privately owned forests, excluding peasant community holdings and farm woodlands, showed the following development in European Russia:

Years	Millions of <i>Dessiatines</i>
1881	42.4
1899	40.6
1905	39.2

In the above data concerning private forests, no distinction has been made between (1) the forests belonging to the large estates and (2) the forests held mainly for speculation by timber merchants. However, one of the principal ideas emphasised in the Russian forestry literature (Arnold, Gershman, Kurdychko, Tsvetkov) is that in the treatment of the forests there were enormous differences between the types of management applied in these two categories.

After 1861, there was a definite tendency for Russian forests to pass from the possession of the landed gentry into the hands of timber merchants. Under merchant ownership, this change usually involved

the rapid and complete liquidation of merchantable timber, a practice which became widespread owing to the increasing demand for wood products on the world market.

Data concerning the changes in the two groups of ownership are presented in Table 2—1.

Such data, submitted by the provinces and given in terms of percentages of the total land area of the province, show for the period between 1877 and 1905 how the land ownership of landed proprietors, i.e. of the nobility, continuously decreased and how at the same time the area belonging to merchants and timber traders continuously increased. These figures are for the whole land area, but as they constitute the major part of the landed estates in the provinces concerned, they also show the changes in forest ownership.

According to other data (Buchholz, 1961, p. 9) the forest holdings of the merchants increased at the expense of the forest holdings of the nobility by 33 per cent in 1877—1905. It should be added, however, that all these figures are rough estimates. The important feature is the general trend of development, and this is unequivocal.

2.2.6 *The Peasant Community Holdings*

The peasant community holding (*obchina* or *mir*) is characteristic of old Russia, and its resemblance to communist collective farming is quite remarkable. It is evident that this system had developed in the Russian peasantry “a deeply egalitarian and communal instinct, foreign to the individualism of the Western farmer” (Dobb, 1948, p. 61). It formed the foundation upon which the socialist system of co-operative production could be built directly.

After the peasant insurrection of 1905, the Czarist government became aware of this fact. It decided to establish conditions for the liquidation of the community ownership of land, and to institute measures to facilitate the transfer of such land into private property, i.e. to establish single enclave holdings to be held as individual property in hereditary tenure. These measures are known as the Stolypin Land Reform (inaugurated on 9 Nov. 1906). However, in the development and course of the Russian Revolution of 1917 it became apparent that this land reform had come too late to influence the coming political developments in Russia.

After their emancipation in 1861, the peasants received land for their own use, but not as private property, and only that land which they had already used before the reform. Emancipation established

nothing resembling a system of private proprietorship. The land released by the former owner, the State or the landed gentry, was formally vested, not in the individual peasant, but in the peasant community (Charques, 1956, p. 157). Moreover, land was allotted for "permanent use" only on condition that compensation was paid to the State, and the responsibility for the payment of these instalments lay directly on the peasant community. In other words, all members of the community were jointly responsible for the payment of such compensation. Members of the community were not allowed to leave the community without paying their full share, and their right to alienate the land allotted for their use was very limited. Consequently, the peasants were tied to their community and could leave it only after receiving definite permission to do so (Baykov, 1947, p. 10).

All land belonged in fact to the community, which had the right of periodical redistribution of the land amongst its members according to the number of members in the peasant household. The peasant household received the land in separate plots, usually in scattered lots or blocks, for use until the new partitioning was made. Under this partitioning process each community was the master of its own forests, and the details of forest distribution depended on the joint decision of the peasants in the community. Often the forests were treated in the same way as the arable land, with a periodical redistribution amongst the peasants at regular intervals. Usually only a certain part of the forest was subject to such distribution; the rest of the forest was held in reserve until the next distribution. A peasant household with two members was given, for example, two shares of the forest, a household with four members received four shares, etc. During a certain period the peasant was allowed to cut all the trees on his allotment. Those who were not able to cut all their timber before the next distribution were allowed to do so later, but this practice generally caused much trouble and misunderstanding.

Another way of handling communally-owned forest was to distribute it on the basis of individual trees, and not by area of forest land. The peasants decided each year how many trees should be allotted to each person or each household. Each peasant cut the trees allotted to him and could dispose of them in any way he wished.

The third way of distributing the interest of individual peasants in community forests was in terms of processed forest products in volume units. This method was used particularly in broadleaved forests, where the output of firewood might be considerable.

The fourth and simplest way of distributing individual interests in

community forests was by selling all the forest owned by the community to a timber merchant for logging and by distributing the money amongst the peasants. The data available in the older Russian forestry literature show that the last-mentioned method was used frequently before the enforcement of the Forest Protection Law of 1888 (Arnold, 1893). As a matter of fact this law was promulgated too late to save the peasant community forests in more densely populated sections of European Russia, because in the course of 15 years, during which there existed no provisions at all for limiting excessive cuttings, the greater part of these forests was felled, and the forest land left in a deplorable state. An additional cause of this was the fact that the exploitation of State forests had been limited, and therefore the timber merchants had put pressure on peasants in order to be able to buy their forests (Surozh, 1908).

2.3 Objectives of Forest Management and Policy

2.3.1 Outline of General Goals

The adoption of the *laissez-faire* policy towards the forests in private ownership in the first half of the 19th century did not mean that the State at the same time gave up its promotion of forestry in general. The measures taken at the time indicate that the attention of the Government was concentrated on the State forests in particular. Already the "Project of Forest Law" (*Proekt Ustava o Lesakh*), drafted during the reign of Catherine II, stressed that the purpose of the regulations was to "spread appropriate forestry practice to all State forests" (Gershman, *L. Zh.*, 1911, 5, p. 804). It was further stated that the goal of forest management must be based, apart from the supply of shipbuilding timber to the navy, on the idea of "financial exploitation" (*finansovaya eksploatatsia*). This concept has not been clearly defined. However, as the right to cut trees and to use standing timber in the State forests without charge was revoked at the same time, the term can mean nothing else but that the State forests were to be managed in a way to yield revenue to the exchequer. In other words, standing timber was to be turned into a marketable commodity, which it had not previously been in the home market.

The importance of the forests as a source of revenue to the State, and their financial importance, were stressed particularly during the reign of Alexander I, when the administration of the State forests was subordinated to the Ministry of Finance (*Ministerstvo Finansov*).

Fixed prices on stumpage sales (*lesnie taksy*) were applied in the State forests for the first time in 1799.

The idea that the State, when putting forests under management, must take into consideration the economic aspects seems to have been the primary purpose of this. Later, the demand for a sustained-yield management was raised also. The general goal of the administrative activities was organised forestry practice and forest conservation. As almost 90 per cent of the total forest area in Russia belonged to the State, it was considered sufficient, at least before the Emancipation Act of 1861, to implement organised forestry practice only in publicly-owned forests. Nor were the authorities able to interfere with the affairs of the private owners (Tsvetkov, 1957, p. 43). The situation was changed only when Alexander III passed the Forest Protection Law in 1888.

Professor Rudzky (1880) wrote in this connection that "the conception of a steady and even yield should not be taken literally, because the very utilisation of timber fluctuates from year to year" (p. 10). "Annual fellings at exactly the same level are also unnecessary; but a certain continuity in cutting amount, always and everywhere, is inevitable. A forestry practice based on the continuous production of forest crops, with annual fellings in approximately equal quantities, is consequently an obligatory method in all fairly large-sized forest complexes" (p. 11).

The following statement by Professor M. M. Orlov (1903, p. 4) is typical of the ideas obtaining at the time: "Forest under management (*les khozyaistvenny*) differs from virgin forest (*devstvenny, stikhyny*) in that in the former, timber utilisation is proceeding continuously. The idea of continuity is basic for forest management, and this applies to all its different types (*vsekh raznoobraznykh form*) of every shade. Thus, continuous utilisation presupposes a care for the reproduction of the forest crop to replace what has been cut."

We can conclude from the above statement, the author of which (as mentioned in the introduction, see p. 113) was one of the most prominent scholars of Czarist Russia and for long the head of the Department of Forest Management at the Forestry Institute in St. Petersburg, that the requirement for sustained yield was considered the central idea of organised forestry practice. The same author adhered to this view also after the Soviet take-over in Russia. This is borne out by the following quotation (Orlov, 1924, p. 221):

"Proper forest management requires guarantees for sustained yield, under consideration of maintenance and perpetual improvement of

forest property (*postepennoye uluchshenie lesnovo imushchestva*), for the purpose of giving the highest benefits to the Government of workers and peasants."

It is significant that the concept of forest management included the demand for sustained yield, and that this was something that could not be separated from organised forestry. Orlov's last major work in the field of forest management, dedicated to the memory of his teachers and predecessors, Arnold and Rudzky, again stressed that the continuous production of forest crops and the profitableness of the measures applied should be the guiding principles of forestry. He even identifies the concept of forest management (*lesnoye khozyaistvo*) with these two principles when he says (Orlov, 1927, p. 4),

"Forest management shall be called an activity of man, connected with the forest, and directed towards the continuous and most profitable utilisation (*postoyannoye i naivygodneisheye polzovanie*) of that forest in its permanently established boundaries."

It should be added, however, that these ideas about the goals of forestry were generally accepted in Czarist Russia, and that the steps taken to achieve the goals were well adapted to the purpose.

2.3.2 Background to the Cutting Restrictions in Private Forests

As pointed out above, government control over the private forests was retained until 1782. Thereafter, the private forest owners obtained the full and unrestricted use of their forest areas. It was stressed that, on the one hand, the State forests were sufficient to supply the navy and that, on the other, the "careful estate owners" themselves would see to the maintenance of their forests, to their own advantage and to that of their heirs (Arnold, 1893, p. 244).

In the first half of the 19th century, there were many reports that indiscriminate cutting in oak forests was increasing; but owing to the general social conditions in the country and to the circumstance that the demand for timber products was moderate at that time, it was not as yet anything which resembled forest devastation on a large scale.

After the emancipation of the peasants (1861), the landed gentry began to sell their private forests to merchants, as has been mentioned above.

The sale of standing timber frequently led to forest devastation. Large forest complexes were sold in a manner which gave the purchaser a free hand to cut the entire growing stock during the period

fixed in the sale contract. These purchasers were not the true owners of the forest, who had an interest in keeping it in a productive condition, but timber merchants, hence the ruthless methods employed (Arnold, 1893, pp. 194—195).

The domestic demand for timber products had increased considerably in connection with the construction of railways and with the growth of industry. At the same time, an increased demand on the world market had stimulated exports, so that large quantities of roundwood and sawnwood were sold to the industrialised countries of western Europe, particularly from the western provinces of Russia.

A further factor which led to a growing public support for measures to prevent forest devastation was the clearing of land for agricultural uses.

This clearing of forest occurred, as pointed out above, mainly in the less forested and more densely populated areas of the central parts of European Russia (Tsvetkov, 1957, p. 58). This had the result that the forest area proper, which was to produce timber, decreased rapidly.

A reaction against forest devastation, and the tremendous decrease of forest land in districts where both the productive and the protective functions of forests were essential, became inevitable. Public opinion grew so strong that forest conservation became the main objective of government policy in the country. The means of achieving this was the general Forest Protection Law, which will be studied in more detail below.

2.4 Administration of Forests in Public Ownership

2.4.1 Main Features of Development

The first central administrative body to exercise supervision and control in forest was the Admiralty Collegium (*Admiralteiskaya Kollegia*). The reason for this was that the main value of the forests to the State, in the time of Peter I until almost a century later, was the supplying of timber for building warships (cf. p. 123).

The independent civil service department for the administration of State forests—the Forest Department (*Lesnoy Department*)—was established by Czar Paul in 1798. In 1802, his successor, Alexander I, placed this central administration under the authority of the Ministry of Finance (*Ministerstvo Finansov*) to emphasise the importance of forests as a source of revenue for the exchequer (Gershman, *L. Zh.*,

1911, 5, p. 805). The Forest Department was very soon merged (1811) with various administrative organs for State lands and other natural resources, and the name of the Central Administration of Forests was then changed to the Department of State Resources (*Department Gosudarstvennykh Imushchestv*), which was made an independent ministry in 1837. The Forest Department was also re-established under its old name within the framework of the new Ministry.

The ideas current in the first half of the 19th century deemed it undesirable to concentrate all forests in public ownership under one common administration. The idea of decentralising forest administration was supported by Count Kankrin, the head of the Ministry of Finance. His intention was to have the State forests administered by such government offices and institutions as would profit economically from the forests (Shelgunov, 1857, pp. 300—301). Following his suggestion, a special Forest Department for Shipbuilding (*Department korabelnykh lesov*) was established in 1828, subordinate to the Ministry for Marine (*Morskoye Ministerstvo*). The forests in the vicinity of navigable rivers, containing high-grade timber suitable for the construction of ocean-going vessels, were delimited and regarded as a type of forest reserves (*korabelnye roshchi*). The felling of trees in these forests was permitted only to obtain timber for shipbuilding, and only wood of inferior quality could be sold (in limited quantities) to the local population. This government office was closed in 1859, and its forests were merged with the other State forests.

During the same period, extensive areas of State forests were turned over to various industrial administrations, the most important of which was the Central Administration of Mining Industry (*Gornoye vedomostvo*). In 1832, a bill was introduced by the Ministry of Finance, by which State forests were to be turned over to municipalities. The councils concerned took over the administration of these forests.

In 1834, an important measure to promote decentralisation was taken; the Crown Appanages were given a forest administration of their own. Up to then the Crown forests had been administered together with the other State forests, and there had existed no difference in the scope and in the economic objectives of the management of these two groups of forests. Some change in the managerial policies of the two central administrations became discernible afterwards, however.

The organisation of the central administration of the State forests has been much criticised subsequently. From a thorough analysis by Professor M. M. Orlov (1906, pp. 43—94) of the developments, and from his proposed improvements, it can be concluded that much re-

mained to be done at the turn of the century to enable the forest administration to function satisfactorily and to attain the level of rationalisation considered desirable. He recommended that the example of forest administration in western Europe be followed. Furthermore, he made statistical comparisons of the profitableness of forest management, and showed Russia's inferiority in this respect. He also criticised sharply the disconnectedness of the central forest administration of the State, particularly the fact that the immense forest areas in the Urals were administered by the mining industry and that this was not justified from the viewpoint of national economy and of direct State revenues. It goes without saying that forest administration in Czarist Russia was in need of considerable reorganisation and improvement, but the basic administrative apparatus largely resembled the model of those countries in Europe which were most advanced in silviculture at that time. Western Europe provided Russia with its first ideas about organised forestry practice, and this system remained in force until quite late, although demands were voiced for a management system more appropriate for Russia (cf. Prokhorchuk, *T.I.L.*, 1950). However, the models from other countries had to be modified and adapted to Russian conditions, which were different from those in western Europe both as regards the size and the accessibility of the forests.

2.4.2 Administrative Organisations and their Functions in State Forests

The central agency for the administration of State forests was organised as a relatively independent office, subordinated in turn to the Ministry of Finance, the Ministry of State Resources and finally, before the Bolsheviks achieved power, to the Ministry of Agriculture. In the provinces, regional forest administrative agencies were subordinate to the Divisions of Agriculture and State Resources (*Upravlenie zemledelia i gosudarstvennykh imushchestv*), headed by the Provincial Governor.

The local independent administrative unit in this departmental administration was the forest district (*lesnichestvo*), under the direction of a forest supervisor (*lesnichy*). Forest districts were sub-divided into ranger districts (*obyezd*), each under the supervision of a forest ranger (*obyezdchik*), and further sub-divided into beats (*obkhod*), each in the charge of a forest guard (*lesnik*). It should be mentioned that the Russian word *obyezd* is derived from a word meaning "to ride around", and *obkhod* from "to walk around", and the comparative size of the two units is thus implicit in their names.

The number of forest districts, and their average area, showed the following development:

Year	Number of Forest Districts	Average Area of a District (<i>dessiatines</i>)
1866.....	599	280,000
1889.....	741	307,000
1899.....	1,043	230,000
1903.....	1,232	280,000

The fact that the number of forest districts grew while their average area remained roughly the same proves that new virgin forest areas were constantly being put under administration.

The size of the forest district depended to a great extent on the intensity of forest management pursued. This, in turn, was dependent on the opportunities of marketing, transport facilities, density of population, and many other factors. A more important factor here was the distribution of forest land. In the agricultural zone of the south and west, forests were usually scattered in small units among agricultural land whereas in the north large continuous areas of forest were interrupted only by swamps, barren land, water and other natural features.

Hence the average area of a forest district in the whole of Russia means little. It is essential to group the forest districts in accordance with their size, based on the intensity of forest management. The relevant information is given in Table 2—2.

In the forests of the first group, constituting three-quarters of the total forest area, no kind of forest management existed, and the bulk of these forests were practically untouched, apart from incidental

Table 2—2. Intensity of Forest Management, as shown by the Number of Forest Districts and their Sizes, 1889

Group	Forest area <i>thousand dessiatines</i>	Forest districts		Total forest area		Average forest area per district <i>dessiatines</i>
		<i>number</i>	<i>per cent of total</i>	<i>million dessiatines</i>	<i>per cent of total</i>	
1	3,009—31,200	40	5.4	169.9	74.7	4,247,000
2	103—985	136	18.4	43.3	19.0	318,000
3	10—99	436	58.8	13.6	6.0	31,000
4	0.5—9	129	17.4	0.7	0.3	6,000
Total		741	100.0	227.5	100.0	307,000

Source: Surozh, I. *Lesnaya khozyaistvo v nikh i lesnaya promyshlennost*, Warsaw, 1908

cutting of the best trees in the vicinity of navigable rivers; in the forests of the second group a regulated selective cutting existed; in those of the third group, extensive forest management was practised (clear-cutting in strips with natural regeneration following); in the fourth group an intensive form of forest management was practised (clear-cutting with artificial regeneration following, improvement cuttings, etc.).

In 1903, the total number of forest districts had increased to 1,218 (Orlov, 1906, p. 50), and during the following ten years, until World War I, the number of forest districts still increased, accompanied by an intensification of forest management. As a result, the total area of the two last groups was almost doubled.

In 1839, the Corps of Foresters (*Korpus lesnichikh*), which was an organisation for professional forest employees of the higher ranks, was granted military status. The forest officials lost their military rank in 1867, and were turned into a civilian corps once again.

The total membership of forest officials in that organisation developed as follows:

1837—	507 persons
1866—	1,332 "
1898—	3,388 "
1903—	3,715 "

Most of the members of the Corps of Foresters were forest officers with a professional training at university level. In 1903, of the total number of 3,715, however, 1,503 persons (40 %) were foresters with a vocational training, who were called forest conductors (*lesnoy konduktor*). Almost 85 per cent of the members of the Corps of Foresters were employed in state forest administration.

The forest personnel of lower rank, forest rangers and forest guards in charge of forest protection (*lesnaya okhrana*), totalled 31,864 in 1903 (Orlov, 1906, p. 65). Most of them had no vocational training.

The Forest Department, as a rule, sold timber standing, and was not concerned with logging operations. The Corps of Foresters was opposed to the latter in principle. They maintained that the burden of logging operations on the forest personnel would be excessive, with the result that their direct duties (forest protection, silviculture, etc.) would suffer (Surozh, 1908, pp. 35—46).

The so-called forest taxes (*lesnie taksy*) were applied to stumpage sales from the earliest days of the Forest Department. These fixed prices are particularly important in the forestry practice of the Russian State, both in Czarist Russia and under the Soviets, although they are

comparatively little known elsewhere. The appraisal of stumpage value was carried out on the basis of these fixed prices, which were the basic price unit in all forest sales. The majority of stumpage sales took place at auctions, which were of two different kinds: (1) restricted biddings, which could be attended only by local inhabitants; and (2) public auctions open to all buyers. This difference had the purpose of preventing the timber traders from buying up the timber needed by the local inhabitants themselves, as well as preventing the export of timber from districts poor in forests.

2.4.3 Administration of Crown Appanages and Other Public Forests

The Crown Appanages constitute the most important component in this group, depending on the geographical location and economic importance of the forests.

Up to 1834, these forests were administered by the Forest Department, and no clear difference was discernible between them and the State forests, with the exception that the revenues from the Crown Appanages were separated from the other revenues and transferred to the Imperial family. At first, the Central Administration of Crown Appanages employed no professional foresters. About 1860, some foresters with university training were found amongst its personnel. One such forester was Vargas de Bedemar, who later compiled the well-known volume tables for standing timber. By 1893, the administration of the Crown Appanages was divided into 12 regions (*udelny okrug*), each with a regional chief at its head (*upravlyayushchy udelnovo okruga*). In every region there was one chief forester in charge of the forests (*starshy lesnichy*), and a number of supervisors (*upravlyayushchy imenii*). Further sub-divisions of the forest administration were similar to those in the ordinary State forests, i.e. they were divided into ranger districts and beats. In 1898, the Crown Appanages employed 493 forest rangers (*lesnoy smotritel*) and 3,519 forest guards (*lesnoy storozh*). By then, 75.6 per cent of the total forest area had been put under management with formal working plans.

The Crown Appanages sold mainly standing timber to the highest bidder, but if there were difficulties connected with stumpage sales (e.g. on the River Shura), they resorted to logging operations themselves. The Appanages had a number of large sawmills, for instance, in Archangel, on the Volga, at Kovsha, and on the Naverke (*Bialoviezhskaya Pushcha*), the output of which was exported to a great extent (Surozh, 1908, pp. 99—102).

The forests subordinate to the Cabinet of the Czar, the revenues of which went to the Czar personally, were managed roughly on the same lines as those described above, although, owing to their geographical location, forest exploitation there was of no importance. These forests were also administered by professional foresters.

The forests of the mining industry constituted a special problem in Russian forestry, and were, as pointed out above, very much discussed. These forests had to supply charcoal to the mining industry in the Urals. For this reason, only fuelwood was produced there. Forest products or standing trees from these forests were not sold to the local population to satisfy their requirements, and the people were therefore obliged to cut the necessary timber without permission, in other words to steal it. The establishment of sawmills and other industrial enterprises which needed timber was forbidden in these forest districts. Generally speaking, the forests of the mining industry were administered at considerable deficit, mainly because high-quality timber without exception was used as fuelwood and for charcoal burning (Petrov, 1952).

The Forest Administration of the Mining Industry (*Gornoye lesnoye upravlenie*) was headed by a Chief Forester (*glavny lesnichy*). In 1889 it employed six forest inspectors (*lesnoy revisor*), 21 forest supervisors (*lesnichy*), 35 forest technicians (*lesnoy konduktor*) and 556 forest rangers (*obyezdchik*). The administrative structure and staffing of this group of public forests were quite adequate.

The Forest Administration of the Don Cossacks employed one Chief Forester (*oblastny lesnichy*), two forest inspectors, 12 forest supervisors, 10 forest technicians, 36 forest rangers and 181 forest guards (Surozh, 1908, pp. 104—105). Their work consisted mainly in forest planting and erosion control.

2.5 Forest Protection Law of 1888

2.5.1 General Provisions

In 1864, Czar Alexander II, after having heard several reports of widespread forest devastation within his realm, ordered an investigation of the situation, together with recommendations for the regulations that would be necessary to put it right. The first results of the investigation were mainly regulations of local character, such as the Forest Allotments Law of 1873 for former state serfs in Central Russia. In 1867, a law was passed for the preservation of forests in the

Crimea. In 1877, regulations concerning forests owned by the Cossack villages (*stanitsa*) of the Don Army were confirmed. It was not until 4 April 1888 that the new general Forest Protection Law (*Lesokhranitelny Zakon*) was ratified by the Czar (Arnold, 1893, pp. 246—250). This law is of great importance in Russian forestry, and with it begins a new era that lasted until the end of the Czarist regime.

The most important aim of the 1888 law was to prevent the clearing of forest land, and to avoid its being turned over to other forms of land use. The clearing of land for agricultural use without the permission of the government authorities was prohibited in all categories of ownership. Further provisions were made to prevent excessive cuttings and to promote organised forest management. The main purpose, in other words, was to conserve forests in the regions where timber shortage was already felt or could be expected and thus contribute towards a more equal distribution of forested areas throughout the country (Gershman, *L. Zh.*, 1911, 5, p. 809).

In the practical application of these provisions, the main point of the law was the requirement of a working plan. Cuttings that were carried out according to an approved working plan were allowed. If the cutting for sale was carried out without an approved plan or exceeded the allowed cutting budget, a penalty was imposed.

Under the provisions of the law to encourage extension of forest management, forest owners were entitled to premiums for the establishment of plantations (which were also exempt from taxes), and for the cutting and regulation of their forests according to plans. The premiums paid to private forest owners for the surveying and regulation of their forests were rather high, and resulted in the drawing-up of many working plans for private forests.

The influence of the law varied with the type of ownership and with the locality. It was intended to apply certain parts of the law to certain types of forest ownership and to certain localities; this reflects the general aim of the legislators not to apply too many restrictions and to enforce only such regulations as seemed absolutely necessary. The Forest Protection Law was applied in full only to the forests owned by peasant communities. State intervention in, and the undertaking of the management of, the peasant community forests was deemed to be of the greatest necessity. These forests served, in the first place, the important purpose of supplying the peasants with the necessary timber. Their indiscriminate devastation would have led to a breakdown of the peasant households. In the second place, no other category of forest owners exposed their forests to the same degree of devasta-

tion danger as did the peasants (Arnold, 1893, pp. 253—256), as has been pointed out above (cf. p. 137).

2.5.2 Geographical Range of the Protection Measures

The provisions of the Forest Protection Law of 1888 applied only to forests in European Russia and the Caucasus, with a total land area of 1,633,000 square versts¹ and a population of 50 million. This region was the most densely populated and the most poorly forested part of Russia at the time. The same region was to be declared a zone for watershed protection by the Soviets 50 years later. In other parts of Russia the law was enforced only in special cases.

As from 1 January 1904, the restrictions of the law were applied to a total forest area of 50.6 million dessiatines, scattered in 262,491 forest units (*dacha*).

The ownership distribution of this forest area was as follows (Surozh, 1908, p. 128):

	<i>Millions of Dessiatines</i>	<i>Forest Units</i>
1. State (<i>kazennie</i>)	11.9	6,937
2. Crown Appanages (<i>udelnie</i>)	2.3	834
3. Mining industry (<i>gornoye vedomstvo</i>)	0.5	103
4. Other industries (<i>khoziastvennoye vedomstvo</i>)	0.06	471
5. Farm woodlands (<i>krestianskie nadely</i>)	4.8	44,434
6. Peasant communities (<i>krestianskie obchestva</i>)	3.0	20,249
7. Churches, monasteries, cities (<i>tserkvi, monastyri, goroda</i>)	0.7	4,977
8. Private persons (<i>chastnie litsa</i>)	27.2	184,111
9. Entailed large estates (<i>mayoratnie imenia</i>)	0.2	375
Total	50.66	262,491

The above figures included 0.6 million dessiatines (2,939 units) of forest preserves, and 0.6 million dessiatines (124 units) of watershed protection forests. Approved working plans for commercial forests in the last five ownership groups were set up for a total area of 9.9 million dessiatines (24,984 units); according to management prescrip-

¹ 1 square verst = 1.14 square kilometres, or 0.439 sq. miles English measure.

tions, clear-cutting in strips was to be applied on 8.2 million dessiatines, and selective cutting on 1.7 million dessiatines.

In 1909, the forest area with approved working plans totalled 12 million dessiatines, including 1.3 million dessiatines forest reserves (Gershman, L. Zh., 1911, 5, p. 84).

2.5.3 Institutions for Enforcement of the Law

Under the law of 1888, the general enforcement of the forest protection regulations was placed under the control of the Ministry of Agriculture, to which the Forest Department was directly responsible. In the provinces ("governments", *gubernia*) and counties (*uyezd*), so-called Forest Protection Committees (*Lesokhranitelnny komitet*) were formed. The Forest Protection Committee comprised the governor of the province as its chairman, a representative of the local nobility, the president of the district court, representatives of the Forest Department (usually two forest inspectors), representatives of the Land Administration (*Semelnaya uprava*) and some other local agencies, as well as a number of representatives of the forest owners.

In 1903, there were altogether 66 Forest Protection Committees in the whole of Russia. These committees arranged the local inspection of forests, in private as well as public ownership, through the personnel of the State forest administration, the police and county agencies. To take charge of the actual control of the forests, 280 forest inspectors (*lesnoy revisor*) from the Forest Department were engaged by 1903. The local supervision body consisted of 5,050 persons, 24 per cent of whom were employees of the Forest Department (forest supervisors and their assistants), 29 per cent were police inspectors, 39 per cent chiefs of county boards, and eight per cent others. Moreover, in charge of the protection of private forests, 1,210 forest rangers and guards from the State forest administration were employed (Surozh, 1908). These Forest Protection Committees were active until the October Revolution of 1917, and operated quite successfully. Especially important was their role in the establishment of forest preserves, and their activities in the development of the idea of soil conservation in general.

2.6 Working-Plan Management

2.6.1 First Instructions for Forest Regulation

There was a strong conviction prevalent in Russia, fostered from the very beginning of organised forestry, that sustained yield manage-

ment could be achieved only by working plans. Thus forest regulation and the preparation of working plans connected with it held a prominent place in the intentional forestry practice of Czarist Russia.

One major feature of forest regulation in Czarist Russia is the abundance of instructions. From a historical viewpoint these instructions are of great value. Not only do they reflect the development of forest management on the basis of working plans, but they also give a good picture of cutting practices in the country during the course of almost a century.

Attempts to put forests under organised forest management in Russia date back to the 18th century. However, no information is available as to whether any working plans were prepared. Forest regulation on a larger scale started at the beginning of the 19th century. The first official Instructions for Forest Regulation in the Russian State Forests were compiled by Arnold, and issued in 1845 (Chikilevsky, 1957, p. 305). These instructions prescribed the regulation of yield on the basis of the combined area and volume allotment method, whereby the cutting schedule progressed by periods throughout the entire rotation. A few of these original working plans, which were written under the directives of 1845, have been preserved. They show that the rotation for conifers was 120 years, and for deciduous species 60 years (Tyurin, *L.Kh.*, 1963, 8, p. 80). In addition to the stand description data, a working plan of that time was mainly made up of a series of tables. Marketing conditions and timber prices seem to have been taken into consideration, but only in a minor way.

The Instructions of 1859 prescribe the regulation of yield on the basis of normal annual cutting area, and the preparation of working plans in a less elaborate form (Chikilevsky, 1957, p. 306). A major point to be remembered in regard to the Instructions of 1859 is that under them the greater part of State forests in European Russia were put under management for the first time.

2.6.2 Forest Regulation Instructions of 1888

Of even greater importance were the Instructions of 1888, which provided for the preparation of simplified working plans in such private forests as were under the Forest Protection Law. These working plans were required to contain at least the following data: (1) a map of the forest area with boundaries clearly marked and (2) a short description of the forest, including the size and order of cuttings. The exact scale of the map was not prescribed, but the map had to

be large enough to indicate the boundaries of the stands, the location of cut-over areas, and openings which the forest owner planned to reforest. A rough type classification into conifers and deciduous species was required, without further distinction between the various tree species. The stands were also to be divided on the basis of age into three classes: (1) mature, (2) not mature, (3) seedlings and saplings.

The determination of the annual cut and the regulation of yield were based on rotation periods which were standardised for all forests of similar character: for the conifers 60 years, and for the deciduous species 30 years. Unquestionably such rotations were too short, and invariably led to overcutting. In deciduous stands, the size of the felling area was not limited, and it was left to the judgment of the owner of the forest. A similar condition prevailed in mixed stands where pine was predominant. In pure pine stands, however, it was required that the number of seed trees left on each dessiatine should be not less than 30. If no seed trees were left, the cutting was to be done in strips not exceeding 105 metres in width. The last-mentioned cutting method was also used in spruce stands (Arnold, 1893, pp. 196—112).

These were the minimum requirements for the management of private forests. Under the Forest Protection Law of 1888, the owners of large private forests were also allowed to use more detailed working plans of their making, which had to be presented to the Forest Protection Committee for checking and approval. Once approved, all cuttings in accordance with the working plan were permitted and were accepted as good. In order to encourage forest owners to prepare working plans for their forests, various cash premiums and other awards were established. This system of premiums had really been in effect since 1876, even before the enactment of the general Forest Protection Law. The surveys and the actual preparation of working plans in private forests in old Russia were usually done by private foresters who had adequate forestry training and experience. Government employees, including foresters employed as supervisors by Forest Protection Committees, were also permitted to do such work. The expenses were paid by the forest owner.

Special regulations were in force regarding forest preserves, where cutting of living trees was very much restricted. Such cuttings as were done were mainly salvage cuttings for the removal of dead trees. Working plans for forest preserves were set up at the expense of the State, which had the authority to take over such forest preserves as seemed necessary.

At the same time, the regulation of State forests was made more

thorough, and the methods applied were made far more precise. According to the Instructions of 1887 and 1888 (a special one for State forests) it was required that the felling areas be chosen in regular felling series. In 1894 the area allotment method was reintroduced, and the Instructions of that year prescribed that the forest regulation work was to be done by the local forest personnel (Surozh, 1908).

2.6.3 Forest Regulation Instructions of 1911 and 1914

The author of the Instructions of 1911 was Professor M. M. Orlov. The first paragraph of the Instructions clearly defines the objective of forest management, namely, the highest net income under conditions of a continuous utilisation of the forest crop (Tursky, 1912, p. 54), i.e. sustained yield.

This series of Instructions emphasised the need for more accuracy in carrying out field work, especially in cruising. The regulation of yield was based on a combination of age-classes, area allotment and stand management methods. The last series of Instructions for carrying out forest regulation work in State forests of Czarist Russia was issued in 1914. In its basic principles, this series is very similar to its predecessor.

One interesting development was the procedure followed in preparing a working plan in State forests, according to these Instructions:

Before beginning the work of surveying in any forest district, a preliminary conference took place between the supervisor of the district, the regional inspector and officials of the Forest Regulation Division. The conference laid down the proposals for future management. The formation of management and administrative sub-divisions was also discussed and decided on. The field work, surveying and cruising were accomplished by a forestry technician under the supervision of an inspector of the Forest Regulation Division.

The main parts of a working plan were as follows:

1. A directive concerning the surveying of boundary lines;
2. Tables showing the distribution of age-classes, site quality classes, and stand quality classes;
3. The annual felling budget, expressed in area units for the felling cycle (10 years), and the felling sequence according to compartments and stands;
4. The description of stands;

5. Maps, usually one stand map and so-called planchette maps on a larger scale.

Total volume, and the volume of single stands, were estimated visually. No estimates were made of growth or increment, and the allowable cut covered only the main or regeneration cut, little or no attention being paid to the intermediate cuts, including thinnings.

In this connection, one circumstance is of especial importance: forests in Russia which were put under management were split up into quadrangular compartments, separated by straight-line boundaries and permanent corners. The size of the compartments depended on the intensity of forest management, which in its turn was connected with the operating profit per unit area. The larger the profits per unit, the smaller the compartment. The fixed minimum area of a compartment was one square verst. It might be added that in the State forests of Russia, splitting up into compartments and the cutting of straight-line boundaries had already been prescribed in 1826 (Surozh, 1908).

In accordance with the Instructions of 1911, the national forest units (*lesnaya dacha*) were divided into six categories (Tursky, 1912, p. 54). For instance, the first or highest category comprised forests where the profit per dessiatine was 10 roubles and the size of a compartment 100 dessiatines. Such profitable forest units existed. They were found in the zones where the forests attained their optimum growth, in the southern and western parts of Russia, and where the demand for timber was great. The lowest category comprised forests where the profit per dessiatine was one rouble or less. In the case where clear-cutting was practised, the size of a compartment had to be 1,600 dessiatines. When selective logging was employed, as was the rule in the remote forest areas of the European North or Siberia, the size of a compartment was as large as 6,400 dessiatines.

2.6.4 Silvicultural Prescriptions in Working Plans

Up to 1838, selective logging was generally applied everywhere. With the progress of forest regulation, the felling of trees was gradually concentrated on certain felling areas determined by the working plan, and in 1860, selective logging was discontinued in the State forests in the southern, western and central parts of European Russia.

Since then felling in strips, followed either by natural or by artificial regeneration, has been the common practice in the forests under State ownership. The width of the strips varied with the geographical location and the intensity of forest management. In the south and west

of European Russia, the width of strips was usually about 50 to 100 metres, and in the north and east about 500 metres. As a rule, the felling area was divided up by straight-line boundaries, with inscriptions of the date and details of the felling year. In pine forests, the alternate strip method was generally used, but clear-felling in progressive strips was common in spruce and deciduous forests. Pines were most commonly left as seed trees. The regeneration period was calculated to be about 20 years, during which time the entire series of fellings within a given compartment or stand had to be finished. The width of the felling strip, its direction, and the felling sequence were, as a rule, prescribed by the working plan (Surozh, 1908).

Thus these working plans were very rigid in their silvicultural requirements; this restricted the scope of the local personnel and made their work routine. However, strict regulations were necessary, considering the standard of training of the general run of forest employees and the low efficiency of forest management at the time. On the other hand, it was a great handicap that these strict regulations were meant to be followed throughout the entire area of Russia, irrespective of local conditions. It may be noted that the main reason why clear-felling was accepted as the general cutting method was the simplicity of computing the yield by area, the simplicity of selling timber standing, and the simplicity of controlling regeneration after the logging operations were finished. Yield regulation on the area allotment basis is generally closely connected with clear-felling, and the history of the development of forest management in Czarist Russia does not indicate any exception to this relationship.

Felling in Russian State forests was not extensive, and rotations were usually long. Thus the tendency towards conservation under the ownership of the Crown was apparent.

2.7 Silvicultural Practice

2.7.1 Natural Regeneration of Forests

The present Russian forests, primeval as well as those of second growth, have mainly been established by natural regeneration. Only a very small fraction of second growth stands are the result of artificial planting. These latter are situated mainly in the southern and western regions of European Russia.

The regeneration of virgin forests has very often occurred after forest fires, and fire is considered the best promoter of pine and larch

regeneration in the north (Molchanov, 1934). It is assumed that great areas of the northern, rather even-aged natural conifer forests owe their existence to the extensive forest fires which occurred in the 18th century during the reign of Czarina Anna. According to the historical documents still available, there was a series of droughts, during which the forest fires in northern and central Russia became uncontrollable. A somewhat similar situation can be observed to-day in Siberia and in the northern part of European Russia. Over vast areas, after severe fires, occasional groups or even single trees of various species only slightly harmed by the fire have served as seed trees, and as a result even-aged young growth of larch, pine and birch has covered these burned areas. After a few years spruce, a tree species of great tolerance and ability to meet the harsh climatic conditions of these northern sites appeared under the second-growth stands of the fire type. Within a short time it spread more and more, and eventually displaced the pines and larches (Tkachenko, 1955, pp. 400—402).

In the establishment of organised forest management in Russia in the middle of the last century, the tendency was always to develop clear-felling methods, although they involve the cutting of entire stands and the removal of all individual tree species. The first requirement for applying this type of cutting is that all the trees to be felled are merchantable. In Russia this only holds true in the regions of dense population and in areas with cheap transport for roundwood, for example near the waterways. Actually, the clear-cutting method was applied in the southern and central regions of European Russia. In the north, selective logging was mainly used right up to the beginning of World War I. Deciduous species had no market; only the largest and best grade of coniferous trees, usually with a breast height diameter of 30 to 40 centimetres, could be harvested (Alekseyev—Molchanov, 1954, p. 6). Clear-felling was followed in pulpwood logging, especially in pure spruce stands and in the vicinity of rivers (Kruedener, 1943).

A golden rule of silvicultural practice when clear-felling is applied is that each successive removal should only follow its predecessor after regeneration has become established on the last strip cut. If this rule was not followed, as all too often was the case, natural regeneration could not always be successful. The most common result was a change of tree species, high quality coniferous stands being replaced by less valuable deciduous species. Especially in spruce forests it was a common experience that clear-felled areas regenerated naturally to aspen, birch and grey alder. This has been reported as being more or less usual

in the north-eastern sections of the spruce *taiga* (Melekhov, 1944). However, more frequently the deciduous species dominated in the next period of the rotation.

2.7.2 Artificial Reproduction of Forests

Forest regeneration by artificial measures in the Russian State forests was particularly intensive at the beginning of the present century. In 1899 a decree was issued according to which the buyers of standing timber had to make a down-payment to the Forest Regeneration Fund to ensure the slash disposal and reforestation of the cut-over areas. The local forest administration used the money in this fund for artificial regeneration, either by direct seeding or by planting.

The down-payments in question were comparatively high. For instance, according to the Instructions of 1904, they were in northern Russia 1—14 roubles and in southern Russia 15—34 roubles per dessiatine. The average down-payment throughout the whole of Russia was roughly 10 roubles per dessiatine in 1905. Considering that at the same time the total area of cut-over areas in the State forests was 141,000 dessiatines, the guarantees paid to the State in the course of one year made 1.4 million gold roubles. The Forest Regeneration Fund totalled as much as 2.5 million gold roubles on 1 January 1904 (Orlov, 1906, p. 77).

In fact there were few buyers who took the necessary steps, i.e. carried out the slash disposal and artificial planting, to have the down-payment refunded; usually the money in question became State property. From these payments and revenues the local forest administration had to carry out reforestation, and for this purpose so-called silvicultural instructors (*kulturny nadziratel*) were employed. However, despite that, the fund was not fully used (in 1900—1906, for instance, only 53 % of the income was spent) and the money accumulated continuously. It might be added that the total planting costs per dessiatine were roughly 18 gold roubles (Surozh, 1908, pp. 59—66).

The cultivated area, including afforestation of steppes, totalled 97,000 dessiatines in the State forests between 1866—1898. In Crown forests under the administration of the Appanage Department, 600 dessiatines of cut-over areas were regenerated annually on average.

Weedings and thinnings in young stands in State forests were applied only in densely populated areas, and only when the marketing conditions were good. However, the total area of improvement cuttings was rather limited.

In private forests, clear-cutting methods were also commonly used, but not with the same care as in the State forests. Partial cuttings for natural regeneration were systematically applied on some of the large estates, but for the most part these cuttings were very close to selective logging.

In order to develop the practice of silviculture in the private forests, the law of 1876 provided for cash premiums and awards for forest owners who employed artificial methods in the regeneration of their forests. According to the law of 1888, the State nurseries were required to deliver seedlings and seed, either free or at a set price, to those owners whose forests were under the supervision of the local Forest Protection Committee (Arnold, 1893, pp. 114—118).

Undoubtedly the above-mentioned provision contributed much to the development of silviculture, but it was not enough. Many authorities on Russian forestry considered the general situation in Russian silviculture before World War I as being far from satisfactory, especially in the regions where stumpage buyers—logging companies and merchants—had had a free hand. The most important obstacle to silviculture was the grazing of cattle and sheep.

2.7.3 Afforestation of Steppes

The history of forest planting on the Russian steppes goes back more than two and a half centuries, to the time when oak plantations were started to provide timber for the shipbuilding needs of Peter the Great (1696). In 1787, Potemkin ordered the sowing of acorns in the departments of Taganrog and Nikolayev. Especially important in the afforestation work of the Ukraine were German colonists, the so-called Mennonites, who had left Germany because of their religious convictions and their opposition to military service. These immigrants were placed in settlements, which had been founded by Arakcheyev¹ in 1817, and instead of military service they were required to complete six years of labour service for the State. Each settler of military age was required to plant 87 hectares of forest annually.

Originally, these plantations were mainly made by the settlers in lieu of military service, and were not part of any plan for the afforestation of the steppes. However, they were so promising that in 1841, after one of his inspection trips, the Minister of the Crown Estates, Kisilev, decided to undertake the problem of afforestation of the steppes

¹ The hated statesman in the reign of Alexander I, the founder of "military colonies" in Russia (Charques, 1956, p. 133).

on the basis of their success. In 1833, Brinken, a forest authority of the time, wrote an article entitled "Prospects for the Afforestation of Steppes", in which he described the forest plantations on the River Molochina which had been established by the Mennonites. He proposed to cover the Ukrainian steppes with uniformly-spaced forest belts, and claimed that the improvement of climate would be very beneficial if only eight per cent of the total area of the steppes were afforested (Mayer—Wegelin, 1943).

The actual undertaking of the suggested work, or rather its beginning, fell on the shoulders of von Graff. He established the experimental areas of Veliko Anadol on the open steppes, and started actual afforestation work, using the cheap labour of the Mennonites for this purpose. Characteristic of von Graff's work was his considerable expenditure on the preparation of the ground for the planting operation itself, as well as additional expenses in the further treatment of the plantation. The cost for the establishment of such a plantation at that time amounted to about 200 gold roubles per dessiatine, and this work was possible only because of the cheap Mennonite labour.

Bark, who succeeded von Graff as head of the experimental forest district of Veliko Anadol in 1866, tried at first to simplify the planting procedures of von Graff in order to decrease costs. Instead of spending several years in the preparation of the soil, he endeavoured to solve this problem by leasing the area for a short period for agricultural use. He succeeded in decreasing the costs to about one-seventh of the earlier amount, i.e. to 30 gold roubles per dessiatine. Bark was thus able to demonstrate that the afforestation of steppes was financially feasible, and the practice was extended to other steppe regions, notably the eastern Ukraine, and near the Volga. From 1872 onwards, Tikhanov afforested some 2,000 dessiatines on the Don, and improved and further simplified the methods advocated by Bark.

However, these later plantations were not too successful and could not stand too close a comparison with those established by von Graff. In contrast to von Graff's stands, which were still thriving, these later plantations grew very poorly, were attacked by various pests and diseases, and often disappeared completely.

The great drought year of 1891 put everything to the test. Thousands of hectares of plantations died completely, and what remained was in poor shape. The drought gave a blow to all methods of planting that had been advocated up to that time. Only one species survived this fatal drought more or less satisfactorily—the oak (Vysotsky, 1929).

The year 1891 brought about a complete change in the afforestation

procedure. It was accepted as a fact that it was not possible to have large mature stands on the steppes; the idea of improving the climate of the steppes by creating large areas of forests was finally dropped and consequently the whole afforestation project was abandoned.

2.7.4 Shelterbelt Planting

The great famine year of 1891 changed basically the aims and methods of forest planting in the steppes, though not the idea itself. Instead of creating forests for the supply of wood, shelterbelt planting, the purpose of which was to protect the agricultural crops and to assist in holding sand dunes and gullies, now became the major concern. The initial introduction of shelterbelt planting as an organised Governmental measure dates back to the same famine year of 1891. Experiments in planting shelterbelts on the black soil zone were initiated under Professor Dokuchayev's¹ leadership.

The problem of drifting sands and erosion ravines in the Lower Volga region and the Ukraine had reached such threatening dimensions that the Czarist Government was forced to take action for their control. Special organisations or committees of foresters were formed as an "organisation to combat sands and gullies". The main purpose of these organisations was to halt drifting sand by means of willow plantations to prevent the dunes from encroaching upon fertile lands, to stabilise gully erosion, and also to afforest certain areas in need of such treatment.

3. Development in the U.S.S.R.

3.1 Functioning of Forestry in the Soviet Type of Economy

3.1.1 Some Characteristics of the Central Planning System

The definition of the Soviet type of economy, as it is officially declared, is very simple; the economic system is based on public ownership of the means of production, and this is organised in such a way that the production can be directed according to a plan designed to satisfy the needs of the people in the whole society. If one imagines this economic system functioning in a real world, it is quite clear that only the State can fulfil these functions (Thalheim, 1962, p. 51).

¹ A well-known Russian scientist of the period.

In this type of economy (the *Befehlswirtschaft* of A. Weber, 1949), with a single authority, it is implied that the central administration body knows what people "really" want, and is going to give it them by the planned use of the means of production. There is no free market, and the planning system, teleological in its conception, constitutes the focal point, because the bureaucracy is to do administratively what the free market does automatically. In other words, the State has taken over all main initiative, except consumers' freedom of choice. The State directs and administers the enterprises in all fields of economy according to the plan. The State and its organs appoint managers of the enterprises and control their work. The State plans the country's national economy; it distributes manpower as well as the material and financial means, it determines the pace and the increase of productivity work, the extent and structure of the production as well as both domestic and foreign trade turnover, and the prices and wages. One of the most distinctive features of the Soviet economy is the fusion of political and economic leadership. This means unity of political and economic management, and the subordination of the operational goals to the general objectives of the Communist Party (Voronin *et al.*, 1960, p. 37).

It must be added that the State, by its control of all means of production and since it is not bound by any restrictions in its decisions, can exploit its power position much more intensively than any private owner of means of production. The latter must pay attention to competition from other producers, and cannot ignore the demands of the labour force which is organised in trade unions. While the workers in a free economy can influence their wages through their trade unions by a strike, the Soviet workers have no such possibility. In other words, the State has an authority as final and complete in labour management as it has over every phase and aspect of the functioning of the economy.

Soviet economic planning is based upon the maxim of planned development. Theoretically this is derived from the reproduction theory as presented by Karl Marx in his work "Capital" (1915, II, pp. 453—610), that is, the process of perpetual reproduction on an enlarged scale. However, the planned development of the economy cannot be applied by itself if the ultimate objective of the development is not known.

The planned economy is not only concerned with the compilation of the plans, but also with their fulfilment. In reality, all activities are concerned with the fulfilment of the plan. However, the Soviet type of

economy is not a planned economy pure and simple, in the sense that the plans must merely be fulfilled. The goal is the fulfilment and overfulfilment of the plan quotas, and the reduction of the planned production costs. In other words it is in fact neither more nor less than a hortative economy. The work of the manager and the leading personnel is stimulated by bonuses in cash or kind. The bonuses they receive depend on the extent of their overfulfilment of plan quotas, as measured by the output, the cost of production and other indicators (Bienstock *et al.*, 1946, p. 94). On the other hand, demotion or punishment follows deficiencies in the fulfilment of the plan.

The theoretical requirements of the maxim of "reproduction on an enlarged scale" and, as its consequence, the practical application of a hortative economy, are very significant for forest economy. It is increasingly evident that this system—overfulfilment of the planned output and reduction of the actual cost of production to below the estimated level—implies features incompatible with organised forestry practice. An analysis of the long-term consequences to Soviet forestry of the systematic application of the hortative principle will follow later in this work.

3.1.2 General Objectives of Government Policy

Karl Marx wrote that the future communist society, under conditions where workers would have the opportunity to develop social consciousness, would inscribe on its banners, "From each according to his ability, to each according to his needs" (Marx, 1941, p. 23). The equalisation of reward for different kinds of work (in Russian *uravnilovka*) in actual practice has proved to be impractical, however. To save the situation it was announced that "the Soviet Government cannot consider as its task the immediate realisation of this equality at the present moment, when only the first steps are being made towards transition from capitalism to communism" (Baykov, 1947, p. 43). Under conditions when productivity has not risen sufficiently for everybody to have as much as he wants, the slogan becomes "From each according to his capacity, to each according to his labour" (Wiles, 1962, p. 49).

This is a more realistic approach to the actual situation. However, the application of this slogan characterises one of the main principles of the Soviet system. Voznessensky (1948, p. 85), former head of the *Gosplan*, gives a bolder explanation: "In the Soviet economic system, people's actions are mobilised for the execution of the State plan, and

the work of every toiler is, in the final analysis, subordinate to the common goal". Consequently the focal point is the exploration of the economic and social ends which the Communist Party is pursuing. A State plan, as an expression of economic policy, must be directed towards the desirable future economic and social situation. In this connection, however, the crucial problem is the definition of the ultimate objective and the explanation of why the chosen "common goal" will be the most appropriate.

Stalin (1953, p. 46) derived the "common goal" from the "objective laws of socialism" (*obyektivnie zakony sotsializma*), which is alleged to be "the securing of the maximum satisfaction of the constantly rising material and cultural requirements of the whole society". These economic laws, like the laws of nature, according to Stalin are "reflections of objective processes taking place independently of the people's will" and "they cannot be changed or negated" (Schwartz, 1954, p. 94). However, this definition is incompatible with Soviet reality. It is not at all in accord with the measures set out in the plans for the development of national economy.

As Professor J. Tinbergen (1963, p. 106) points out, there is no doubt that all governments "have in mind the basic aims of development". The difference between the objectives of the western democracies and of the Soviet government, in regard to the higher living standard of the population, is primarily to be found in the time aspect of the problem. The politicians who rule in the West have in fact carried out, or will be carrying out, their plans for the prosperity and welfare of their peoples. At any rate, the generation living now will enjoy the fruits of these efforts. The Soviet leaders, too, promise higher living standards for the whole of the population, but this is to be achieved in the more distant future.

The general objective of the five-year plans both under Stalin and later, was the "industrialisation of the country". That this industrialisation would automatically bring a "maximisation of social welfare" in its wake cannot be verified.

The real aims of Soviet economy have been defined by experts outside the Soviet Union quite differently, and they all seem to agree. The long-term objective, according to them, is the building up of the communist society of the future, though the intermediate "benchmark" goal is rapid economic growth (Höhmann, O. W., 1964, 4, p. 12).

Lovestone (1959, p. 549), Director of International Publications, CIO-AFL, Washington, formulates the immediate broad goals as follows:

1. "To speed the building of heavy industry as the base of the country's economic development and strength,

2. "To secure the development of heavy industry so as to make the U.S.S.R. ever more independent of countries outside of its area of control."

Another authority, Professor G. W. Nutter (1962, p. 292), puts it as follows: "The explanation for the Soviet record lies in the unity of purpose and practice on the part of the rulers—enhancement of State power—and in their selective mobilisation of resources—systematic favouring of industry over other sectors and of investments over consumption, including leisure."

There is ample proof that under Stalin the Soviet Government always insisted that the targets for heavy industry must be fulfilled at all costs, and that the consumer goods industries had to take the strain. In the Seven-Year Plan, 1959—1965, introduced by Khrushchev, the principle of the priority of heavy industry over light industry is also repeatedly reaffirmed. To the Soviet public this plan was represented as a decisive milestone of advance on the road of gradual transition from socialism to full communism, a period in the not too distant future when everybody should have an abundance of everything to satisfy his requirements (Levine, *The New Leader*, 25 May 1959, p. 17). Thus, the final objective is still claimed to be superabundance and social harmony, which will be achieved during the communist stage of development, but it is not exactly specified when the U.S.S.R. will enter this promised land.

Another point in Khrushchev's economic programme is of importance. When the Seven-Year Plan was announced in November 1958, Khrushchev described this as a decisive step towards a final victory in the competition with capitalism. He predicted that in 15 years the U.S.S.R. would "take the first place in the world not only in total output but also in *per capita* production" (Hoeffding, *F. A.* 1959, 3, p. 395). Competition with the most advanced industrial countries in the West was thus set up as a component of the economic objectives, and the definite plans were to be compiled in accordance with this idea.

It is clear that Soviet intentions change as the world situation develops. Competition with the West will perhaps not be the most important factor in Soviet economic expansion, and is of minor importance in this connection. The overall objectives of the regime, the reason why the Soviet system is being implemented, as a means to reach a certain end, must be elucidated before we can analyse opera-

tional goals and their fulfilment. The operational goals in the different sectors of economic activity must be derived from the general objectives, and for the people of the U.S.S.R., as for numerous other peoples in the world, development towards higher production is accepted as one of the fundamental overall targets. The influence of this general objective on forestry will be examined in more detail in the following chapters.

3.1.3 Adherence of Forestry to the Central Planning System

The administrative organisation of the U.S.S.R. might be compared to that of a huge enterprise or corporation, though naturally with considerable simplification. The board of this enterprise would then formally be the Council of Ministers of the U.S.S.R. and its executive agency from 1963, the Supreme Council of National Economy. Actually, the "top management" or the "commanding height" is the Praesidium of the Central Committee of the Communist Party. It is elected and removed by the Party membership, just as the board of directors of a business enterprise or a corporation in the capitalist countries is elected and removed by the shareholders. The Party Praesidium, like a board of directors, has management functions, and thus has the right of making decisions at all levels of industrial administration (Granick, 1960, p. 205). Thus "the party-state guides the Soviet economy as a single, huge, multibranch, multiplant enterprise" (Spulber, 1962, p. 8).

The units subordinate to this huge concern are, in the first place, the regional *sovnarkhozy*, which in their turn have special departments for forest management and forest industry. These departments are, therefore, not independent enterprises which function autonomously, but only parts or divisions in a larger economic organisation which comprises other branches of the national economy. All work as organs of the whole. The production and financial plans of forest management and forest industry are, in the same way, only parts of the general economic plan which embraces the whole of the national economy. The forestry sector is determined by the general economic development plan and interests, and, to a minor extent, also by the special interests of forestry which take into account both the production function and the protection function of the forests.

The general objective of such a large industrial corporation, in which the members of the Communist Party have the function of the capitalist shareholders, is determined essentially, as was stressed above, on political grounds. Consequently, in such a corporation "all import-

ant economic decisions are basically political, and therefore all industrial executives must orient their professional thinking on the job in political terms" (Granick, 1959, p. 284; Voronin *et al.*, 1960, p. 37). The Party leadership demands from the industrial leaders in the first place (and this applies also to the forestry sector) that the plans be fulfilled. But the plans should not merely be fulfilled, they should be overfulfilled, indeed the plans should be overfulfilled to the greatest possible extent.

The operational goals in forest management and forest industry are derived, as are those of the other branches of national economy, from the political objective for a general economic growth in terms of industrial expansion. This presupposes also an expansion of output in forestry, as regards both the primary and the secondary production stages. The general objective for activities in the forestry sector have been formulated as follows: "The task is to satisfy the growing demand for wood products in the economy." This formula is frequently reiterated in forestry publications and also in academic journals and daily newspapers. As regards the production of roundwood, it must be stated that Soviet output really has kept pace with the increasing demand by the economy. For example, in 1913 the total cut (timber removed from the forests) was 67 million cu. m, in 1930—147 million cu. m, in 1940—246 million cu. m, in 1950—266 million cu. m, in 1960—369 million cu. m, and in 1964—385 million cu. m. (*N. Kh. SSSR*, 1965, p. 193). Such an increase in the output of primary forest products (construction and industrial roundwood as well as fuelwood) is remarkable. In a country where all forests were put under management on a sustained yield basis, such an increase of timber output would hardly be possible, even if all merchantable growing stock were cut.

The increased timber output in the U.S.S.R. does not imply that the primary forest production, i.e. the growing of trees, has also increased. As is known, this kind of increased production can be achieved within certain limits only, determined by the natural growth conditions. In other words, the increased cutting amount in the country is not balanced by a real increase in the biological forest production, and this is not maintained either by spokesmen for Soviet forestry. The reason why the annual cut could be increased on such a scale lies in the special conditions of Soviet forest economy. There are in the country large virgin forests which were not utilised earlier, owing to their inaccessibility, and where organised forestry practices were, and are, non-existent.

To keep pace with industrialisation and to satisfy the growing

demand for forest products by the economy, the timber removals during the first industrialisation period took place mainly in areas closest to the consumption centres, where there were sufficient manpower supplies. The forests in these areas were, as a rule under organised forest management previously. The timber output could be multiplied only by ignoring the principle of sustained yield and by abolishing all cutting restrictions. The result was that the timber stock in the poorly forested areas was very soon depleted. To maintain the roundwood supplies to satisfy the ever-growing demands of the national economy, logging operations had to be extended to distant virgin forests, hitherto considered to be completely inaccessible. The relocation of logging operations is undeniably connected with large-scale investments. The production costs for timber from virgin forests are, therefore, relatively high; in fact, the timber industry is heavily subsidised (Katkoff, 1961, p. 376). But subsidies seem to play a minor role in the Soviet system. The primary consideration is to satisfy the increasing demand for timber, and to fulfil the production plans in this respect.

The protection function of the forests can be maintained much more easily in a centrally directed system which controls all land and natural resources than in a society where land belongs to a number of private owners whose interests are divergent and who are rarely unanimous in support of such decisions. In this respect all dictatorships are superior to democracies, and the Soviet system is no exception to the rule. It cannot be denied that recently Soviet policy has strongly promoted favourable developments in this field, contrary to what has been the case before. But the progress achieved in the development of the protection functions, too, is dependent on the political objectives, and the Soviet system in itself is no guarantee that the objectives in this field will not be re-examined and changed. Such changes of policy have in fact occurred in the past.

3.1.4 Planning in Forest Management

According to a standard work on planning in forest management, *Organisation and Production Planning in Forest Enterprises* (1960), compiled by 11 prominent forest economists, including Voronin, Vasiliev and Sudachkov, the basic idea of forest land management is stated to be the principle of expanding reproduction, which is said to be derived directly from the basic economic law of socialism. The practical application of this principle to forestry means a systematic

increase of forest production and of the share of forestry in the general expansion of the economy (p. 9). In other words, the objective is to attain a higher productivity of the forests and to increase their economic importance. This objective is to be achieved by a uniform economic plan, harmonised in all its parts, and by exploiting all the resources of Socialist forestry (p. 10). The plan is to direct and organise forest production in the way most suitable for the attainment of the objective.

The implementation of planned economy in forestry practice, and its theoretical background, which have been only touched upon here, need a more detailed explanation and clarification. This is best done by direct quotations, owing to the ambiguity of the arguments used. An authoritative statement in the above work, for instance, reads in English translation as follows (p. 11):

“The organisation of production plays the role of a really scientific and secure means of increasing the production and its economic results under conditions of socialist production, under which the objective economic law of planned, proportionate development in national economy is active, and under which the activity of any enterprise constitutes an organic component part of all fields of production and of the entire economy. Under such conditions production organisation becomes merged with production planning, it acquires to an increasing degree the characteristics of economic science and it becomes one of the more important means of organising the struggle for the exploitation of all resources according to the plan, for the fulfilment of plans by the dates set, not only individual enterprises but in all fields, in the whole of national economy. The role of production organisation is particularly important whenever the economy is engaged in raising steeply the productivity of labour, in economising the available means of production and in exploiting extensively the accumulated reserves.”

The above could be summarised in brief by saying that planning plays a central role in “socialist” forestry, and that the forestry production plan constitutes an integral part of the general economic plan.

An important question here is the relation between the traditional forest planning, which consists of forest regulation, the main instrument of which is the working plan, and the “socialist” planning which is in effect a forestry production plan. The question can be answered by the following quotations from the above work (p. 16) given here in English translation:

“Forest regulation (*lesoustroistvo*) is concerned primarily and especially with the forest as such, whereas the organisation and planning of production (*organizatsia i planirovanie proizvodstva*) is concerned with forestry production (*lesokhozyaistvennoye proizvodstvo*) . . .

“Forest regulation shall be subordinate to forest administration (*upravlenie lesami*), whereas the organisation and planning of production shall be subordinate to the management of forestry production (*upravlenie lesokhozyaistvennym proizvodstvom*). Forest regulation deals with the inventory of forest resources in nature, with the compilation of organisation forms for timber utilisation and reproduction and, in this connection, also for the whole system of forest administration . . .

“Forest regulation shall conform with the common requirements of economics. It builds upon the results achieved in general forestry and silviculture (*lesovedenie i lesovodstvo*). It supplies the general organisational scheme for the reproduction of standing timber and its utilisation, having but the validity and significance of a draft plan (*proekt plana*). It should be used only together with the material of forest inventory and other survey data, to compile perspective and operational plans for the actual performance of forest management.

“The organisation and planning of production, on the contrary, has to draw up the compulsory plans for forestry production in accordance with the general objectives for the development of the economy and to safeguard their fulfilment.”

The above does not really clarify the difference between these two principles of planning. From what has been said, however, it can be concluded that forest regulation is regarded as a technical procedure only, almost identical with forest mensuration or forest surveying, or both.

On the other hand, it is also maintained that even in a Soviet-type planned economy, forest regulation is not merely a subordinate procedure, as far as long-term forestry planning is concerned.

The Instructions for Forest Regulation issued by the Soviet Government in 1926 stipulate that the purpose of this activity is to draw up working plans for an appropriate forest management in forest districts and their sub-divisions. Under the Instructions, this must be done so as to make it possible to obtain surveying data applicable to larger geographical areas, and finally to the whole country. This would make it possible to draw up a national plan for the management of forest land in accordance with the following objectives (Tyurin, *L. Kh.*, 1963, 6, p. 86):

1. Sustained yield;
2. Supplying the national economy and the local population with timber in accordance with their needs;
3. Complete but not exhaustive exploitation of the utilities of the forest;
4. Improvement of stand composition and of the growth rate of timber by improving the productive capacity of the soil.

During the NEP period, the idea was that working plans compiled on the classical pattern should be extended into a national planning instrument, and that forest regulation should, under the Soviets, retain the position it held in Czarist Russia. It must be added, however, that the 1926 Instructions differ slightly from the earlier ones. Over and above prescriptions regarding the surveying and yield regulation in the commercial forests, the 1926 Instructions also dealt with the protection of forests. Contrary to earlier practice, the cruising and planning work was delegated to the local forest personnel in order to secure working plans of acceptable quality.

The Instructions recommended neither volume allotment nor area allotment methods, but established a cutting sequence which was to have secured the natural regeneration of cut-over areas. The concept of "rotation" was firmly established in these first Soviet Instructions (Chikilevsky, 1957, p. 320).

It is clear without further explanation that, to begin with, the Soviet Government could only follow the old Instructions issued during the Czarist era. The existing working plans, however, were of very little value, and in the blind struggle for timber and more timber, no attempt was made to observe them. Forest regulation in the true sense of the word was dropped entirely when large-scale industrialisation of the country began. As Professor Tyurin (*L. Kh.*, 1963, 6, p. 86) puts it, "The period from 1930 to 1935 was a period of extreme decline of forest regulation (*upadka lesoustroistva*), judged at that time to be useless (*nenuzhnyy*) owing to misunderstandings."

In fact, the industrialisation of the country brought about an increasing demand for timber for construction purposes. The allowable cut, determined by the working plans, was a moral obstacle to the increase of the timber output and was, primarily for these reasons, considered to be incompatible with the development of the forest industry. What is more, it was also claimed that the working plans were based upon principles which were partially irreconcilable with the development of a socialist economy. This was the main reason why the fundamental principles of the classical forest regulation—the main

determinants of which are yield and rotation—were rejected in forest management planning during the period of the rapid industrialisation of the country (Chikilevsky, 1957, p. 321).

However, this contemptuous attitude towards the old-style forest regulation changed soon enough, as borne out by the fact that in 1938 a new series of Instructions for Forest Regulation was issued, which were followed in 1945 by new directives for the compilation of working plans. The last-mentioned Instructions particularly emphasised the renewal of forests. Contrary to the 1938 Instructions, the later ones present the *leskhoz* as the forest management unit for which a working plan should be compiled.

In 1952, the Ministry for Forest Management (*Ministerstvo lesnogo khozyaistva SSSR*) issued a new series of instructions for the compilation of working plans, entitled "Instructions for Forest Regulation and Surveying in Forests of National Significance" (*Instruktsia po ustroistvu i obsledovaniiu lesov gosudarstvennogo znachenia*). However, these Instructions proved inadequate for management planning in integrated forest enterprises, that is, in enterprises where forest management and logging operations were conducted under the supervision of the same administrative staff. Moreover, they were in force throughout the whole country, and were therefore implemented in a routine way in all geographical areas, irrespective of varying natural and economic conditions (Ponomarev, *L. Kh.*, 1961, 4, p. 7). They were therefore amended, with the approval of the Ministry for Agriculture (*Ministerstvo selskovo khozyaistva SSSR*), in 1960 and issued under the title, "Basic Instructions for Forest Regulation in the U.S.S.R." (*Osnovnie polozhenia po ustroistvu lesov SSSR*).

The above detailed report on the developments has been included to illustrate the changing attitudes towards planning.

After World War II, there was a considerable reversal in Soviet policy in general. The classical methods of forest regulation were revived, and the working plan suddenly became a very important instrument of planned economy, according to certain authorities. "Forest management without forest regulation is equal to building without plan and project", Vasiliev and Nevzorov wrote in 1948. According to the same authors, the time had come to realise that forest devastation could not be allowed to continue. The first step, they said, was to end anarchy in the utilisation of timber resources and to improve the distribution of forests in the U.S.S.R. They stated further that there was a need for balancing the annual growth and the annual cut. So far, they claimed, the annual cut had been high in sparsely

forested areas and low in well-forested regions. They advocated the transfer of the main logging operations from the timber-deficit regions to the timber-surplus regions. All problems were expected to be solved by appropriate planning.

The question, however, is: what kind of planning? The authors did not concentrate on the traditional working plan, but referred to the "socialist" plan for forestry production. In essence, this last-mentioned plan was a programme of action in forest management, co-ordinating information, forecasts and directives concerning the output in a given period. Several types of plan are distinguishable here: long-term expansion plans, perspective plans and annual working plans. The most important of these in the planning of national economy is perspective planning (*perspektivnoye planirovanie*). The "perspective" or "intermediate" plans are drawn up for five to seven years, compiled according to Government directives, and represent a detailed scheme which provides the definite basis for scheduling yearly orders to all branches of the economy.

The five- to seven- year period was originally selected as being the time needed for the planning and construction of new industrial establishments. It has been suggested that perspective plans should be compiled annually. The initial and terminal points of the projection would be moved forward each year (Spulber, 1962, p. 17). On the other hand, perspective plans for 15 to 20 years at a time are also to be compiled in the future.

The intermediate plans constitute the basis for the compilation of the operational or yearly working plans. The operational plans in forest management are drawn up with reference to the component processes in the management. Owing to the seasonal character of forestry work, separate plans are drawn up for the separate periods: for example, the plan for artificial regeneration in the spring, the plan for weeding in the summer period, etc. Consequently, the planning in primary forest production comprises both planning of separate processes and planning for separate periods.

The standard work by Voronin, Vasiliev *et al.* (1960), to which we referred earlier in this chapter, will be cited again. The basic subdivisions of the current operational plan in forest management are:

1. Production plan (*plan proizvodstva*);
2. Plan for labour and wages (*plan po trudu i zarabotnoy plate*);
3. Cost-price plan (*plan sebestoimosti*);
4. Plan for capital constructions (*plan kapitalnovo stroitelstva*);
5. Financial plan (*finansovy plan*).

The annual volume of timber assigned for cutting in the State Forest Fund is called the Harvest Cut Fund (*lesosechny fond*). The planning of the quantity of the harvest cut, i.e. of the timber removals, is carried out simultaneously with the compilation of the perspective and of the operational plans. The determination of the timber output in the current operational plan is based, on the one hand, on the calculations of allowable cut, and on the other hand on the wood requirements of consumers as well as on the balances of the timber supply and demand, compiled by the separate economic regions.

The allowable cut for each major management unit (*leskhoz*) is determined by the forest regulation, usually for 10 years at a time. In recent years special 10—15 year plans for raising the productivity of the forests have also been compiled. The fixing of the allowable cut is primarily based on the actual situation of the growing stock, more particularly on the availability of mature timber and on the reproduction conditions of the forests (pp. 138—139).

Forest renewal is considered the main objective in the production process of forestry. Increase of the forest crop by various silvicultural measures must be achieved in strict agreement with perspective and operational plans, which means that the planning of silvicultural prescriptions must be carried out in minute detail. The forest area in need of artificial reproduction measures of various kinds is called the Silvicultural Fund (*lesokulturny fond*). It includes (p. 171):

1. Forest areas not covered by forests and in need of artificial reproduction measures, as well as areas assigned for reproduction cutting during the planning period;
2. Areas to be put into productive condition by means of natural reproduction but in need of partial silvicultural measures;
3. Areas with stands not fully stocked, or stocked with low-quality tree species, which must be reconstructed from an economic point of view.

The acreage of the Silvicultural Fund, i.e. the area in need of artificial silvicultural measures, is fixed by the forest regulation work or by special surveys. The selection of areas where the actual work is performed, and the selection of silvicultural techniques for any specific working section, are in fact major elements in the compilation of an operational plan in silviculture. The determination of priority in silvicultural measures plays an important role in this connection. The operational plan must take into account also the economic aspect of the work. It is necessary to find a way of getting the work done with the smallest possible outlay both of labour and money, and of creating

the most favourable conditions possible for the use of machinery (p. 172).

The reason why the contents of the plans have been reported on in such minute detail is that we have tried to establish the differences between “capitalist” and “socialist” planning in organised forestry. It seems clear enough that no essential differences exist in the management planning at enterprise level. An annual operational plan exists also in private-enterprise forestry undertakings, although the plan there is less rigid than its counterpart in a planned economy, as a rule. It seems that the Soviet authorities have not so far devised a theory of planning which can combine the timber supply and demand balances into a single system, and integrate them with the long-term production of the forest crop on an expanding scale.

The basic difference seems to lie in the theoretical approach. The communist planners regard a long-term plan, too, as a purposeful set of directives for action, and not as a simple prognosis. A plan embodies the policy-makers’ will to change the prevailing conditions. In fact, in all economic sectors including forestry, any plan must link the everyday activities with the basic political objectives of the party (p. 37). In other words, in the Soviet conceptual framework, planning is defined as what is desirable from the viewpoint of the policy-makers’ aspirations. Where the problem is the creation of a new future, the planning of operational objectives is not based on past economic trends and on the directives expressing the changes desired by the planner. It is based instead on “engineering and designing” completely new constructions (Spulber, 1962, p. 220). A traditional working plan, which is an engineering blueprint for forestry activities in the near future, falls short of these requirements of socialist planning. This is why it is regarded as only an auxiliary instrument for production planning in forestry.

3.2 Institutional Structure of Forest Administration

3.2.1 Situation during the Early Period after Land Expropriation

The process of changing the former capitalist system of forestry into a socialist system started after the October Revolution of 1917 with the nationalisation of the private forest lands. One of the first acts of the Soviet Government was the Land Decree (*Dekret o zemle*) which abolished without compensation the landowner’s right to

his land. This decision, the "Basic Law on Forests in the Russian Socialist Federal Soviet Republic" (*Osnovnoy zakon o lesakh Rossiiskoy Sotsialisticheskoy Federativnoy Sovetskoy Respubliki*), proclaiming all private forest land to be the "common property" of the society (*obshchenarodny fond*), was issued in the name of the "Central Soviet of Workers and Soldiers" and signed by Lenin on 28 May 1918.

In reality, there was never a defined plan, other than opportunism, for the reconstruction of the administrative system on the new basis. The first task of the new rulers was the difficult problem of the *de facto* alienation of forests, and of arranging for their management. All problems connected with the nationalisation and general supervision of forests were temporarily put in the charge of the local agricultural committees, but without giving these committees any definite instructions. Particularly uncertain was the status of the formerly privately-owned small forests scattered among the agricultural land. Every local committee acted in accordance with its own ideas, and the situation became chaotic, leading finally to complete anarchy in the administration of the former private forests.

The administrative structure of the former State forests did not undergo any important changes, however, and after the Communist *coup d'état* these forests were still under the administration of the Forest Department, subordinate now to the People's Commissariat of Agriculture (*Narkomzem*). The organisational structure of forest administration changed completely after the liquidation of the Forest Department as an independent central administration body, in 1930, when its merger with the timber industry was accomplished.

After a lengthy period of confusion and misunderstandings, the Soviet Government drew up and promulgated forest regulations in the form of a Forest Code of the Russian SFSR (*Lesnoy kodeks*). It was issued for the first time in 1923, revoked and amended in 1928, and issued in its final form in 1929, including amendments and supplements up to 1 January 1929. The Forest Code was based generally on the regulations of the Czarist Government, and took over bodily the greater part of the old system of management. However, it never had a practical value as far as the protection of forests was concerned. Its main value lay in the regulations for forest administration.

According to the Forest Code, the nationalised forests were divided into: (1) forests of local significance, and (2) forests of national significance. The division of forests into these groups had an important economic and political objective. First of all, its major aim was to

supply the rural population with timber and to help to regulate the secondary uses of the forests, such as grazing. A minor purpose was to relieve the Forests Department of the obligation of providing timber for the small wood-consumer.

The State still retained the ownership of the forests of local significance. The village community was entitled only to the usufruct. In law, this is still the position (Zaslavskaya, *L. Kh.*, 1961, 5, p. 56).

As a matter of fact, the decree abolishing private ownership of all forest land introduced a general devastation of forests. Timber was cut wherever it was easily accessible, without regard to future growth. Even forests of polewood-size often fell victim to the axe. The former working plans were entirely disregarded, although in some better-located areas the actual timber removals approximated to the anticipated allowable cut of 20 to 30 years ahead. The unprotected forests thus became an object of uncontrolled, excessive utilisation by the whole population, even more so because during the period of the Civil War, and long afterwards, the whole country had to use wood for heating purposes. During the Civil War, the supply of wood fuel to railways caused especially great forest devastation. In the winter of 1919—1920, all forested areas located on either side of the main railways were officially released for clear-cutting. In order to provide Moscow and Leningrad with fuel, all woods within 30 kilometres from Moscow and 50 kilometres from Leningrad were also released for fuel-wood cutting. A statement attributed to Lenin voiced his opinion that the forests contributed much to the “rescue of the revolution” from disaster and downfall in those troubled times (Buchholz, 1943, p. 77).

Summing up, during the periods of “War Communism” (1918—1920) and “NEP” (1921—1927), unrestricted cuttings were common in the whole of Russia, and in certain regions resulted in great forest devastation. Thus the idea of forest conservation was abandoned by the Soviet leaders from the very beginning of their regime, despite the fact that it was theoretically recognised by these same leaders, as proved by the promulgation of the Forest Code.

3.2.2 Administration of Logging Operations

The main concern of the Soviet Government from the very beginning has been timber procurement. In consequence, therefore, forest exploitation has always dominated forest management. Such a situation certainly involves a serious obstacle to primary forest production, and the changing nature of the administrative system appears to be trace-

able to the dominance of timber harvesting in relation to all other activities in the forests.

After the appropriation of the forests and wood-processing factories, the emphasis was substantially put on logging operations to meet the requirements for fuelwood and roundwood for industrial uses in the factories, in which the manufacturing of forest products had slowly started again.

On 27 August 1918, the Soviet Government appointed a so-called dictatorial triumvirate to run the entire forest industry of Soviet Russia. Neither property rights, cutting restrictions, nor any other legal or economic consideration were to hinder these men in their direction of the industry. At that time of general anarchy the triumvirate failed to supply the railways with fuelwood, and was replaced by the Central Timber Committee. As the imports of coal from England were cut off and the transport of fuel supplies from the southern coal districts, such as the Donets basin, was paralysed, the whole country had to use wood for heating purposes.

A Soviet decree was issued obliging every peasant living in the vicinity of forested areas to cut and deliver a certain quantity of fuelwood. The former forest supervisors of Czarist Russia were obliged to fulfil their personal wood quotas, which were the same as those of the rest of the population; at the same time they were responsible with their lives for the fulfilment of the total cutting budget assigned to their district (Liberman, 1945, p. 14).

During the period of the New Economic Policy, the old capitalist methods of logging were partly revived. The Soviet Government signed agreements with contractors and merchants of the pre-revolutionary era who had managed to stay alive. Under these contracts they were obliged to produce fixed quantities of fuelwood for localities mentioned in the agreement. The Government provided these contractors with cash and food to pay their workers.

Thus the activities of timber procurement in those times were based on two different principles: private initiative and voluntary contracts on the one hand, and forced labour as a set duty to the State, on the other.

During this period, the administration of wood-processing industries was concentrated in the Supreme Economic Council and its subdivisions "Glavks" and "Trusts". The trend of the time was to extend the independence of factories and enterprises, and to organise them as industrial *kombinats* or combines (Baykov, 1947, p. 108). One of the first of these trusts was planned for the timber industry, in order to

group regionally the sources of raw materials. *Severoles*, or the Northern Timber Trust on the White Sea, was the first in the northern forest zone, where it controlled the logging operations and the manufacturing of timber products from the forests most accessible for export. It may be added that this first trust planned for the sawmilling industry was soon to become the model and prototype of most of the trusts in various other branches of Soviet industry (Liberman, 1945, p. 99).

The Soviet timber trusts can be compared with trusts in capitalist countries in form only and not in essence. The timber trusts were established in the beginning as regional groupings of wood-processing plants, fed by adjacent forest resources and served by the same transport facilities. According to the above definition, the State gave independence to these industrial enterprises in the execution of their operations within the limits of the status approved for each of them, acting on the basis of commercial calculation or business accountancy (*khozraschet*) with the aim of deriving a profit (Baykov, 1947, p. 110). Later (in 1927) the status of the trusts was changed. It was then stressed that a trust must act on the basis of commercial calculation only as far as this coincided with the planned tasks approved by the Central Agency of State Planning (*Gosplan*). In the NEP period, in order to encourage export and the subsequent influx of foreign currency into the country, some forest utilisation licences (concessions) were issued to foreign firms for certain areas in European Russia and on Sakhalin. However, these concessions were soon ended, as it proved hard to subordinate them to Soviet control.

In the period of the first Five-Year Plan (1929-1933), which aimed at a rapid industrialisation of the country, great changes took place in the administrative organisation of the timber industry. During the NEP period, the activities of the industrial enterprises concerned were mainly logging and the manufacturing of primary forest products. In principle, the industry acted as a buyer of standing timber from the forestry agencies (forest districts) subordinate to the Forest Department. However, there was considerable jealousy and controversy between the two organisations. The main point of misunderstanding was connected with the allotment of timber by the Forest Department to the timber industry. The latter naturally wanted, and asked for, the more accessible forest areas, whereas the Forest Department, which aimed at a sustained yield policy, assigned to the timber industry the more remote forest stands. These serious struggles between the two bodies lasted for several years, and only ended when the Forest

Department was detached from the People's Commissariat of Agriculture by a decree of 25 February 1930, and attached to the Supreme Economic Council, to form the Central Administration of Forest Industry (*Lesprom*). This agency became the sole master of the Russian forest resources, with the responsibility not only for logging and manufacturing but also for the management of forest land. According to the Soviet leaders, this was done in order "to bring about a better planned development of the timber industry and the forest management according to socialist principles" (Buchholz, 1938, 1943 and 1961).

In January 1932, the Supreme Economic Council was itself reorganised in People's Commissariats of various industries. Thus the *Lesprom* became an independent People's Commissariat and was renamed *Narkomles*, the abbreviation of "People's Commissariat of Forests and Timber Industry" in Russian.

The *Narkomles* retained its status as the central agency for the whole forestry sector until 1947, when the Ministry of Forest Management was established. From then onward the management of forest land was transferred to the new agency. Since that time, the former *Narkomles*, renamed the All-Union Ministry of Forest Industry (*Ministerstvo lesnoy promyshlennosti SSSR*), has lost its supremacy in forestry sector and resumed its old position as the chief logging operator and wood manufacturer. It has also lost its right of free stumpage and again has to buy the standing timber from the formal forest land owner (the Ministry of Forest Management and the Ministry of Agriculture respectively), in the same way as all other logging operators in the U.S.S.R.

The basic production unit in logging is the forest industrial enterprise (*lespromkhoz*), originally established through the amalgamation of two or more forest districts (*lesnichestvo*) of the former Forest Department. The *lespromkhoz* usually embraces one or even more river basins, and thus the boundaries between the logging enterprises often coincide with watershed areas. The transportable forest enterprises (*lestranskhoz*) are a variety of the *lespromkhoz*. Their name stresses the migratory character of these enterprises. In fact, the *lespromkhoz*y also frequently migrate to new forest areas, after having used up the mature timber resources available.

The chiefs or directors of the *lespromkhoz*y are supposed to be trained forest engineers. However, this is not always the case. Their first assistants are called chief engineers. The subdivisions of the *lespromkhoz* are forest points (*lesopunkt*) under the leadership of a

supervisor (*nadchalnik lesopunkta*) and logging camps (*masterskaya uchastka*) under the supervision of a forest technician (*tekhnoruk, master lesa*).

3.2.3 Revival of Forest Administration Agencies

The main effect of the organisational reconstruction in 1930 was that it in fact converted Russian forestry into a timber industry. The Soviets excused this by saying that in view of the increasing demand for timber by the new five-year plans, and the complete socialisation of industry, the country could not afford to adhere to the conservative principles of foresters who, in many cases, were not able to grasp the true meaning of industrialisation.

In 1932 Lobov, the People's Commissar of Forests and Timber Industry, declared publicly that application of the principle of sustained yield in forestry had inevitably prevented accomplishment of the production targets set for the industry. The supreme importance of the timber industry for "socialist reconstruction" demanded that its fullest development be assured through unrestricted exploitation of the forest. As a consequence, all principles of organised forest management were now discarded and their defenders liquidated, although no new directives for forest management were issued (Buchholz, 1938 and 1943).

However, the complete sacrifice of the sustained-yield principle led only to further denudation of the poorly forested areas.

Unlimited devastation of forests in the neighbourhood of rivers in the southern regions brought about a partial change in the forest policy. By the action of the Council of People's Commissars of the U.S.S.R., a reorganisation of the forest economy was decreed as of 31 July 1931 (*Decree, 1934*). All forests were divided into two zones or classes: the "industrial zone" and the "silvicultural zone". In the silvicultural zone were included the southern agricultural regions of European Russia and Siberia, the republics of Central Asia, and all forest lands which had a water protection value on the upper courses of the Volga, Dniepr, Desna and Oka rivers. The forests of the silvicultural zone were returned to the jurisdiction of the People's Commissariat of Agriculture. All other forests were assigned to the "industrial zone."

However, this decree did not bring about any change or improvement, either generally or locally, and forest devastation was common at a time when the process of collectivisation was at its height, and

everywhere. It should be mentioned here that this decree was issued when there was tremendous confusion among the Russian peasantry.

On 12 July 1936, a new law was issued regarding management of the forests in the silvicultural zone, or—as it was called in the new terminology—the watershed protection zone (*vodookhrannaya zona*). These forests were now put under the direction of an independent agency—the Central Administration for Forest Protection and Silviculture (*Glavlesookhrana*), attached directly on the Council of People's Commissars (*Sovnarkom*). In 1936, the total forest area in the watershed protection zone comprised about 52 million hectares, but in 1940 it was increased to about 69 million hectares (Buchholz, 1943, p.88).

Unquestionably, the forests of European Russia suffered immense devastation in World War II. The “scorched earth” strategy, which was used at Stalin's command, was also applied extensively to forests. During the war, the Germans, as well as the Russians themselves, were forced to cut wood in the most accessible places, and this was done of course without consideration for the most elementary principles of forest management (Buchholz, 1948). In addition, the war caused extensive devastation of the forests in the eastern regions of Russia, which were not directly touched by war. Owing to the lack of transport facilities, wood was required not only for fuel but also for other purposes; thus cutting was carried out in the areas where it could most easily be obtained.

After the war, the fourth Five-Year Plan was inaugurated, for the restoration and development of the economy of the U.S.S.R., covering the years 1946—1950. The principal aims of this plan were “to rehabilitate the devastated regions of the country, to recover the prewar level in industry and agriculture, and to push them considerably beyond that level” (Special Supplement on the Fourth Five-Year Plan, 1946). The most important event during that period was the establishment of an independent “Ministry of Forest Management of the U.S.S.R.” (*Ministerstvo lesnovo khozyaistva SSSR*), by a decision of the Praesidium of the U.S.S.R. Supreme Soviet on 4 April 1947.

The new Ministry had the following duties to perform:

1. Reforestation of cut-over areas, burns and other open areas.
2. Raising the level of silvicultural work, and growing more valuable and faster-growing species.
3. Preservation of existing forests, re-establishment of forests in watershed areas (*vodookhrannie lesa*), and control of erosion through planting in the head-water areas of the big rivers and their tributaries, in eroded gullies and on drifting sand dunes.

4. Afforestation of steppes and other dry or semi-arid areas, especially in the Volga region, in the eastern part of the Ukraine, in the Kulundin and Barabinsk steppes, and in Central Asia.

5. Organisation and development of a network of forest nurseries, to provide planting stock not only for State forests, but also for the forests of collective farms, and for shelterbelt planting; organisation of seed procurement and seed control.

6. The institution and extension of a systematic practice of cleaning and thinning for forest improvement; sanitary cuttings (*sanitarnaya rubka*) and prompt removal of dead trees.

7. Drainage of forest land and protection of forests against harmful insects and diseases.

8. Organisation of the protection of forests against fire, and the prevention of unauthorised cutting.

9. Assistance to collective farms in shelterbelt planting, and organisation of regular forest management in the farm woodlands.

10. Planting of "green forest belts" around cities and industrial centres.

11. Organisation of a permanently occupied body of forest workers, and raising the level of efficiency in silviculture and forest improvement work by mechanisation of the various operational stages.

In brief, the Ministry of Forest Management and the agencies subordinate to it were to handle forest management in general (silviculture, forest protection, etc.) over the whole territory of the U.S.S.R. Further responsibilities of the new Ministry were the enforcement of forest regulation, the surveying of forest resources, the determination of the volume of the annual cut, finding felling areas for logging, applying regulations to loggers and haulers. In other words, the Ministry had taken over the role of a forest-owner who does not deal with logging operations. Stumpage appraisals and sales in the "usual capitalist manner" were introduced in 1949. The new schedule of fixed stumpage prices (*popennaya plata*) was put into effect, to be adhered to by all logging operators in State and *kolkhoz* forests. Stumpage sales on the basis of fixed stumpage prices had been in use in Czarist Russia since the beginning of the 19th century, as mentioned in a previous chapter, and the same system, in part, was used by the Soviets before the winding-up of the Forest Department (1930).

The central office of the Ministry was divided into several departments. Some of these may be mentioned:

Lesproyekt—for inventory by photogrammetry and aerovisual surveys, as well as forest regulation by ground survey methods. The

status of this department differs to some extent from that of the ordinary administrative department. Legally, it was the All-Union Association of Trusts for Photogrammetry and Forest Regulation (*Vsesoyuznoye obedinenie aerofotolesoustroitelnykh trestov*). These trusts worked on a self-accounting basis (*khozraschet*), and were actually contractor enterprises for forest surveys and for a variety of planning work.

Agrolesproyekt—for shelterbelt planting and afforestation of the steppes. This department also deals with forest influence research and planning in the semi-arid areas.

Glavlessempitomnik—for providing planting stock (tree seeds and transplants) for silvicultural work. The seed extraction and seed test control, as well as the nurseries all over the U.S.S.R. are under the supervision of this department. The seed control stations and the large nurseries are headed by directors.

In addition to the three departments mentioned above, there were several others dealing with timber management, silviculture, forest protection, education, research, personnel, etc.

The local administrative units were not organized in exactly the same way as those in Czarist Russia which persisted until the abolition of the independent forest administration in 1930. According to Soviet authorities (Voronin *et. al.*, 1960, pp. 38—39), the old system was “linear” (*lineynoye upravlenie*) while the new system was “production-territorial” (*proizvodstvenno-territorialnoye upravlenie*). The most important difference between the old and the new systems is that in the new administrative structure there exists an intermediate level of authority under the Ministry, called *leskhoz* (abbreviation of *lesnoye khozyaistvo*), headed by a director, who is assisted by a number of specialists.

The next administrative unit is a forest district (*lesnichestvo*), under a forest supervisor (*lesnichy*). The responsibilities of a forest supervisor in Soviet Russia are not exactly the same as they were in Czarist Russia. He is not an independent forest manager, but merely a subordinate who receives directives from his chief, the director of the *leskhoz*.

In the Ministry of Forest Management, at the time of its establishment, the total number of *leskhoz*y was estimated at 2,000 and that of forest districts at 8,000 (*Selskokhozyaistvennaya entsiklopedia III*, 1953, p. 49) but some years later it was reported (Kovalin, 1959, p. 9), that the total number of *leskhoz*y was 2,129 and that of the forest districts 9,624, in the whole country.

The forest districts, in their turn, are divided into forest ranger dis-

tricts (*obyezd*) and beats (*obkhod*) under forest rangers (*obyezdchik*) and forest guards (*lesnik*). These subdivisions are almost exactly the same as those in Czarist Russia.

In 1948, the number of forest employees with special forestry training totalled 15,800. In 1953, the number of specialists with higher education or medium training was 23,000. At the same time, 8,000 persons without any special training in forestry were employed in forest administration, including 700 directors of the *leskhozy* (*L.Kh.*, 1953, 10, p. 4). In 1954, the total number of forestry specialists with professional training (*spetsialisty-lesovody*) was reported to be 30,000 (*L.Kh.*, 1955, 1, p. 6), which had grown to 45,000 by 1959 (Kovalin, 1959, p. 9). There is no evidence how such a great increase in the number of specialists, in this case mostly silviculturists, was brought about in so short a time. The only possible explanation is (if this is true) that many specialists have been insufficiently trained. This might be concluded from numerous items in Soviet forestry literature. Apart from this, we must take into consideration the report that foresters with higher education were continually leaving the forest service and preferred to work elsewhere, where the living conditions were somewhat better (*L.Kh.*, 1953, 1, p. 13).

The size of the various administrative units mentioned above varies with the geographical locality and accessibility of the forest areas. The local demand for forest products and the intensity of forest management are also factors of importance, at least in theory, in the areas where there are old agricultural settlements.

However, this division is generally considered unsatisfactory, as the duties of the employees are said to be distributed unjustly. Judging from what is written in the Soviet forestry journals, the greatest dissatisfaction is caused by the fact that the composition of the personnel is similar on all *leskhozy*, irrespective of the amount and nature of work to be done (*L.Kh.*, 1953, 12, p. 71). For instance in the Krasnoyarsk district, Siberia, the average size of the *leskhozy* was 6—8 million hectares, and that of the forest districts 2.5—3 million hectares (*L.Kh.*, 1954, 2, p. 27). On the other hand, in the Ukraine the average size of the *leskhozy* was roughly 22,000 hectares, and of the forest districts roughly 5,000—6,000 hectares. On some *leskhozy* the annual cut totals several hundred thousand cubic metres. This has to be marked, valued and prepared for sale. On the other hand, there are *leskhozy* which do not sell timber at all, simply because they have no timber stocks at their disposal.

3.2.4 Reorganisations after the Decentralisation of the Planning System

The system of vertical business administration prevailed more and more as the industrialisation of the country proceeded. The flow of operational orders to basic enterprises was organised by industrial sectors, grouped as people's commissariats (ministries) at Government level. The People's Commissariat for Forests and Timber Industry (*Narkomles*), was established in 1932, as was mentioned previously. In 1948, there were two independent central administration bodies in the sector of forestry: (1) the All-Union Ministry of Forest Industry, and (2) the All-Union Ministry of Forest Management. This situation lasted until Stalin's death.

One of the first steps after the formation of Malenkov's cabinet (March 1953) was the abolition of the independent Ministry of Forest Management; all its functions were taken over by the Ministry of Agriculture.

There is no need to trace the details of the numerous changes in the administrative setting. It is only important to point out that the central administration of forest management as an independent agency at Government level was not long-lived.

However, during its short existence it succeeded in making a number of essential improvements in forest management and forest policy. The period might be described as a "renaissance of forestry", mainly characterised by a return to the old and well-tried methods of Czarist Russia. It is true that the Head of the Ministry of Forest Management must be seen essentially as a senior business executive with a technical background. He is not a politician as the term is used in the democratic world, but a policy-maker in the Soviet sense. As a specialist and representative of forestry as a distinctive economic sector, a Minister can influence the general policies in his own field much more than can a civil servant ranking below the other policy-makers. Forestry lost its foremost support when the Ministry of Forest Management was abolished. The consequences were obvious—the interests of sound forestry practice were again pushed into the background in the controversy between silviculturists and logging managers. It seems that the latter had re-established their decisive power in the essential questions of timber allotment for cutting.

There is no doubt that now, as also in the early 1930s, one of the most important causes of the split between forest management and timber industry lies in the sharply controversial issues between forest employees who serve the long-term goal of forest conservation, and

those who, in a logging enterprise, have to fulfil and overfulfil the immediate production targets. In a combined administration under the same "roof", the logging managers usually have their way at the expense of silvicultural considerations.

On the other hand, however, the existence of a large number of industrial ministries, each controlling its own enterprises on a national level, placed a heavy burden on the co-ordinating function. The body which carried out the co-ordination work was, in fact, the *Gosplan*, but officially it had no powers to order a ministry to do anything. The situation was changed by the reorganisation of the *Gosplan* in 1956, and by the establishment of the State Economic Commission (*Gosekonomkomissia*). This agency, which was in charge of current planning, was simultaneously given powers over virtually all the industrial ministries. Even the Ministry of Agriculture, which included the Central Administration of Forest Management and Shelterbelt Planting (*Glavnoye upravlenie lesnovo khozyaistva i polezashchitnovo lesorazvedenia*), was put under the control of the *Gosekonomkomissia*. In 1957 came another major reorganisation, when Khrushchev ordered the complete abolition of the *Gosekonomkomissia* and of most of the other industrial ministries.¹

The new administrative arrangement of 1957 was based on the territorial principle. The country was divided first into 103 regional economic councils (*Sovet narodnovo khozyaistva*), the boundaries of which were mostly co-extensive with those of existing administrative districts (Nove, 1961, p. 69). The number of *sovnarkhozy* was gradually reduced, and in February, 1963, there were 47 *sovnarkhozy* (Fischer, O.W., 1963, 3—4, p. 199). The *sovnarkhoz* became responsible in practice for forest management and forest industries within its area.

The internal organisation of these councils varied greatly from region to region, depending on the natural conditions and industrial development of each particular area. In the timber-surplus regions, as a rule, *sovnarkhozy* have special departments for the different branches of forestry and wood processing.

Within the Economic Council of the Volga-Vyatka, to take an example, there are four departments in the timber sector, namely (*E.G.* 18 January 1964, p. 31):

¹ Under the administrative reform in October 1965 the system of industrial ministries in the forestry sector was reinforced. There were established a Ministry for Forest, Pulp, Paper and Woodworking Industries of the USSR (*Ministerstro lesnoy, tsellyulosnobumazhnoy i derevoobrabatывayushchey promyshlennosti SSSR*) and a Ministry for Forest Management of the RSFSR (*Ministerstro lesnovo khozyaistva RSFSR*). The functions of forest management and functions of logging operations were separated on the lower administrative levels, too.

1. Administration for Forest Industry and Forest Management (*Upravlenie lesnoy promyshlennosti i lesnovo khozyaistva*);

2. Administration for Woodworking and Furniture Industry (*Upravlenie derevoobrabatывayushchey i mebelnoy promyshlennosti*) for the city of Gorky;

3. Administration for Woodworking and Furniture Industry (*Upravlenie derevoobrabatывayushchey i mebelnoy promyshlennosti*) for the district of Kirov;

4. Administration for Pulp, Paper and Wood-Chemical Industry.

The *sovnarkhoz* reform of 1957 had far-reaching consequences for the forest administration. In fact, it diminished the size of the central administrative body, which had the responsibility for all forests in the U.S.S.R., and could co-ordinate activities in the *sovnarkhozy*.

Within the Ministry of Agriculture there was still a Department of Forests and Shelterbelts (*Glavnaya inspektsia po lesnomu khozyaistvu i polezashchitnomu lesorazvedeniю*), which had authority in all forests, but its duties were mainly supervisory.

To cope with this abnormal situation, in which each *sovnarkhoz* worked independently in matters concerning its forests, a common administration for both forest management and forest industry (*Glavleskhoz RSFSR*) was established in the Russian SFSR in 1959. This administrative reorganisation led to an amalgamation of *lespromkhozy* and *leskhozy* in integrated enterprises (*kompleksnoye predpriatie*), which were not only to carry out logging operations, but also see to it that the cut-over areas were reforested. The management of these enterprises was entrusted to the *sovnarkhozy* in the districts rich in forests, while the *Glavleskhoz RSFSR* managed them directly in areas poor in forests.

The amalgamation of forest management and logging operations under a common administration was carried out in all the constituent republics, with the exception of Estonia, Belorussia and Georgia (Perepechin—Filinov, 1964, p. 5).

In 1961, a new reorganisation was carried out, and the supreme forestry leadership was transferred from the Ministry of Agriculture of the U.S.S.R. to the *Gosplan* of the U.S.S.R., and renamed the Division of Forest Management (*Otdel lesnovo khozyaistva Gosplana SSSR*). The main duties of the Division were as follows (Bovin, *L. Kh.*, 1961, 9, p. 4):

1. The compilation of plans (*proyekt planov*) for the development of forest management and for the increase of forest productivity, as well as the control of their fulfilment.

2. The compilation of basic instructions and regulations for forestry practice.

3. The carrying-out of forest inventories, and on the basis of these the determining of the allowable annual cut in the Forest Fund.

4. The compilation of plans for the assignment of cutting areas to logging enterprises.

This list does not indicate that the supreme body in question had anything to do with the co-ordination of forest management and logging, although integration between these two activities had already come about at a lower enterprise level, as pointed out above. However, integration at top level was soon carried out. In 1962, a State Committee for the Forest, Pulp, Paper and Woodworking Industries and Forest Management was established at the Council of Ministers (*Gosudarstvenny komitet Soveta Ministrov SSSR po lesnoy, tsellyulozno-bumazhnoy, derevoobrabatывayushchey promyshlennosti i lesnomu khozyaistvu*). This central administration also took over all experimental and planning organisations in the field of forest management. Policy-making in the whole forestry sector, as well as the control of activities, was thus co-ordinated in one government body.

In 1963, this top organisation for forest management and forest industries was subordinated to the State Planning Commission (*Gosplan*) of the U.S.S.R. (Perepechin—Filinov, 1964, p. 6). It should be added that the "complete forestry planning" by the top organisation is subordinate to the "industrial grouping" (*otraslevaya gruppa promyshlennosti*) and is, therefore, not independent (editorial in *Pl. Kh.*, 1963, 4, p. 9). The situation shows also the actual position of the *Gosplan* under Khrushchev.

Planning has remained the central task of the administration, and the whole administrative apparatus has been designed to facilitate planning and the control of plan fulfilment. It is important to bear this in mind in any further analysis of the Soviet system and its consequences in forestry.

3.2.5 Assignment of Cutting Areas

In 1930, the local timber enterprises (2,000 in number) and the administrative agencies of forest management (forest districts, totalling about 2,500) were merged into industrial forest enterprises (*lespromkhoz*), and subordinated to one central administration (*Lesprom*) which embraced all branches of forestry; the purpose of this was to centralise and co-ordinate completely all phases of wood production.

Table 2—3. Timber Resources Allotted to Logging Operators, 1947—1962

Year	Number of assigned cutting areas	Area <i>thousand hectares</i>	Marketable timber volume	Annual cut	
				total	as <i>percentage</i> of total marketable timber volume
			<i>million cubic metres</i>		
1947	181	—	325	21	6
1950	1,279	63,269	4,269	210	5
1955	2,034	116,060	7,539	358	5
1959	2,343	135,733	10,255	395	4
1962	2,252	132,260	10,052	396	4

Source: Perepechin-Filinov *Lesopolzovanie v SSSR 1946—1962 gg.*, Moscow, 1964, p. 66.

The part of the first Five-Year Plan which concerned wood production failed dismally, and the requirements for construction and industrial roundwood could not be satisfied. Consequently, the Soviet Government was soon obliged to amend its initial programme and to permit those commissariats and Soviet enterprises which were in the most urgent need of wood products to start logging operations to satisfy their own needs. During World War II there was a considerable increase in the number of enterprises which themselves procured the wood products they needed. However, many of these enterprises caused extensive disorder in some forest regions. The main reasons for this were the competition between the various logging operators and their snatching of better logging areas from one another.

In order to avoid too frequent a migration of the logging operators, certain forest areas have recently been assigned to individual enterprises for logging; only these enterprises are entitled to exploit the timber stock in question. This system has similarities with the timber-leasing or licensing system applied in Canada and with the forest concessions of the past. The difference is that in the U.S.S.R. the assigned cutting areas are allotted for a shorter period, 15—30 years on an average, and the higher administrative agencies can cancel the concession at any time. The volume of the annual cut in such a timber raw-material source is from 100,000 to 300,000 cubic metres on an average (*L. Kh.*, 1954, 2, p. 6).

Table 2—3 shows the standing timber stock allotted to separate logging operators for long-term utilisation, as held by these operators during the period 1947—1962.

The above table shows that the number of raw-material sources in-

Table 2—4. Distribution of Timber Resources among the Various Logging Agencies, 1962

Logging operators	Number of assigned cutting areas	Marketable timber volume	Prescribed annual cut
		<i>million cubic metres</i>	
Total assignment of timber resources	2,252	10,052	396
Assigned to			
1. Regional Economic Councils (<i>Sovnarkhozy</i>).....	1,494	9,020	338
2. Central Administration of Forest Management in the Russian SFSR (<i>Glavleskhoz</i>)	96	148	10
3. Ministries of constituent republics, All-Union ministries and other agencies	263	362	20
4. Local organisations.....	399	522	28

Source: Perepechin-Filinov *Lesopolzovanie v SSSR 1947—1962 gg.*, Moscow, 1964, p. 67.

creased continuously until 1959. Actually, the increase slowed down in 1957, and afterwards there was a decrease to a certain extent. At the beginning of the period in question the agency granting these timber stocks as raw-material resources was the Ministry of Forest Management, and later the Central Administration of Forest Management and Shelterbelt Planting, subordinate to the Ministry of Agriculture; most recently, until 1963, the Department of Forest Management in the State Planning Commission of the U.S.S.R. has made the allocations.

The agencies receiving the concessions were, at the beginning of the period, the Ministry of Timber Industry, the Divisions of Wood Procurement in several other ministries and a number of "self-procurement agencies" (*samozagotovitely*). One of the purposes of the reorganisation of industrial administration in 1957 was to merge all logging enterprises which were subordinate to enterprises and agencies not connected with forestry, with *lespromkhozy* operated by the *sov-narkhozy*. This measure was regarded as one of the greatest advantages of the general reorganisation of the administrative apparatus, the main object of which was, as pointed out above, a decentralisation of the administrative system.

As a result of this reform, most logging operators were subordinated to the Regional Economic Councils (*sov-narkhozy*). Some of them were also merged with the existing *lespromkhozy*. However, these mergers were not carried out consistently and the "self-procurement agencies" are still responsible for a great part of the logging operations. The

system of self-supplying enterprises, which as a rule do not consume all timber, but only those categories of it which they themselves need, causes considerable losses to the economy, according to Soviet sources (Zheludkov, *Pl. Kh.*, 1964, 8). Reportedly, production costs or the self-cost of a cubic metre of timber in these agencies is two to three times higher than that in the neighbouring *lespromkhozy*. It might be added that the timber produced and consumed by the agencies, which amounts to about 50 million cubic metres a year, is not included in the general production plan. Thus the State planning covers, in fact only 75—80 per cent of the total timber output (Sprintsyn, *L. P.*, 1964, 2).

Table 2—4 gives an outline of the central administrative agencies, which in 1962 were dealing with logging operations in the forests assigned to them for exploitation.

The ministries and other agencies under (3) above include the Ministry of Communications (52 assigned cutting areas), the Committee for Transport Buildings in the U.S.S.R. (39 assigned cutting areas), and other All-Union Ministries (81 assigned cutting areas).

Enterprises which have resource bases of their own include pulp and paper combines. According to a regulation issued by the Economic Soviet of the Council of People's Commissars of the U.S.S.R. (*Ekonomichesky Sovet pri SNK SSSR*) in 1940, the bigger industrial enterprises were entitled to resource bases of their own. For instance, the Balakhna Kombinat was assigned its own cutting area of about four million hectares. Somewhat smaller resource bases were assigned to the Mari, Kondopaga, Novo-Lyalya and certain other combines.

This assignment policy was continued in 1962, despite criticism.

It has been suggested that instead of huge forest areas (at times more than a million hectares), which the pulp enterprises have been holding as their resource bases, their raw material could be supplied by "specialised units" (*spetsializirovannye khozyaistva*) which are smaller, scattered over a wider area, and produce only pulpwood in suitable dimensions (Perepechin—Filinov, 1964, pp. 69—71). Thus the use of valuable sawlogs as pulpwood could be avoided.

3.3 Forest Management Zones and Cutting Practices

3.3.1 Subdivision of Forests according to Management Goals

The prerequisite of an organised forest management is the need for forest products. If forest products cannot be marketed locally, and if it is technically impossible to sell them in the world market, then it

is impossible to introduce any kind of forest management system, with the exception of fire-protection measures. Such "non-operated areas" must first be opened up for the use of timber products. Active timber management can be introduced as the next stage after the construction of roads which make the forests accessible, and after the elimination of other economic obstacles to logging operations.

As a matter of fact, the major part of the forest land in Russia is not being exploited for timber products. Vast areas of virgin forest in remote parts of Siberia and in the European North are still technically and economically inaccessible, and consequently these lands cannot be put under a form of management which could be described as organised forestry. This can be applied only to accessible forest areas, classified as commercial forests, which comprise the minor part of the forest land in Russia. The border-line between these two categories—the "forests in use" and the "non-operated forests"—cannot be established with any certainty on the spot; it is merely a fiction, and one which is constantly being changed by the opening-up of new virgin forests for logging operations. However, for describing conditions in Russia this division is of some importance, because in this manner we can acquire a clearer picture of the prerequisites which dictate the system of forest management and its intensity.

As was mentioned before, according to the Forest Decree of 1931, all forests in Russia were divided into two zones: (1) forests of industrial significance (*lesa promyshlennovo znachenia*) and (2) forests of silvicultural significance (*lesa lesokulturnovo znachenia*).

The forests of the first-named group were supposed to supply the national economy with timber products, and unrestricted cuttings were allowed for that purpose. No other consideration, such as the influence of forests on climate and water behaviour, reproduction of cut-over areas, etc., was permitted to interfere with the procurement of timber for the industrialisation of the country from this zone.

In the silvicultural zone, certain special cutting restrictions were introduced. Logging was completely stopped, with the exception of the felling of dead and injured trees, within a zone one kilometre broad on both banks of the Volga, Don, Dniepr and Ural in their lower and middle reaches. Concentrated fellings, i.e. widespread clear-cuttings, were not permitted in the silvicultural zone. According to the regulations, the quantity of the annual cut was not to exceed the annual increment of wood in this area (Motovilov, *T.I.L.*, 1953, p. 53).

The law of 2 July 1936 extended the cutting restrictions in southern and central Russia to an area of 75 million hectares, and the former

silvicultural zone was renamed the "watershed protection zone" (*vodo-okhrannaya zona*). The law forbade clear-cutting within a zone up to 20 kilometres wide on both banks of the Volga, Don, Dniepr, Ural and other designated rivers in European Russia. In the immediate neighbourhood of the rivers, this zone mainly comprised the protection forests, which totalled about 15 million hectares. The forest land outside this protected forest belt was called "the logging area of the watershed protection zone", and clear-fellings were permitted there. In the watershed protection zone, particular attention was paid to the thinnings and improvement cuttings. Furthermore, it was demanded more emphatically than before that the annual cut should not exceed the increment, which was estimated at approximately 2.3 cubic metres per hectare, an average accepted for the whole watershed protection zone.

It was expected that this new watershed protection law would be decisive in its effects on the timber industry. Theoretically, the annual cut in Ukraine would be reduced to one-third of its former volume. However, despite these restrictions the forests in the watershed protection zone still played an important part in supplying the U.S.S.R. with timber. These forests comprised only 8 per cent of the total forest area, but timber supplied by them amounted to more than 50 per cent of the total timber consumption of the country (Vasiliev, 1948).

A new division of forest areas into management categories took place in 1943, and three new groupings were established as follows (Motovilov, *T.I.L.*, 1953, p. 54):

Group I: All national reserved parks, forests protecting soils, field protection forests, and forests around the resorts, cities and industries that belonged to the "green forest zone", also forest strips in western Siberia (*lentochnye bory*) and small ranges of forests in the steppes (*kolki*), protection forests along railways, highways, rivers and around lakes, protection forests bordering the tundra, etc.

Group II: All forests in the southern, south-western, south-eastern, and central portions of the U.S.S.R. as well as in other sparsely forested regions.

Group III: Forests in other regions of the U.S.S.R.

This division does not show directly the differences of management intensity, based on the relationship between revenue and expenditure, or in other words the operating profit per unit area. The above-mentioned division into three groupings represents the arbitrarily-dictated or intended status of forest management in different geographical regions.

Table 2—5. Forest Area and Standing Timber, by Management Groups, in the U.S.S.R. 1961

Groups of Forests	Area			Growing stock		
	Total area of the Forest Fund	Forested area	Percentage distribution of forested area	Total volume	Volume of mature timber	Percentage distribution of mature timber
	<i>million hectares</i>					
Group I.....	170.12	87.96	12.8	8.93	5.46	9.6
Group II.....	86.55	55.79	8.1	4.60	1.85	3.2
Group III.....	919.12	543.03	79.1	62.81	49.62	87.2
Total	1,175.79	686.78	100.0	76.34	56.93	100.0

Source: Ponomarev, A. D. "Lesnoy Fond SSSR", *Lesnoye Khozyaistvo*, 1963, 6, p. 51.

According to the Instructions, the cutting system and forest management in general were to be different in the three groups of forests.

The areas of the forests of these three groups, for 1 January 1961, are given in Table 2—5.

The area in the three groups is not fixed for a long period, and in fact almost continuous transfers take place from one group to another. These changes, which have some bearing on the intensity of forestry practice, show how the intensification of forest management is gradually progressing.

It should be added, however, that the division of forests into these three groups has been severely criticised by Soviet forest experts. One of the most prominent critics, Perepechin (*L. Kh.*, 1964, 1, p. 25) says in this connection, "The existing division of forests into different groups has grown obsolete and now constitutes an obstacle to development of forest management and utilisation of timber. It is time to re-examine this division, proceeding from new scientific achievements in hydrology, biology and economics." However, a number of scientists want to retain the division, and in their turn have criticised Perepechin's arguments and ideas. Following the discussion, the Central Board of the Scientific-Technical Society for Forest Industry and Forest Management (*Nauchno-tekhnicheskoe obshchestvo lesnoy promyshlennosti i lesnovo khozyaistva*) proposed at its meeting in March 1964 that the principles of the division should be re-examined and possibly amended (*L. Kh.*, 1964, 6, p. 8). It is not known at the moment whether this proposal will be carried out. As this division is at present being applied over the whole country, a more detailed description of cutting practices in different groups of forests should be of some interest.

Table 2—6. Distribution of Group I Forests in the RSFSR, 1961

Regions	Green belts	Field protection, soil protection and recreation forests	Highway, railway, river and watershed protection forests	Nut cropping forests	Forest belt bordering the tundra	Non-specified forests	Total
European North	2,196	43	5,443	—	16,104	20	23,806
Ural	2,399	965	4,452	328	8,209	37	16,390
Western Siberia	669	1,692	1,558	875	—	151	4,945
Eastern Siberia	983	603	13,648	4,830	42,137	135	62,336
Central Russia .	3,188	2,907	5,760	—	—	169	12,024
Far East	1,242	17	23,846	201	6,170	502	31,978
Total	10,677	6,227	54,707	6,234	72,620	1,014	151,479

Sources: (1) Lesnoy Fond RSFSR, *Statistichesky sbornik*. Moscow, 1962, p. 25.

(2) Perepechin-Filinov *Lesopolzovanie v SSSR 1946—1962 gg.*, Moscow, 1964, p. 24.

3.3.2 Management of Group I Forests

These forests have been segregated from the other national forests on the basis of their protection value or other special purposes. It has been emphasised that the protection function must always prevail over the production function in the management of these forest lands. Consequently, the primary management goal is protection, and the cutting of timber is permissible only when it will not prejudice the protection function of the forests. In the dry regions, the influence of forests on climate and water behaviour is considered to be of greater importance than the utilisation of wood products, and this concept has acted as a guide to all kinds of forestry activities.

According to Nesterov (1954, p. 385), the total area of these forests was originally 60 million hectares, while Eitingen (1953, p. 400) estimated it at 66 million hectares. On the other hand, Kovalin (1959, p. 8) estimates the total area of Group I forests at 30.5 million hectares, of which only 24.7 million hectares are forested. The total area of Group I forests was to comprise about 12 million hectares of mature and over-mature forests, with an estimated growing stock of 1,768 million cubic metres (*L. Kh.*, 1953, 11, p. 17).

The total area of the forests in Group I on 1 January 1961 was estimated at 170 million hectares, of which 152 million hectares were in the Russian SFSR (Perepechin—Filinov, 1964, p. 24). The area of mature and over-mature forests comprised 49 million hectares in the U.S.S.R., with a growing stock of 4,739 million cubic metres (p. 35).

The distribution of these forests in the Russian SFSR by special purposes is shown in Table 2—6.

One of the most important activities in the Group I forests has been **shelterbelt planting**, the purpose of which has been the creation of soil surface protection (*pochvozachitnie*) and field protection (*polezачitnie*) forests. Under the Soviet Government the planting of forest strips on a large scale in the steppes was begun in 1931. In accordance with “the decree of the Council of People’s Commissars of the U.S.S.R. on the reorganisation of forest economy”, 31 July 1931, the fundamental problems were designated as the combating of drought, the attainment of increased agricultural productivity by means of protective shelterbelts, the protection of farmland against the destructive processes of sheet and gully erosion, and the fixation of areas subject to such damage.

On 28 October 1948, the Central Government of the U.S.S.R. issued a decree outlining a huge project in this field of activities. In reality, it was nothing more or less than the old steppe afforestation plan of Czarist Russia, discarded in the 19th century, but now revised and rejuvenated. However, the whole plan had been slightly changed and was much more extensive.

The detailed forest planting project called for the planting of shelterbelts and other forests for soil-conservation purposes, amounting to some six million hectares during the period from 1949 to 1965. The programme of afforestation was to be carried out on an area stretching from the Urals to the River Dniestr, and from the River Oka in Central Russia to the Black Sea. It included practically all the forest steppe and steppe zones, which are the main agricultural region of European Russia and the one most densely populated. This large undertaking is not yet completed; although it seems that there are some deviations from the original plans, the plan-fulfilment work has undoubtedly been successful.

In 1959, a **forest belt bordering the tundra** (*zapretnie pritundrovie polosy*) was segregated from the commercial forests in Group III and attached to Group I as protection forests. The width of the forest belt is almost 100 kilometres, and its total area, as shown in table 2—6, is 72.6 million hectares (Perepechin—Filinov, 1964, p. 25). The background to this important measure is that after concentrated logging operations it is extremely difficult to reforest large-scale clear-felled areas near the arctic forest limit; as a rule, they become tundra. The same transition is evident near the southern forest boundary, where the transition of forests to steppe or desert is accomplished very

easily. The obvious purpose behind the creation of protection forests in the northern regions is the prevention of the transition from forest to tundra; therefore, this measure must be considered to be of great importance.

Green belts (*zelenie zony, gorodskie i poselkovie lesa*) around the cities and industries are established for recreation purposes. These are important for public health and for providing opportunities for camping. On 1 January 1951, there were such forests in the neighbourhood of 725 towns and industrial centres and near 900 other settlements. Their total area was estimated at 8.6 million hectares at that time (Nesterov, 1954, p. 388); but on 1 January 1961, the total area was estimated at 10.7 million hectares, as may be seen from Table 2—6.

Highway and railway protection forests (*pridorozhnie lesa*) have the purpose of protecting these traffic arteries from snow, and in the desert and steppe zones from drifting sand. River or watershed protection forests (*vodookhrannie lesa*) are primarily to regulate water flow, and to avoid the silting of watercourses. These forests are found in the basins of almost all the more important rivers in European and Asiatic Russia, and their total area is about 20 million hectares (Nesterov, 1954, p. 380).

The purpose of national reserved parks (*zapovedniki*) is to protect and to preserve particularly valuable vegetation and animals. The total number of national parks in the U.S.S.R. amounted to 81 in 1960 (Motovilov, 1960, p. 470). These reservations are scattered all over Russia. The more important national reservation areas are Pechora-Ilych, the Altay Mountains, Askania Nova, Kisyl-Agach, the Caucasus Mountain, Kondo-Sosvensk, Sikhote-Alin and Bialovezhskaya Pushcha. Their total area was estimated at 10.5 million hectares (Nesterov, 1954, p. 389).

In Group I are included also forests of special value (*tsennie lesa*), which are mainly in the steppe and forest-steppe regions. These forests have been planted to a considerable extent and have long been used as experimental and demonstration forests for the afforestation of steppes and shelterbelt planting. Among them should be mentioned the Shipov and Tellerman forests (province of Voronezh), the Shatilov forest (province of Orlov), the Chenny forest (province of Kherson), the Tulske Zaseki and Buzuluk Bor (province of Kuibyshev) and the Veliko-Anadol forest. The total area of these forests was estimated at 3.7 million hectares (Eitingen, 1953, p. 401).

According to the original regulation, only thinnings, improvement and salvage cuttings were normally permitted in all these forests.

Later (from 1952), regeneration cuttings were permitted (*lesovostanovitelnie rubki*) to a limited extent, mainly group-selection cuttings which were to deal with the large volume of over-mature timber stock (Nesterov, 1954, p. 562; Kovalin, 1959, p. 25).

The annual volume of regeneration cuttings totalled 1.5 million cubic metres in 1953 (*L. Kh.*, 1955, 3, p. 29), but was increased to 13 million in 1962 (Perepechin—Filinov, 1964, p. 34). Such an increase in the cutting amount shows that the management of these forests has diverged radically from the original intentions. Further changes leading to increased cutting have been proposed by several forest authorities (*L. Kh.*, 1963, 6, p. 4; *L. Kh.*, 1964, 6, p. 8), and it seems that in the future the production function of these forests will be regarded as being as important as the protection function, which was originally to be their only one. But it seems quite clear that these two functions can conflict with each other; and the change cannot be in conformity with the Law on Preservation of Nature in the Russian SFSR (*Zakon ob okhrane prirody v RSFSR*), promulgated on 10 October 1960. An authority in this field, Dekatov (*L. Kh.*, 1962, 8, p. 22), writes:

“It is necessary to change and rationalise the cutting practice in the Group I forests. As from 1954, regeneration fellings are being carried out here, most of which are clear-felling and are not at all in accordance with the purposes (water regulation, water protection, soil protection, climate protection and sanitary purposes) for which these forests were designed. Under the Nature Protection Law all kinds of cuttings, with the exception of thinnings, are prohibited in forest preserves, water-regulation and water-protection forests.”

The quotation hardly requires comment. We have here a typical example of how a law is simply ignored, if circumstances so demand.

3.3.3 Management of Group II Forests

These forests are mainly in the mixed forest zone of European Russia, and partly also in the settled areas of the northern coniferous zone. The forests of the old agricultural areas, which are not included in Group I, thus constitute the major part of Group II. The total area of this forest group amounted to 80 million hectares according to Nesterov (1954, p. 386), and to 83 million hectares according to Eitingen (1953, p. 410). On 1 January 1961, the total area was estimated (cf. Table 2—5) at 87 million hectares, of which only 56 million hectares are actually forested. Approximately 77 million hectares are classified as forests in use (Perepechin—Filinov, 1964, p. 10).

According to the Instructions, these forests have to be managed in such a way that the annual cut does not exceed the increment. This means that the usual methods of forest regulation and working plan management must be applied here if this goal is to be reached. As was pointed out earlier, the basic tasks are the collection of material on the basis of which the allowable cut can be established, and the direction of the cutting practice. This offers nothing new in the general approach to forest regulation, compared with the situation before the revolution, with the exception that techniques have changed, and that a number of new methods of cruising and forest survey have been developed. The fact that the formal working plan (*lesoustroitelny plan*) is now called an "organisation-management plan" (*organizatsionno-khozyaistvenny plan*) is irrelevant.

One of the most important parts of a working plan is the calculation of the allowable cut. As a rule, only the final or regeneration cut is fixed by area and volume in a working plan. The amount of intermediate cut—thinnings and salvage cuttings—is not regulated in detail. In general, it can be said that the amount of all kinds of intermediate fellings plays a relatively negligible role in the cutting budget of the U.S.S.R., and that for this reason the concept of allowable cut comprises only final cut, i.e. clear-fellings and partial fellings for the purpose of regeneration, but not intermediate cut, which is undertaken with the purpose of improving the existing forest stands. The cutting system prescribed by the organisation-management plan in the Group II forests does not differ much from that in old Russia in this respect.

The motive for thinnings and other improvement cuttings, according to some authorities (Vasiliev—Nevzorov, 1948) is not always silvicultural considerations. Such cuttings are undertaken partly for the purpose of meeting the need for timber, especially in timber-deficit regions. There are many examples in Soviet forestry literature of cases in which thinnings and other intermediate cuttings were ostensibly carried out but where in fact a kind of selective logging has been applied and the best trees have been removed (*L. Kh.*, 1953, 12, p. 7). In some other cases, felling and removal of the marked trees were carried out so carelessly that most of the remaining trees were seriously damaged. When wind, snow and insects did their part, the result was the complete devastation of these stands.

The proposed annual cutting budget in a working plan is not binding to the local forest executives, however. It merely consists of material for the planning bodies, which definitely fix the actual timber volume which is felled each year.

There is evidence that the timber drain, i.e. the volume taken by cutting, has considerably exceeded the allowable cut in some regions (Ponomarev *et al.*, *L. Kh.*, 1958, 11, p. 4).

The actual cut exceeded the allowable cut in 1955 by approximately five per cent and in 1957 by 17 per cent. An important question in this connection is how the allowable cut is fixed and amended from time to time. That it is not a quantity which remains unchanged for ever should be self-evident, and this is borne out by available Soviet material. For example, in Belorussia the annual allowable cut was fixed at 4.1 million cubic metres in 1956, and decreased to 3.7 million cubic metres for the period 1961—1965. In the Ukraine, at the same time, the allowable cut was increased from 6.2 million to 7.0 million cubic metres per year (Ponomarev *et al.*, *L. Kh.*, 1958, 11, p. 9). A comparison between the allowable cut and the actual cut cannot, therefore, give us a correct picture of the real conditions of forest management. A comparison between the actual cut and the annual increment seems to be more to the point, but only if the distribution of stands by age classes is more or less normal. If we consider conditions in Belorussia, where only four per cent of the standing timber volume is classified as mature (Tribushevsky—Sazonova, *L. Kh.*, 1964, 6, p. 31), the allowable cut must be considerably below the mean annual increment. On the other hand, in the northern virgin forests, where the age-classes of mature and over-mature timber dominate, the allowable cut should exceed the annual increment, as a rule. For the U.S.S.R. as a whole, therefore, a comparison between the actual cut and the annual increment would also be almost useless.

Silvicultural practice prescribed by the working plans in the Group II forests, up to now, has been mostly clear-felling in strips, with a width of up to 200 metres for coniferous species, and up to 500 metres for deciduous species. However, in some cases, especially in forests which are assigned to logging operators, concentrated clear-fellings up to one kilometre in width are permitted.

Silvicultural practice as applied in the prescribed strip method of clear-felling requires that the felling of strips must be carried out, in theory, in such a manner that each successive cutting follows the previous cut only after regeneration is established on the last strip cut. This rule is not too often applied in practice; natural regeneration, of course, cannot be always successful in such cases. The most common result is a change of species, high-quality coniferous stands being replaced by less valuable deciduous species. It is a quite common experience, especially in spruce forests, that clear-felled areas regener-

ate naturally to aspen, birch and grey alder. The deciduous species are more frequently dominant in the next period of the rotation.

Natural regeneration of pine on clear-felled areas depends largely on the site conditions. One of the requirements for it is the presence of parent trees which can furnish seed, and for this reason scattered seed trees must be left in the cut-over areas, according to the cutting instructions of 1950. However, this regeneration of pine is not always satisfactory, and artificial methods must be resorted to, if permanent deforestation is to be avoided.

3.3.4 Management of Group III Forests

The vast forests of the northern *taiga* zone in Europe and Asia compose this group, the acreage of which constituted, in 1961, 70 per cent of the total area covered by forest in the U.S.S.R. (Ponomarev, *L. Kh.* 1963, 6, p. 51). In this region, known as the "industrial forest zone", removal cuttings have taken the form of unrestricted devastation of forests. Widespread clear-felling, which is applied so as to make mechanised logging operations easier, is common practice in the heavily forested northern regions. These removal cuttings can be considered largely only as approximate clear-fellings, because the different organisations which are entrusted with logging leave a considerable quantity of timber in the forests, either in the form of wood waste or in the form of non-utilised wood products. The trees of lower quality and smaller dimensions are usually left unfelled on logging areas. Thus the non-utilised timber constitutes from 10 to 40 per cent of the total potential volume (Nesterov, 1954, p. 526; *L. Kh.*, 1954, 6, p. 21 and p. 24; Kovalin, 1959, p. 18 and p. 22). The use of the term "clear-felling" as applied to this kind of cutting practice seems quite wrong. The term "heavy selective logging" would undoubtedly be more correct in this case. The reason why the cutting of entire stands and the removal of all individual tree species are not practised is that all the trees to be cut are not marketable in the northern taiga zone. Only the largest coniferous trees (which in comparison with those in other site and geographical conditions cannot be considered large and are not of best-quality timber), can be harvested in the poor growth conditions which prevail in these forests. Deciduous species, with the exception of match and plywood logs, have in general no market in the northern parts of the *taiga* zone. Despite this, the Soviet Government issued a decree at the end of 1954, which is called "Improvement of the

Utilisation of Timber Assigned for Cutting" (*Ob uluchenii ispolzovania lesosechnovo fonda*), and which lays down that between 1955—1957, the leaving of non-utilised wood uncut on logging areas, i.e. lower-quality coniferous trees and deciduous species, had to be reduced and from 1958 totally discontinued (*L. Kh.* 1955, 1, p. 4).

In order to achieve some kind of regeneration in the cut-over areas, the cutting instructions of 1950 (*Pravila rubok glavnovo polzovania v lesakh SSSR*) provide for a limitation of the clear-felled areas to one square kilometre or 1×2 kilometres, depending on the geographical locality and the prevailing forest types. Moreover, seed trees must be left, and the vigorous undergrowth should not be damaged by logging operations. These regulations are not usually followed.

The conditions for forest growth, and especially for regeneration, in the north are rather unfavourable in general, owing to the following factors: (1) the growing season is short; (2) lack of warmth; (3) permanently frozen subsoil; (4) an over-abundance of water; (5) the seed years occur at too long intervals, and the ripening of the coniferous seed is often prevented by weather conditions during the growing season; (6) an extremely slow rate of growth of the forest trees themselves.

Such unfavourable conditions for forest growth prevail in vast areas of the European North and Siberia. The greater part of the Siberian forests, where permanently frozen subsoil can be found comparatively far to the south (e.g. in the neighbourhood of Lake Baikal), must be classified as such forests. Conditions of growth there should be more or less similar to those which prevail in the forests of northern Sweden and Finland, and in the vicinity of the alpine or arctic forest limit. These last-mentioned forest areas in northern Sweden are considered to be economically sub-marginal from the standpoint of timber production on a sustained-yield basis. When utilisation of forest products at a profit is questionable in forests which, with regard to accessibility and marketing conditions, are in a relatively favourable position, this is applicable to the Russian circumpolar forest belt to a much greater extent. There, in the best cases, non-recurrent exploitation can be found (the so-called "timber mining" areas), where the logging of the virgin forest crop is technically possible under certain conditions, and perhaps even justified economically, but where the outlay for silviculture and management costs in general cannot be paid for from the stumpage value, because in most cases this is negative. In reality, these logging operations are carried out with great financial losses (*Izv.* 27 April 1951 and 24 March 1955). These areas thus constitute a

“submarginal economic site”, which of course precludes any permanent production of a forest crop on a sound economic basis.

However, this cannot be applied to all forests in the industrial forest zone. The forest growth conditions are quite satisfactory in the southern and middle *taiga*, where the logging operations are concentrated for the time being. No economic considerations should prevent these forests from being put under management according to the schemes and principles which have been laid down, at least theoretically, in the directives for forestry practice in the forests of Group II, which were treated in the previous section.

3.3.5 Management of Kolkhoz Forests

After the Communist *coup d'état* in October 1917 and the abolition of private ownership of all forest lands, the nationalised small forests, scattered and intermingled with agricultural land, were separated into a special category called “forests of local significance”.

Under the Forest Code of 1923, the forests of local significance were to be turned over for perpetual tenure, free of charge, to land societies (*zemelnoye obshchestvo*), agricultural artells (*selskokhozyaistvenny artel*) and various other associations of agricultural workers (*obyedinenie trudovykh zemlepolzovateley*). In the promotion of the collectivisation programme, and the development of collective farms (*kolkhozy*), part of these forests were assigned to the *kolkhozy* in 1930 as sources for timber supplies.

Consequently, the *kolkhoz* forests were primarily derived from former privately-owned small woodlands and peasant community holdings which were actually used by the peasants. They included further woodlands which had been transferred to the *kolkhozy* from the State Forest Fund in connection with the straightening of boundaries and the consolidation of holdings and, more particularly, with the elimination of peasant strip fields in the land tenure system. Artificially created shelterbelts and forests planted on sandy soil or in gullies for protection purposes were also turned over to the *kolkhozy*, and so was newly afforested land, in connection with the reorganisation of rural land use.

According to the official Soviet statistics (*Materialy po statistike lesnovo fonda SSSR, 1930*), in 1927, the total area of forests of local significance was estimated at 26 million hectares, 24 million hectares of which were actually covered with forest. This area does not include the forest land of the territories gained by the U.S.S.R. as a result of

Table 2—7. Distribution of Age Classes, by Regions, in Kolkhoz Forests, 1961

Main Economic Regions and countries	Forest area <i>thousand hectares</i>	Percentage distribution of forested area by age classes			
		Young stands (age classes I and II)	Stands of middle age	Stands approaching maturity	Mature stands
1. Regions of the RSFSR:					
1. European North...	6,152.8	29.3	37.2	14.3	19.2
2. Ural.....	4,144.6	27.3	27.9	20.2	24.6
3. Western Siberia....	4,235.4	28.6	27.5	18.3	25.6
4. Eastern Siberia....	7,843.5	19.9	20.7	17.4	42.0
5. Far East.....	1,373.0	25.0	15.5	10.0	49.5
6. Central Russia.....	6,137.8	56.4	22.1	12.2	9.3
Total RSFSR.....	29,887.1	31.9	26.2	16.0	25.9
7. Baltic area					
Estonia.....	369.2	48.7	30.2	14.6	6.5
Latvia.....	542.1	39.4	28.2	20.8	11.6
Lithuania.....	362.7	65.0	23.7	8.7	2.6
Kaliningrad (East Prussia)....	14.7				
Total.....	1,288.7	49.4	27.5	15.5	7.6
8. South-Western area					
Belorussia.....	1,594.8	73.3	18.4	6.4	1.9
Ukraine.....	2,165.4	75.6	15.4	6.2	2.8
Moldavia.....	21.8	85.7	9.5	3.2	1.6
Total.....	3,782.0	74.7	16.6	6.3	2.4
9. Transcaucasia					
Georgia.....	596.6	38.1	40.9	9.5	11.5
Armenia.....	48.0	46.3	32.4	10.8	10.5
Azerbaijan.....	177.7	38.3	39.8	11.4	10.5
Total.....	822.3	38.6	40.2	10.0	11.2
10. Soviet Central Asia					
Kazakhstan.....	357.8	43.8	15.8	10.2	30.2
Kirgizia.....	38.3	58.9	19.5	12.9	8.7
Turkmenia.....	26.9	28.4	36.4	19.3	15.9
Tadzhikistan.....	21.4	40.1	32.9	9.8	17.2
Uzbekistan.....	175.8	57.3	22.2	20.5	—
Total.....	620.2	47.8	19.3	13.7	19.2
Grand total for the U.S.S.R.	36,400.3	37.4	25.4	14.8	22.4

Sources: (1) Mukhin, A. Kolkhoznie lesa, *Lesnoye Khozyaistvo*, 1963, 6. p. 57.
(2) Lesnoy fond RSFSR, *Statistichesky sbornik*, Moscow, 1962

World War II. According to Matyuk (1939), the total area of local forests on 1 January 1937 was estimated at 51 million hectares.

The first comprehensive inventory of *kolkhoz* forests was carried out by 1 January 1956, to determine their condition. Before this, the forest statistics in the general land balance were approximate. Such information as volume of timber stock, composition of stands, growth

and other information necessary for the management of forest land remained unknown. However, such inventory data regarding *kolkhoz* forests have never been published officially.

The next inventory, in 1961, the details of which were published by Mukhin (*L. Kh.*, 1963, p. 6) gave a more complete picture of *kolkhoz* forests. The forests were described by area and volume according to the main commercial tree species and age classes. According to the inventory, the total area of *kolkhoz* forests amounted to 36.4 million hectares, or 2.9 per cent of the total forest area in the U.S.S.R.

The distribution of *kolkhoz* forests by main economic regions and their percentage of the total forest area are shown in Table 2—7.

More than half the *kolkhoz* forests are found in the European part of the U.S.S.R. The average forest area per *kolkhoz* varies from district to district. In the Black Earth Belt it is estimated at 138 hectares, in the European North at 2,977 hectares, in the Urals 1,462 hectares, in Western Siberia 3,006 hectares, and in the Far East 3,771 hectares (Mukhin, *L. Kh.*, 1963, 6, p. 57).

The distribution by forest management categories is as follows: 8.9 million hectares, or 20 per cent, belong to Group I forests, and 27.5 million hectares to Group II forests. Some 32.2 million hectares, or 88 per cent of the total forest area, are covered with forests, while the remainder comprises forest land not covered with forests, i.e. cut-over and burned-over areas and semi-permanent openings. Non-forest areas, i.e. non-productive and agricultural lands, are not included in the statistics on *kolkhoz* forests. The total volume of growing stock is, according to the 1961 inventory, estimated at 2,199 million cubic metres, 841 million cubic metres (38 %) of which is mature timber. According to the estimates, annual growth in *kolkhoz* forests totals 62 million cubic metres, 51.5 millions in the Russian SFSR.

As seen from the above table, *kolkhoz* forests constitute, on an average, 2.9 per cent of the total forest area in the U.S.S.R. This percentage varies greatly from region to region, depending on the general distribution of forest land and on varying natural and economic conditions. In the Ukraine, for example, the *kolkhoz* forests comprise almost 23 per cent of the total forest area; in the Far East the corresponding percentage is 0.5.

As regards the classification of stands by tree species, the *kolkhoz* forests differ from the forests under State administration. The distribution by dominant species is as follows: conifers 44.5 per cent, common deciduous species 47.9 per cent, and hardwoods 7.6 per cent.

The hardwoods—predominantly oak, ash and elm—are mostly found

in the forest steppe zone. Especially noteworthy is the fact that the deciduous species, such as birch and aspen, occupy almost half of the forest-covered area in *kolkhoz* forests, while they occupy only roughly 16 per cent in the State Forest Fund.

The age-class distribution in the main economic regions and countries, in percentage terms of the total forest-covered area, is also shown in Table 2—7.

It can be seen that in some regions, particularly in the western parts of the U.S.S.R., *kolkhoz* forests are predominantly composed of young stands, mature stands being almost non-existent. In the well-forested northern regions, and in Siberia, mature stands predominate.

The composition of forests by species and age-classes largely reflects the silvicultural practices of the past. Unsuitable cutting methods, and the absence of artificial reproduction, have resulted in a deterioration in the general growing conditions and the productivity of stands in *kolkhoz* forests. References to this unfortunate state of affairs abound in forestry literature, and several suggestions have been made for improving the conditions in *kolkhoz* forests (Mukhin, *L. Kh.*, 1961, 3; Ryabinin, *L. Kh.*, 1962, 3). It has been pointed out that the average timber stock per hectare of forested land in *kolkhoz* forests is 30—40 per cent lower than in the forests under State administration, despite the fact that the productive capacity of the soil in *kolkhoz* forests is frequently higher than it is in the State forests.

As the condition of forests is largely dependent on how their supervision is organised, let us examine what the State authorities have laid down in this respect.

According to the regulation of 2 March 1932, under the heading “Administrative Organisation of Forests of Local Significance” (*Ob organizatsii upravleniia lesami mestnovo znachenia*), the small scattered forests were merged into larger administrative units, and subordinated (*v isklyuchitelnoye vedenie*) to the local soviets (*selsovet*) and provincial executive committees (*raispolkom*).

By a decision of the Council of People’s Commissars, dated 4 April 1939, all forests of local significance were placed under the supervision of the Central Administration of Forest Protection and Silviculture, or *Glavlesookhrana* (Lopatin—Chirkin, 1940, p. 55). After World War II, formal control over the local or *kolkhoz* forests remained in the hands of *Glavlesookhrana* and its successors, at first the Ministry of Forest Management and later the Ministry of Agriculture. The direct supervision of these forests is the duty of the *leskhoz*y. However, the latter employ no special personnel for the purpose. In most cases

the *kolkhoz* also lacks forest technicians or guards with special training, although officially the *kolkhoz* should employ such specialists (*L. Kh.*, 1954, 9, p. 36).

The management of the *kolkhoz* forests, their legal status, and directives for wood utilisation in these forests are determined by the Regulations on *Kolkhoz* Forests (*Polozhenie o kolkhoznykh lesakh*), issued in 1948. Some of these rulings have been amended subsequently. On the whole, it is a rule that a *kolkhoz* member cannot use timber products for his own household free of charge, but must pay for them (reduced stumpage price, according to the valid stumpage price schedule in the adjacent State forests). Stumpage without payment is apportioned only to the collective household of the *kolkhoz* (*L. Kh.*, 1954, 1, p. 14).

The *kolkhoz* authorities are entitled to sell timber to other agencies and enterprises. It seems that they make use of this right rather frequently, as the *kolkhoz* income can be improved through sales of timber. Stumpage sales to logging operators, who come from remote districts and who want to transport the felled timber to their places of residence, are, of course, possible only in the easily accessible forest areas, mainly in the vicinity of railway stations. Many State agencies have their special timber procurement agencies which without exception deal with purchases from *kolkhoz* forests.

Such operators cut only the best-quality trees, applying the selective logging method, because railway transport of low-quality construction timber and fuelwood does not pay; moreover, the enterprises which have organised such timber procurement agencies do not need the lower grades of timber.

Instructions for forest regulation in the *kolkhoz* forests (*Instruktsia ustroistva kolkhoznykh lesov*), issued in 1950, give detailed rulings for the compilation of working plans and for the determination of allowable cut in the forests concerned. In fact, the *kolkhoz* authorities pay no great attention to the rulings of a working plan, where the prescriptions for volume of allowable cut and silvicultural measures to ensure regeneration are concerned.

The state of *kolkhoz* forests and the methods employed in their management seem rather poor throughout the U.S.S.R. This impression is unavoidable if we analyse the data published in the 1961 inventory. The conclusion reached by the foremost expert on the forestry situation in *kolkhoz* forests, A. A. Mukhin (*L. Kh.*, 1963, 6, p. 50), can be quoted in this context. In English translation this reads as follows:

“In *kolkhoz* forests attention should be paid above all to the regula-

tion of all fellings, to the rational utilisation of wood, protection of the forests from fire and harmful insects, and to a better organisation of forest management to meet the demands of forestry production and the ever growing requirements of the *kolkhozy* and *kolkhoz* members for building timber, fuelwood and other forest products.”

4. Comparison of Standards and Intensity of Forest Management

4.1 Problems of Rating the Management Status of Forest Land

4.1.1 Introductory Remarks

How is forest land being managed? This is a question which is rather complex and cannot be answered easily. The level of forest management or the treatment of forests for the production of timber depends primarily on method of cutting and the kind of silviculture which is practised. Intensity in applying silvicultural measures, however, is affected by the timber-growing potential and the conditions for renewal of the forest crop, as well as the accessibility and marketing conditions in the particular forest area. A great deal depends on the objectives and policies of the forest owner, whether private persons or Government. But a number of other factors, including traditions in forest conservation, the cultural level of the population, and apparently also the economic system, greatly affect the treatment of forests. It should be added that the Soviet type of economy does not ignore completely the financial results, i.e. revenue from timber sales, when planning operational objectives in forest management. The intensity depends largely on income from stumpage sales, i.e. the price level of forest taxes, which the buyers of growing forest stands for logging purposes pay to the State body which acts as the forest owner. There is an unmistakable similarity with the capitalist system here.

In the first place, we must determine how the potentialities of timber growth have been actually utilised, and what measures have been taken to secure future production. The long time which elapses between the establishment and the harvest of a mature stand is the reason why an examination of past measures is as important as one of the current measures when one is trying to determine future prospects. The current measures in forest management are essentially designed to safeguard future prospects. Considering the object of our study, which is a comparison between the forest management systems of Czarist Russia and of the Soviet Union, it must be stressed that in the

past 50 years the Soviet authorities have had the advantage of being able to exploit the forest crops resulting from the work of earlier periods. Czarist Russia's forest management system and forest policy have contributed essentially towards the large timber crops harvested by the new Russia in order to carry out the plans for a rapid industrialisation of the country. In large parts of Russia it was, indeed, the Czarist forest management which made this possible. The fruits of the forest management system and the intensity with which it was applied from the October Revolution until the present will be harvested by the following generation. One must know what is really happening at present in order to be able to evaluate future prospects.

4.1.2 Criteria for Measurement of Management Standards

To measure the quality of forest land management, attention must primarily be directed to cutting practices. The paramount question from the sustained-yield point of view is whether the amount of the cut is adjusted to the rate of growth. Consequently, the volume of the annual cut and its long-term development must be considered as a first-class criterion in the evaluation procedure. Next comes the type of cutting, i.e. the distribution between the final cut and the intermediate cut. There is no fixed ratio between these two cutting types which may be regarded as an optimum under certain definite conditions. In rating cutting practices, it is customary to consider that the higher the percentage of the intermediate cut, i.e. thinnings, the higher the intensity of forest management. This view is not only held by representatives of traditional forest management in western Europe, but seems to be supported also by Soviet forestry specialists (cf. Kovalin, 1959).

The final removal of the forest crop, or the harvesting of mature timber, is the regeneration felling, which provides for the succeeding crop. The area cut over annually, and its long-term accumulation and transfer into productive condition, is the criterion to be used in measuring the results of forestry practice in timber growing operations. In this connection, the changes of clear-felled forest areas which are not regenerated play an important role. A periodical comparison of non-regenerated cut-over areas is not only a sustained-yield test, but is even more a controlling factor for forestry which aims towards an expanded reproduction. There is no doubt that this is the most correct yardstick by which to measure reproduction on an enlarged scale. It should be added that cut-over areas, both as an absolute and

as a relative quantity, are also an important factor in evaluating the status of forest management. The percentage of unforested areas in the total forest land area offers direct information on how much of the production potential of the soil has not been utilised in timber production. However, it is important to ask what requirements one can make for the level of stock density, and how the potential capacity of forest land, with regard to timber-growing, is actually taken care of in forestry practice. The difference between the ideal productivity and the actual productivity, or, more precisely, the gap between the volume of the "acceptable" growing stock and the "actual" growing stock per unit area in different quality and age classes, is an indicator which enables us to measure the difference of level in the status of timber management. Increasing productivity in primary timber production has become a topical problem in the U.S.S.R. also. Attempts have been made there to establish a yardstick for use in this connection.

However, as long as there is no fixed long-range growth objective which will indicate the potentialities of timber-growing in different forest regions, the possibility of increased production can only be evaluated on very vague grounds and expressed in general terms. The problem of increased productivity in forest management makes an extremely interesting chapter in Soviet forest management, which will be discussed in more detail later.

4.1.3 Reliability of Statistics

The evaluation procedure for cutting amount and practices as well as for regeneration measures in a country as large as Russia is a very complicated problem. This is because the available statistical data on this problem are incomplete and are, moreover, marred by considerable inaccuracies. All that has been said earlier about the reliability of Soviet statistics applies generally in this respect also.

Concerning the statistics of annual timber cut, it can be said that roundwood removals from the stump to the landings or assemblage places are not identical with the actual felling quantity. A large part is left behind on the logging site. It must also be considered that the reported quantities of roundwood removals on *lespromkhozy* are based on the reports periodically submitted by foremen to their superiors. As a rule, this is done during the logging operations, when there is practically no possibility of making any measurements to determine the timber volume more exactly. The original data on which

the statistical computations on different administrative levels are based are therefore rough estimates. The original data are then amended by superordinate agencies before they are submitted to the National Statistical Board, which compiles the logging statistics of the larger regions and of the country as a whole.

It should also be borne in mind that a "cubic metre" as a unit of measure is not uniform and that its real timber content—solid measure without bark—can vary greatly in a country as large as the U.S.S.R. Soviet statistics do not usually disclose what is the real measuring unit used—e.g. cubic metre solid volume including bark, or without bark—in every individual case, and recomputations from one measuring unit into another are not usually available.

It is natural to assume that the preliminary data in timber statistics tend to be exaggerated; in other words, all parties concerned want to show that they have produced more. In the earlier periods of planned economy this tendency to exaggerate was particularly noticeable, with the frequent result that the short-term logging statistics, for months and quarters, were almost valueless. The preliminary reports on annual timber output, too, were drastically amended in later checks, and the figures were reduced as a rule. More recently, when the planning system had grown more efficient and when statistical distortions had become punishable by law, data on roundwood removals seem to have become more reliable. However, the statistical information is sufficient to demonstrate general trends from year to year.

The statistics are even more unreliable in the case of cut-over areas. This is due to several circumstances: in the first place, the so-called clear-fellings can be considered as being incompletely clear-felled, and consequently it is not easy to determine whether the land should be classified after logging operations as clear-felled area or as land still covered with forest; and in the second place, the figures for the size of clear-felled areas are not published outright as a rule. However, they can be calculated on the basis of the published statistics.

Silvicultural measures have been reported quite extensively in recent years, and some material is available also for the earlier years. However, the available data concern mainly the areas where the silvicultural measures, such as planting and sowing, have been undertaken, and not the areas where they can be considered a success. A considerable proportion of plantings carried out are a failure, and consequently the area which has actually been turned into productive condition through artificial regeneration is smaller than is indicated by the statistics. The areas concerned can be estimated only approximately.

Table 2—8. Average Annual Cut in the U.S.S.R., selected periods, 1913—1962
(million cubic metres)

Period	Timber removals	Timber assigned for felling
1913a	61	
1913b	67	
1928—1930	101	
1936—1940	233	
1945	168	
1946—1950	234	251
1951—1955	309	316
1956—1960	369	381
1961	351	368
1962	353	371

a Adjusted to the boundaries before 17 September 1939.

b Present boundaries of the U.S.S.R.

Sources: (1). *Narodnoye Khozyaistvo SSSR, 1960 and 1962*, Moscow, 1961 and 1963, pp. 297 and 179. (2). *Perepechin-Filinov Lesopolzovanie v SSSR 1946—1962 gg.*, Moscow, 1964, p. 91.

Still more uncertain are data on acreage of natural regeneration. Here we can arrive only indirectly at figures which can be regarded as realistic.

In brief, it can be said that we are obliged to use approximate evaluations. Our problem is to give a general picture of the situation, making use of the available statistical data to the greatest possible extent. It thus seems that we can still draw certain conclusions and determine general trends, despite the shortcomings mentioned above.

4.2 Cutting Amount and Methods

4.2.1 Total Annual Cut by Volume

In recent years, statistical data on actual Soviet timber removals have been published in various connections, and at present we seem to have a quite comprehensive picture of the developments. The statistical data published in earlier years have later been recalculated and adjusted, and therefore the figures quoted here differ from earlier statistics. One must differentiate in the statistics between timber removals (*vyvozka drevesiny*) and timber assigned for felling (*otpusk lesa*). The difference between these two is partly due to the fact that not all timber assigned to the logging enterprises or to buyers of standing timber is actually felled, and partly in the fact that not all felled timber is removed from the forests. However, as is apparent from

Table 2—8, the difference is not too great—since World War II, this difference has been about four per cent—but the table does not indicate the quantities of timber which have actually been felled and not removed to assemblage places at roadsides or river banks. It is probable that these quantities lie somewhere between the figures for timber removals and those for the timber allotted for felling.

The above table (2—8) shows clearly the great increase in the volume of the cut under the Soviets. Compared with 1913, the total cutting volume has increased fivefold, while the volume of industrial and construction timber has increased more than eight times, from 30 million cubic metres in 1913 to 256 million cubic metres in 1962 (*N. Kh. SSSR*, 1963, p. 179).

It should be noted that in the past dozen years or so, the total volume cut has remained more or less the same. According to Soviet statistics, there has been no general increase of timber output, as has been the case in other sectors of the Soviet economy, including the output of manufactured forest products. Evidently the general state of things in the forests permits of no further increase in the roundwood output. We shall not discuss here this “stagnation” of Soviet timber production, which is successively increasing in other fields. We shall only recall that the peak of the Soviet roundwood removals seems to have been reached at the present stage of industrial development, and that the volume of cut could be increased further only if the planned increases in the capacities of the wood-based industries became a fact.

An interesting detail which is noteworthy in the present connection concerns the cutting volume in Czarist Russia. According to official Soviet statistics (cf. Table 2—8), the total cut in 1913 was 67 million cubic metres within the present Soviet territory, and 61 million cubic metres within the Soviet boundaries in their form before 17 September 1939. Buchholz (1961, p. 132) maintains that this figure is not correct. Soviet statistics had deliberately decreased the figures for the timber output of Czarist Russia to demonstrate Soviet progress and increased output in this field. In fact, the figure quoted refers to the quantity of timber felled in the former State forests, the statistics for which were published. According to calculations by Tarasov (1925), the total felling volume in forests of all ownership categories in Czarist Russia was about 219 million cubic metres a year before World War I. Considering that there hardly exist any cutting statistics for the extremely heterogeneous privately owned forests at the time, and considering that felling in these forests was much more extensive than that in the State forests, the above figure must be based on rough estimates. An-

Table 2—9. Changes of Annual Cut in two Main Forest Zones, selected years, 1913—1960

	1913	1940	1950	1960
Forest-Deficit Zone				
<i>Million cubic metres</i>	51	111	107	105
<i>Per cent of the total cut</i>	76	45	40	29
Forest-Surplus Zone				
<i>Million cubic metres</i>	16	135	159	264
<i>Per cent of the total cut</i>	24	55	60	71
Total				
<i>Million cubic metres</i>	67	246	266	369
<i>Per cent of the total cut</i>	100	100	100	100

Source: Vasiliev, P. V. *Ekonomika izpolzovania i vosproizvodstva lesnykh resursov*, Moscow, 1963, p. 115.

other author, Seliber (1933), estimates the total cutting volume in European Russia alone at 280 million cubic metres in 1913. As it is impossible to verify the above figures, we cannot throw more light on the anomaly. There is no reason to think that the last-mentioned figures are exaggerated. It follows (and here we agree fully with Buchholz), that Soviet data on the 1913 timber output are too low. It might be added that the present age class distribution of the existing stands also seems to indicate that logging before World War I was more extensive than is now stated officially, but it is impossible to prove this unequivocally on the basis of official Soviet data only.

4.2.2 Geographical Distribution of Cut

Logging has of old been concentrated in the European parts of Russia. Immediately before World War I, about 90 per cent of removals were carried out in this region (Buchholz, 1961, p. 132). The less accessible forests in the northern parts of European Russia and in Siberia were practically untouched in the Czarist era. Logging on a larger scale in these forests began only under the Soviets. According to official statistics (*N. Kh. SSSR*, 1961, p. 299) almost 75 per cent of all logging operations were still concentrated in the European parts of the U.S.S.R. in 1960. It should be recalled that there exists at present no official boundary between Europe and Asia within the Soviet Union. New Soviet statistics do not give any direct information about this traditional division and consequently any figures mentioned can only be estimated.

A survey of the development of cutting volume with a particular reference to the forest-surplus zone and the forest-deficit zone is pre-

sented in Table 2—9. About 98 per cent of the timber output in the forest-deficit zone took place in European Russia. The Asian part of the U.S.S.R.—comprising mainly the Kazakh, Kirghiz, Uzbek, Turkmen and Tadzhik Soviet Republics—is almost unforested, and the total timber output there has been about 2,000,000 cubic metres annually in recent years—about two per cent of the total annual cut in the forest-deficit zone.

A few further comments should be made about the figures included in the table. The cut since 1940 is calculated on the basis of official Soviet statistics on timber removals, while the 1913 calculations are “based on the statistical material of the time” (Vasiliev, 1963, p. 115). In this connection it might be mentioned that the remarks on the 1913 cutting volume, made in the preceding section, apply also to this table, i.e. that the figure quoted is probably too small, but with regard to the ratio of distribution of the 1913 cuttings it is unreasonable to be critical.

A comparison of the trends in timber output in absolute figures indicates that the total cut in the forest-deficit zone has been more or less the same, or that it has even decreased somewhat, since World War II. On the other hand, the cut in the forest-surplus regions, measured in absolute cutting volume, has increased very much; it almost doubled from 1940 to 1960.

This survey of the dynamics of the cut in the two macro-regions gives a very simplified picture of the current relocation of the logging centres. Considering the size of the country, a better picture of real conditions can only be obtained when each of the more important forest regions is examined individually, because development has not been uniform in the different regions and has frequently not even progressed in the same general direction.

4.2.3 Annual Cut in Relation to Growing Stock and Growth

A comparison of annual cut with net growth, or, expressed in a broader way, the relationship between timber growth and timber drain, is an important indicator in evaluating the long-range potentialities of forest land. As has been pointed out before, Russian statistics of annual growth are inadequate and highly contradictory. It follows that a timber balance compiled on the basis of such data is inevitably impaired by great errors, and its value is consequently doubtful, particularly in the forest-surplus zone. Comparative figures showing the relationship between annual cut and growing stock, i.e. the cutting percentage,

Table 2—10. Comparison between Volumes of Growing Stock, Growth and Annual Cut, in selected Regions, 1962

	Total volume of growing stock	Average annual growth	Actual total cut in 1962	Volume of annual cut <i>cu.m. per ha</i>	Annual cut as per cent of	
					Growing stock	Average annual growth
	<i>million cubic metres</i>					
Russian SFSR .	74,127	789.20	334.79	0.51	0.45	42.4
Ukraine	638	15.44	13.63	2.7	2.1	88.3
Belorussia	365	10.83	8.96	2.0	2.5	82.7
Lithuania	111	2.83	2.12	1.9	1.9	74.9
Latvia	170	3.68	4.44	2.8	2.6	120.7
Estonia	88	1.76	1.98	2.5	2.3	112.5

Source: Perepechin-Filinov *Lesopolzovanie v SSSR 1946—1962 gg.*, Moscow, 1964, p. 41.

seem to be more accurate, but as a large part of forests in Russia are inaccessible, these figures lose much of their relevance. However, despite these disadvantages and limitations a comparison of the above factors is of great interest.

Table 2—10 illustrates the relationship of annual cut to annual growth and the growing stock in certain selected areas, i.e. constituent republics. It has been compiled by two Soviet experts, Perepechin and Filinov, on the basis of the official statistics of 1 January 1961. The criticism of the statistics referred to above applies in this case also, and the figures should therefore be accepted with reservation. As regards the smaller republics the figures seem to be more or less realistic and to depict roughly the true situation; they can also be verified by means of other available statistical data. It can be observed that the annual cut still exceeds the annual growth in both Latvia and Estonia, although the age-class distribution is abnormal and mature timber should be in short supply (*cf. Lesnaya Promyshlennost SSSR*, 1957, p. 49). The circumstance that the annual cut as a percentage of the growing stock (the cutting percentage) cannot be considered too high at the same time, indicates that the productivity of the forests, i.e. the actual timber growth per unit area, is relatively low in these countries. The timber drain per hectare of productive forest land (in Russian terminology, forest-covered area) gives us no real picture of the situation. A calculation on the basis of the total forest land, including cut-over areas and burned areas which are not covered with forests, seems to lead us to a closer estimate of the actual productivity of the forests.

As regards the above data on the Russian SFSR, the following facts should be taken into account in a critical examination.

In the first place, even those forests which are at present considered inaccessible are included in the total growing stock. This cannot be considered a correct procedure. In principle, only accessible forests should be included, i.e. forests in which logging is actually taking place or can take place; otherwise, the cutting percentage has no practical value as a factor for comparison. Consequently, the forests which are considered inaccessible at present should be deducted from the total volume of growing stock.

The total volume of the growing stock in the accessible forests of the U.S.S.R. was estimated at 47,860 million cubic metres by 1 January 1961 (Vasiliev, *L.Kh.*, 1963, 6, p. 64). The growing stock in the constituent republics, except the Russian SFSR, was estimated at 2,220 million cubic metres (Perepechin—Filinov, 1964, p. 11). If we assume, to simplify matters, that all these last-mentioned forests are accessible, the total volume of growing stock in the Russian SFSR can be calculated easily enough—it is $(47,860 - 2,220 =) 45,640$ million cubic metres. It follows that the figure of annual cut as a percentage of the growing stock is not 0.45, as quoted in Table 2—10, but 0.73. This figure is certainly more realistic, but it is also clear that it can differ greatly from district to district. In the central parts of European Russia it is presumably much higher, and in Siberia lower, than the overall average of the whole of the Russian SFSR.

In the second place, the above table puts the average annual growth in the Russian SFSR at 789.20 million cubic metres. The mean annual growth (*srednegodichny prirost*), the saksaul (*Haloxylon*) forests excluded, in the whole of the U.S.S.R. has been estimated to be 834.80 million cubic metres (Perepechin—Filinov, 1964, p. 11). Another source (Vasiliev, *L.Kh.*, 1963, 6, p. 65) estimates the total annual growth (*godichny obshchy prirost*) in the U.S.S.R. as of January, 1961, at 874.0 million cubic metres, of which 713.2 million cubic metres were on the forest area in use (*na ploshchady osvoyennykh lesov*). It seems that the above figures cannot be accepted as a basis for a comparison between total annual cut and total annual growth. In this comparison, too, the total annual growth should concern only the forests which are accessible and actually in use. The annual growth in these forests has been calculated by as authoritative an institution as the Forest Institute of the U.S.S.R. Academy of Sciences (quoted according to Vasiliev, 1963, p. 383) to be 471.2 million cubic metres in the whole of the U.S.S.R., and 426.2 million cubic metres in the Russian SFSR. In

Table 2—11. Volume of Timber Cut and its Distribution by Cutting Methods, in selected Regions and Years, 1946—1962

	Year	Average annual cut <i>cu.m. per ha</i>	Percentage distribution of timber output by cutting methods			
			Main cut	Regeneration cut	Thinnings	Other cut
Russian SFSR .	1946	0.43	85	—	9	6
	1950	0.60	90	—	7	3
	1955	0.76	90	3	4	3
	1960	0.86	90	3	4	3
	1962	0.84	90	3	4	3
Ukraine	1946	3.00	73	—	26	1
	1950	3.30	76	—	24	—
	1955	3.40	73	7	15	5
	1960	2.91	66	7	16	11
	1962	2.70	62	6	24	8
Belorussia	1946	2.79	69	—	19	12
	1950	2.00	80	—	18	2
	1955	1.83	77	2	14	7
	1960	1.87	71	4	14	11
	1962	1.97	69	5	14	12
Lithuania	1946	2.56	86	—	—	14
	1950	2.19	61	—	28	11
	1955	2.09	56	6	34	4
	1960	1.57	50	3	44	3
	1962	1.91	35	8	52	5
Latvia	1946	2.59	79	—	1	20
	1950	2.91	67	—	20	13
	1955	2.92	54	2	36	8
	1960	2.85	47	2	45	6
	1962	2.81	43	2	50	5
Estonia	1946	3.23	75	—	—	25
	1950	2.53	72	—	20	8
	1955	3.00	65	3	29	3
	1960	2.87	64	3	27	6
	1962	2.54	53	4	38	5

Source: Perepechin-Filinov *Lesopolzovanie v SSSR 1946—1962 gg.*, Moscow, 1964, p. 11 and pp. 91—86 (Appendix 3).

accordance with our earlier argument, the latter figure would serve better as a basis for comparative calculations of the kind we have to do with here. In replacing, in Table 2—10, the figure showing the average annual growth in the Russian SFSR (789.20) with another which we consider more realistic (426.2), and comparing it with the volume of the actual cut (334.8), the difference between timber growth and timber drain is reduced—and this notwithstanding that the

natural timber drain must be added to the cutting volume when the total timber drain is to be calculated. The annual cut as a percentage of the average annual growth in the Russian SFSR is, according to the new calculation, 78.6 per cent instead of the 42.4 per cent in the table.

It is certain that this percentage, too, varies considerably from region to region, but its value as an indicator in making comparisons cannot be doubted.

4.2.4 Cutting Methods

An important feature in a comprehensive picture of the status of forest management in a country is a description of the cutting practices. In the first place, one must know how the timber removals from the forests are being carried out. If this is done by clear-felling over long periods, the future condition of the growing stock is different from what it would have been if selective cuttings or thinnings had been used.

The predominant cutting method in the State forests of Czarist Russia was clear-felling, which was used from the second half of the 19th century. Selective cutting was used only in areas where there was no market for the whole range of the timber assortment. Thinnings were carried out to a very limited extent only. The Soviets have, more or less, followed the same pattern, with the difference that the clear-felled areas have become more concentrated and larger in size.

The distribution of timber output by cutting methods in different geographical areas of the U.S.S.R. after World War II, is set out in Table 2—11. Before critically examining the table we shall comment on its composition. Timber output has been calculated on the basis of data for timber assigned for cutting. Calculation of the timber output per unit area is in principle based on the areas according to the forest inventory of 1961, taking into account only the accessible forest area in use. As this figure for the Russian SFSR is not directly published in Soviet statistics, it has been calculated by deducting from the total accessible forest area in use in the whole of the Soviet Union (432.27 million hectares, according to Vasiliev, *L.Kh.*, 1963, 6, p. 64), the total forest area in all the other constituent republics (34.8 million hectares, according to Perepechin—Filinov, 1964, p. 11). The total forest area in use in the Russian SFSR has been calculated in this way to be 397.46 million hectares. Thus here, too, the matter was simplified in the same manner as in the preceding section, i.e. that all Soviet forests outside the Russian SFSR are considered as accessible and actually in use. It

might be added that the calculation of timber drain should be made in relation to the total forest area, and not to the forest-covered area, as is the case here. However, this has been impossible owing to the unavailability of data on the total forest area in the various regions.

As regards the technical side of the various cutting methods, it must be emphasised that the final or main cut comprises mainly clear-fellings. In 1962, the so-called complete clear-felling (*sploshno-lesosechnaya rubka*) constituted 77 per cent, and the so-called conditional clear-felling (*uslovnosploshnaya rubka*) 13 per cent of the total cut by area, while the corresponding percentages by volume were 87 and 11. The remainder of the main cut was carried out in accordance with the group selection method, and as selective logging (Perepechin—Filinov, 1964, p. 74). It can be said, therefore, that clear-felling is absolutely predominant in the whole of the U.S.S.R; only in certain areas, chiefly in the mountains in the western and southern parts of the Soviet Union, are different methods of final cut used, so that the land is not completely denuded of trees, and the chances for natural regeneration are consequently better.

There exists a special cutting method which has no direct counterpart in the forestry practice in western Europe. In the Russian terminology it is called regeneration cut (*lesovosstanovitel'naya rubka*). This method, which is not regarded as a final or main cut, is used only in Group I forests. It is conceivable that the cutting of individual mature trees in old stands due to be replaced or already undergoing the process of regeneration can be described as this type of cut. Certain specialists (Dekatov, *L. Kh.*, 1962, 8, p. 21) consider the term "regeneration cut" to be a misnomer, because it may cover any kind of cutting. They therefore recommend the elimination, at the earliest possible date, of this type of cutting, which is neither practically nor theoretically justified. Thinnings (*rubki ukhoda*) comprise all cuttings in younger and middle-aged stands which are carried out for silvicultural purposes. Other cut (*prochie rubki*) consists mainly of salvage cuttings, i.e. the removal of damaged and dead trees.

As shown in Table 2—11, the distribution between different cutting methods varies both regionally and from year to year. The proportion occupied by main cut in the Russian SFSR remained constant—90 per cent—in 1950—1962, but in the other geographical areas its percentage is clearly decreasing. It should be noted that the cutting volume per unit area (cubic metres per hectare of forest-covered land) shows a diametrically opposite trend at the same time: it is rising in the Russian SFSR and falling in the other parts of the U.S.S.R.

Table 2—12. Thinnings as Percentage of the Volume of Total Cut, by selected Regions and Years, 1946—1962

	1946	1947	1948	1949	1950	1951	1952	1953	1954
Russian SFSR	9	10	10	9	7	5	5	5	5
Ukraine	26	26	23	22	24	17	18	16	15
Belorussia	19	21	17	20	18	17	16	15	14
Lithuania	—	—	26	37	28	38	39	36	29
Latvia	1	1	28	25	20	29	36	34	34
Estonia	—	1	24	27	20	21	26	29	32

	1955	1956	1957	1958	1959	1960	1961	1962
Russian SFSR	4	5	4	4	4	4	4	4
Ukraine	15	16	15	17	18	16	25	24
Belorussia	14	15	15	14	15	14	14	14
Lithuania	34	41	48	46	45	44	51	52
Latvia	36	36	37	42	43	45	48	50
Estonia	29	31	28	25	29	27	34	38

Source: Perepechin-Filinov *Lesopolzovanie v SSSR 1946—1962 gg.*, Moscow, 1964 (Appendix 3).

The proportion of thinnings shows an interesting development, which to a certain extent contrasts with the development of the main cut: when the percentage share of the main cut decreases, the percentage share of the thinnings increases. The above table (2—11) demonstrates this relation generally, but the percentage share of the salvage cut (other cut) can distort this relationship. This is because it is not always easy to differentiate between thinnings and salvage cuttings; according to the accepted practices in western Europe, both are regarded as intermediate cut.

The development of thinnings in various geographical areas and in the course of time are shown more clearly in the Table 2—12. This shows clearly that the thinnings constitute a much larger part of the total cut in the western parts of the U.S.S.R. than is the average in the Russian SFSR. Particularly in the Baltic countries—Lithuania, Latvia, Estonia—the thinnings constitute a considerable part of the timber output, and their share is rising steeply. The explanation is partly that there is a shortage of mature stands, and partly that the extensive young forests which were planted in these countries between the two World Wars have now reached an age when thinnings can yield relatively large quantities of timber. However it cannot be denied that the technical knowledge of the forestry personnel probably plays an important role here, as do the local traditions in forestry practice.

As the Russian SFSR, which comprises the forests in the northern

Table 2—13 Thinnings as Percentage of the Volume of Total Cut, by selected Districts and Years, in the RSFSR, 1946—1962

	1946	1950	1955	1960	1962
Karelia.....	—	0.1	0.3	0.6	0.5
Archangel.....	—	0.3	0.2	0.2	0.1
Vologda.....	2	3	1	1	1
Leningrad.....	7	7	3	3	5
Novgorod.....	6	8	4	2	3
Pskov.....	10	13	11	5	8
Kalinin.....	17	19	7	3	4
Moscow.....	32	56	36	27	25
Yaroslav.....	13	13	8	6	8
Smolensk.....	12	18	9	6	9
Kaliningrad.....	—	9	48	30	5

Source: Perepechin-Filinov *Lesopolzovanie v SSSR 1946—1962 gg.*, Moscow, 1964 (Appendix 4).

parts of European Russia as well as in Siberia, cannot be fittingly compared with the Baltic countries, one should compare areas which have more or less similar natural and economic conditions. Table 2—13 shows the percentage share of thinnings in a number of provinces of the Russian SFSR which are mostly situated in the vicinity of the Baltic countries, and in 10 cases east of them. With the exception of the provinces of Moscow and Kaliningrad (formerly Königsberg), where the cutting practices seem generally to have a special character, the percentage share of thinnings in the provinces of the Russian SFSR is noticeably smaller than in Estonia, Latvia and Lithuania. There seems to be a scarcity of stands which require thinning, although extensive clear-cuttings were carried out here after the October Revolution, and in the years between the two World Wars, which should mean, under normal conditions, that the clear-cut areas would now be covered with young, second-growth stands requiring thinning. It seems that other circumstances, too, have led to this lagging behind of Russia's old farming areas in thinning; there is hardly any surplus timber in the poorly stocked stands there, and the need for an intensification of silvicultural measures in these provinces is considered to be of major importance.

4.3 Regeneration of Cut-Over Areas

4.3.1 Forest Land not Covered by Forest

Vast areas of formerly productive forest land in the U.S.S.R. are not used for growing timber crops. They consist mainly of non-regenerated cut-over areas, burned-over areas, clearings with sparse

tree cover and semi-permanent openings. The area is being increased through new cut-over areas in the U.S.S.R. by 2 to 2.5 million hectares annually, 80 per cent of this territory being cut-over areas of coniferous stands and 20 per cent cut-over areas of deciduous species (Pismenny, *L. Kh.*, 1963, 2, p. 36; Perepechin—Filinov, 1964, p. 73). According to other sources (Koldanov, *L. Kh.*, 1962, 3, p. 14), the total forest area assigned for cutting has been most recently (1960) 30,000 square kilometres or 3,000,000 hectares per year. To this must be added areas denuded annually through natural catastrophes, in the first place by forest fires. On the other hand, large amounts of these non-forested areas are annually turned into productive forest land through natural and artificial regeneration, i.e. they are covered by young second-growth stands. The question one asks in this connection is whether the total area of the forest land which is not in a productive condition is increasing or decreasing. Here the official Soviet statistics are not particularly informative. For instance, the extremely detailed statistical data on forest resources for January 1956 (*Lesnaya Promyshlennost SSSR*, 1957) include no figures on forest land not covered by forest. The figure can be calculated only roughly and by using indirect data, estimates and other published material. Statistical data are available for two occasions only, so that it is possible to carry out a limited comparison in time, over a period of more than 30 years.

According to the census of 1927 (*Materialy po statistike lesnovo fonda SSSR*, 1930), the total cut-over and burned-over area, as well as semi-permanent openings, comprised in the U.S.S.R. 44 million hectares. According to the 1961 inventory of forests (Ponomarev, *L. Kh.*, 1963, 6, p. 48; Vasiliev, *ibid.*, p. 64), the total area not covered by forests (*ne pokrytaya lesom*) comprised 172 million hectares, of which 94 million hectares belonged to the category of accessible forests or forests in use (*osvoyenye lesa*). Comparing the latter figure with the total accessible forest area (exploited forests), which according to the 1961 inventory is estimated to be 527 million hectares, we find that the forest area in non-productive condition is 18 per cent of the whole. It should be added that the 1961 data apply to the Soviet territory now, whereas the 1927 data apply to the area before the Soviet territorial expansion as a result of World War II. No detailed information is available on how these areas have been calculated. It is certain that the methods and premises used differed greatly on the two occasions. Nevertheless, the difference is so great that it permits one to conclude that the non-regenerated cut-over and burned-over areas have increased considerably under the Soviets.

The percentage of forest land in non-productive condition is the most important criterion to be used in an evaluation of the status of forest land management. The above-mentioned figure, whose veracity cannot be doubted, must be considered a very high percentage, taking into account the continuous production of forest crop. It should be particularly emphasised that this area comprises forest land of two desirable classes:

1. areas best located for the market, and
2. areas classified as belonging to the highest site quality class.

It is also especially noteworthy because this type of forest was, and still is, an objective of systematic exploitation in the efforts to satisfy the growing needs of the economy in the U.S.S.R.

4.3.2 Progress of Natural Reproduction

What will happen to the 94 million hectares of land which on 1 January 1961 were not covered by forest, and to the two to three million hectares of cut-over forest land which is annually added to it? How much will be reforested naturally during the next few decades? To find the reply to these questions, forest administration agencies and research institutions in the U.S.S.R. have devoted much energy since the war, putting particular stress on the problem of the prospects for natural regeneration on cut-over areas where mechanised logging has been applied.

In the first place, it must be borne in mind that cut-over areas may be divided into several types, the natural regeneration of which is progressing rather differently in different geographical regions. The regeneration period is sometimes of short duration, from three to five years, and extends, in other cut-over areas, somewhat longer—10 years or more (Melekhov, 1960, p. 270). However, natural regeneration will not occur at all in certain other areas within the foreseeable future. It should also be taken into account that most coniferous stands will be replaced after clear-cutting by deciduous species of less value (birch and aspen), which means that the composition of the timber stock will deteriorate gradually in the long run (Koldanov, *L. Kh.*, 1962, 3, p. 13). It is hardly possible to obtain a uniform picture of natural regeneration and how this will influence forest productivity in the future, both quantitatively and qualitatively. Conditions presumably vary greatly from region to region in the different parts of the U.S.S.R.

According to an official examination carried out by the then Central Inspection of Forest Management in 1957 and 1958, and

published by its head, Kovalin (1959, p. 24), the regeneration pattern of large-scale cut-over areas in the U.S.S.R. has been as follows:

1. Natural regeneration with the same coniferous species (pine, spruce, larch) as were predominant in the original mature forest has been attained in 30—40 per cent of the cut-over areas.

2. A change of tree species has occurred in 50 per cent of the cut-over areas, the usual sequence being that less valuable deciduous species, primarily heart-rot aspen, follow the valuable conifers.

3. In 10—20 per cent of the cut-over areas, no young growth has followed, and these areas are turning into waste land or swamps.

As pointed out above, these figures apply to the U.S.S.R. as a whole. It is very evident that the picture in individual regions may be quite different from this general scheme. Conditions of natural regeneration should be worst in climatically unfavourable areas, particularly in the *taiga* zone. A great problem there is that the site conditions for forest growth are imperfect, owing to the flatness of the land surface and the excess of moisture. There is a general conviction that the swampy areas will never be reforested, particularly in the northern section of the *taiga*, and that this area must be classified as swamp, bog or tundra in the future (Nesterov, 1954, p. 518).

Kovalin (1959, p. 24) states further that mechanised logging applied in connection with clear-felling, which is the common practice, has caused particularly great damage in the mountain regions, in the first place in the Caucasus, the Crimea, the Carpathians and in the Far East. Immense areas on mountain slopes have thus been deprived of their vegetation cover, and their reforestation will be exceedingly difficult. Since the watershed and soil protection capacities of these mountainous areas are in considerable danger as a result, this state of affairs cannot be approved by the Soviet people under any circumstances.

4.3.3 Clear-Felled Areas in Need of Artificial Regeneration

If we try to calculate, on the basis of the material contained in the preceding chapters, the size of forest areas which need artificial silvicultural measures to become productive forest land again, we arrive at the following result. The total area of forest land not covered by forests on 1 January 1961 was estimated at 94 million hectares, and 15 per cent of this makes 14 million hectares, this supposing that planting and other kinds of artificial regeneration are carried out only in areas where no natural regeneration whatsoever is taking place.

Things are different in practice. Silvicultural measures apply, to a great extent, also to areas where coniferous stands would be replaced naturally by deciduous species. To prevent this, coniferous trees must be introduced artificially. Certain rough estimates indicate that 42 per cent (Kovalin, 1959) of the clear-cut areas are in need of artificial regeneration. According to other calculations, this percentage is 55 (Vasiliev, 1963, p. 190). Both the quoted figures are thus greater than the 15 per cent mentioned earlier and used in our rough calculations of the arrears in artificial forest regeneration.

According to Kovalin (1959, p. 32), the total area in need of artificial silvicultural measures in the U.S.S.R. (*lesokulturny fond*) amounted to 13.8 million hectares on 1 January 1959. This does not differ from our estimate of the lag in regeneration, which is understandable because both calculations proceed from the same premises. In other calculations, too, (Perepechin—Filinov, 1964, p. 42) the total cut-over area in need of artificial regeneration is estimated at 14—15 million hectares in the whole country. This area has come into being between 1946—1960.

If we accept Kovalin's (1959, p. 32) premise that 1.1 million hectares of the annually clear-felled areas in the U.S.S.R. are in need of artificial silvicultural measures, which is more or less equal to the average in 1951—1960 according to certain other estimates (Vasiliev, 1963, p. 192), we have obtained a basis for further calculation. The question is how the new clear-felled areas will be turned into productive forest land, and to what extent the arrears can be made up. It should be added that this depends on the fixed targets or operational goals in Soviet planning and on what results are expected when planning silvicultural measures.

4.3.4 Artificial Regeneration in Historical Perspective

Soviet forestry literature maintains that the extent of planting and other silvicultural measures has grown several times under the Soviets, in comparison with the Czarist era, and that artificial regeneration now plays a much greater role than before. It cannot be denied that since World War II more attention has been paid to silvicultural measures than was the case before, but the extent of the planted area cannot be regarded as an isolated phenomenon; it should be considered against the background of the general situation. In the first place, the volume of the cut has grown considerably under the Soviets, and in the second place the cutting methods have changed. Instead of cutting in narrow strips where natural reproduction is relatively easy, the

Table 2—14. Relation between Clear-felled Areas in Need of Artificial Regeneration and Areas Actually Treated with Silvicultural Measures in the U.S.S.R., selected periods, 1905 —1965

Years	Total volume of cut <i>million cubic metres</i>	Estimated clear-felled areas in need of artificial reproduction	Treated area, planting and other silvicultural measures for reproduction	Treated area in relation to clear-felled area in need of artificial reproduction
		<i>thousand hectares</i>		<i>per cent</i>
1905—1914 (State Forests)	615.6	1,230	764	62.1
1918—1927 . . .	900.1	2,690	437	16.2
1928—1932 . . .	628.9	1,886	559	29.6
1933—1937 . . .	995.6	2,990	731	24.4
1938—1941 . . .	979.4	2,936	1,054	36.0
1942—1945 . . .	673.6	2,020	245	12.1
1946—1950 . . .	1,172.1	3,525	2,726	77.3
1951—1955 . . .	1,543.0	5,069	5,549	109.5
1956—1960 . . .	1,842.2	6,053	6,745	111.4
1961—1965 . . . (Plan)	1,856.0	5,850	7,084	121.1

Source: Vasiliev, P. V. *Ekonomika ispolzovania i vosproizvodstva lesnykh resursov*, Moscow, 1963, p. 192.

Soviets use large-scale clear-cutting, where as a rule only artificial planting and intensive weeding and tending can guarantee that coniferous species will predominate in the second growth stands which follow the original conifer forest.

A survey of the relationship between the clear-felled area in need of artificial regeneration and the area actually thus regenerated is shown in Table 2—14. It shows that as from the 1950s the area under artificial silvicultural measures exceeded the new clear-felled areas, but that the earlier arrears were very great. One must ask how reliable the figures quoted are before drawing any conclusions. In the preceding section we drew attention to the difficulty of estimating the area in need of silvicultural measures. The table does not cover the whole of the accumulated area, but only the area that has come into existence during the period concerned. That the area under silvicultural measure has of late exceeded the area of new clear-fellings does not mean, therefore, that the arrears have been made up.

It must further be taken into account that the area regarded as being artificially regenerated covers not only planting and seeding, i.e. measures which, if successful, guarantee the transformation into productive forest land, but also preparatory measures for natural regeneration. It is not always certain that scarifying everywhere, i.e. under dif-

Table 2—15. Clear-felled Area Compared with Actually Planted Area, by selected Regions, Total during the Period 1946—1962

	Total clear-felled area	Total planted area (planting and seeding)	Planted area in relation to clear-felled area
	thousand hectares		per cent
Russian SFSR.....	26,132.6	3,743.6	14.3
Ukraine.....	751.7	1,595.0	212.2
Belorussia.....	705.5	660.0	93.6
Lithuania.....	117.6	231.0	196.4
Latvia.....	243.2	163.0	67.0
Estonia.....	131.9	132.0	100.0

Source: Perepechin-Filinov *Lesopolzovanie v SSSR 1946—1962 gg.*, Moscow, 1964 (Appendix 5).

ferent site conditions, can guarantee natural regeneration. We know that in the northern districts seed years are so rare that the soil will frequently return to its natural state before seed is available. Despite silvicultural measures, the area thus fails to become productive forest land.

According to some calculations (Vasiliev, 1963, p. 190) the total area under silvicultural treatment in the U.S.S.R. in 1917—1960 was 18 million hectares, only half of which has been planted or seeded; on 42 per cent of the total the silvicultural measures consisted only of preparations for natural regeneration (*sodeistvie yestestvennomu vozobnovleniu*).

Table 2—14 shows that with regard to silvicultural measures in the State forests of Czarist Russia, the artificially regenerated area as a percentage of the clear-felled area in need of artificial regeneration was in reality higher (62 %) than it was between the two World Wars (16.5—36.0 %). In the period just before World War I, the average area reforested annually by artificial seeding and planting in the State forests was as follows (Kobranov, 1930):

1. from 1901 to 1910—44,890 hectares,
2. from 1911 to 1914—61,950 hectares.

This area includes also the afforestation of steppes and shelterbelt planting. Most of the artificially regenerated area was sown with pine.

Table 2—15 gives us a different picture of the situation. The area planted and seeded is depicted here in relation to the total clear-felled area during the period 1946—1962. In this comparison it is realistic to eliminate certain unreliable estimates, e.g. clear-felled areas in need of artificial regeneration. The differences between the Russian

SFSR and the areas west and south of it are striking. Silvicultural activity is much more intensive in the latter territories than in the former—a fact needing no particular explanation. However, it should be pointed out that the real situation as to the silvicultural arrears is not so favourable as it seems to be from the table. For instance, the afforestation of steppes and shelterbelt planting are included in the artificially regenerated area in the Ukraine, although these activities are in fact carried out outside the forest land proper. Forest planting, according to the Afforestation Project of 1948, which was to be a means of combating droughts, is also included in the total cultivated area. There is reason to suppose that silvicultural measures in the forest lands proper during 1946—1960 did not, in fact, exceed the new clear-felled areas of the same period. However, it must be admitted that the silvicultural measures designed to remove the arrears have been fairly satisfactory, if the available statistics are to be relied on, and if the silvicultural measures have been successful in the forest-deficit areas in the western parts of the country. The great problem is to estimate how successful the silvicultural measures have in fact been.

The quality of artificial planting is very poor, according to authoritative statements (Rubtsov, *L. Kh.*, 1964, 1, p. 5). The local forest personnel is, as a rule, mainly concerned in carrying out the silvicultural measures by area as prescribed by the plan, and employing therefore the most primitive methods possible in an unsatisfactory manner. The 1961 inventory (*Lesnoy fond RSFSR*, 1962), included a separate category of forest land which had undergone artificial seeding and planting, the state of which did not permit regeneration to be considered an accomplished fact, so that the areas in question could not yet be classified as young stands. This category was described as “incomplete cultures” (*nesomknuvshiesya lesnie kultury*). Its total area was estimated at 1.4 million hectares in the Russian SFSR by 1 January 1961, of which 0.8 million hectares were in the region of central Russia.

In order to obtain a picture of the results actually achieved by artificial regeneration measures in 1952—1961, a general inventory of forest plantations in the Russian SFSR was made in 1963. According to these records, artificial regeneration had been carried out in an area totalling 3.2 million hectares of the State Forest Fund since 1952. Planting had been carried out in 61 per cent, direct seeding in 31 per cent, and seeding by aircraft in eight per cent of the total area. The inventory showed a total failure on 242,300 hectares or 13 per cent of the plantings, and 256,000 hectares or 21 per cent of the seedings.

The latter figures include also seeding by aircraft, in which there was a 33 per cent failure (Ushakov, *L. Kh.*, 1964, 12 pp. 36—37). The failure percentage varies considerably from region to region. Moreover, there is no clear line between successful and unsuccessful plantings, particularly when naturally-sown plants of deciduous species are abundant and when only subjective evaluation decides whether regeneration measures were successful or not. According to the above source it was resolved, on the basis of the inventory, that beeting is to be carried out on 144,700 hectares, and weeding on 477,600 hectares. Of the 3.2 million hectares concerned, the inventory classified 1.3 million hectares, or 40 per cent of the total, as forested area.

4.3.5 Problems of Productivity Increase in Primary Forest Production

In connection with the increasing requirements for wood products, and with the decrease of the timber supply in the western parts of the U.S.S.R., the problem of productivity increase in primary or biological forest production has become especially acute. It is considered necessary to produce on every area unit of forest land 1.5 to two times as much high-quality timber, in the not distant future, as is produced at present (Vasiliev *et al.*, 1959, p. 10), i.e. at the time when the Seven-Year Plan was passed. Since then, the productivity increase has been the subject of a ceaseless and intensive discussion. In April 1963, a large-scale meeting of experts took place in Moscow, called by the Governmental Committee for the Forest, Pulp, Paper and Woodworking Industries and Forest Management at the *Gosplan* of the U.S.S.R. (*Gosudarstvennyy komitet po lesnoy, tsellyulozno-bumazhnoy, derevo-obrabatypvayushchey promyshlennosti i lesnomu khozyaistvu pri Gosplane SSSR*) to discuss problems connected with the productivity increase and conservation of forests. At this meeting, an improvement programme was suggested for forestry by the chairman and deputy chairman of the committee. A second meeting of the same committee took place in March 1964, and the main item discussed was an intensification of forest management.

As these questions have been discussed by the foremost Soviet forestry scientists and practical foresters, it is advisable to describe the general forestry situation on the basis of the materials and statements at these conferences. The views submitted to the meeting can be summarised as follows.

The management of forest land suffers from serious shortcomings. It can be stated that forestry is in many respects lagging behind the

other sectors of the economy. The great gap in the application of technology as used by the logging industry and by the forest management has not been eliminated. Large areas are covered by stands of low productivity. The average annual growth in all forests is only 1.3 cubic metres per hectare. The corresponding figure for pine is 1.7, for spruce 1.6 and for larch only 1.0. However, in some regions it would be possible to increase the annual growth to 8—10 cubic metres per hectare. Far-reaching changes have taken place in the species composition of stands, primarily because of concentrated clear-fellings on large areas. The average area of forest clear-felled annually is more than 2.5 million hectares in the whole of the U.S.S.R. Clear-felled areas covered previously by natural coniferous stands frequently regenerate as less valuable deciduous stands, more particularly in the European parts of the U.S.S.R. The total volume of the timber stock composed of deciduous species in these areas has increased to 3,000 million cubic metres, 1,600 million of which are mature timber.

The extremely low productivity of the existing growing stock, more particularly in the coniferous stands, is largely a result of its being situated on swampy soils. The total area of swampy forest sites is almost 160 million hectares in the whole of the U.S.S.R. The soil in about one-third of the forest areas in the European parts of the country is water-logged.

Logging operations have so far been concentrated mainly in forests which are easily accessible from the transport network. In the old logging areas, where the supplies of mature timber will be exhausted in the near future, the volume of nearly mature timber is relatively small. It should also be noted that the timber harvesting operations have been carried out predominantly in the best site quality classes, and drier soil has always been preferred to swampy sites (Melekhov, *L. Kh.*, 1963, 6, pp. 6—7). The greatest problem is that despite favourable conditions for timber growth in a number of areas, forest productivity is very low in these very areas. Silvicultural measures are as yet insufficient, and the area of artificial plantings does not equal the annual clear-fellings (*L. Kh.*, 1963, 7, p. 2). What is more, the silvicultural measures carried out are sub-standard, and the efficiency of reproduction measures is much lower than their cost. Thinnings are carried out on a relatively small scale as a rule. As the demand for wood of deciduous species has fallen off, and as a market cannot be found for it even in large areas in European Russia, millions of cubic metres of deciduous timber are wasted at present (*L. Kh.*, 1964, 6, p. 2). Supplies of coniferous timber, which is a more suitable raw material for the pulp

industry, will suffice for only the next 15—40 years in the European parts of the U.S.S.R. (Melekhov, *L. Kh.*, 1963, 1, p. 4). The present and future timber supplies in European Russia are consequently a problem which overshadows all discussions on the productivity increase of the forests.

The decisions made at the above-mentioned meetings of experts include a number of improvement proposals in forest management. These recommendations do not refer to any revolutionary measures which will lead to an immediate improvement in the condition of the forests and secure a rapid increase in productivity. The criticism is most severe as regards the use of the clear-felling system on large, concentrated areas. It was suggested that in certain areas and certain natural forest types (in mountain forests, in stands composed of beech, fir and spruce) clear-fellings should be forbidden completely. Instead, regeneration under shelter should be attained by partial cuttings, i.e. through a gradual removal of mature trees. The regeneration fellings recommended as standard for these forests are partial cutting in strips (*postepennaya rubka*) and selection cutting (*vyborochnaya rubka*). The establishment of stands composed of faster-growing and more valuable tree species is recommended. Drainage of swampy forest land is urged as a particularly effective method for obtaining a productivity increase (*L. Kh.*, 1963, 6, pp. 12—13).

An intensification of silvicultural measures, and more particularly an extension and improvement of planting, is considered the most important step of all. It is pointed out what opportunities exist for increasing the timber output by thinning. The Baltic countries are cited as a model in this respect. For instance, in Latvia the average annual timber output in thinning operations per 100 hectares of forest-covered land is 140 cubic metres, compared with 8.6 cubic metres in European Russia (*L. Kh.*, 1964, 6, p. 2).

The central problem in this is that the actual timber production (effective productive capacity) per unit area is considerably smaller than the potential productive capacity. According to some estimates (Vasiliev, *L. Kh.*, 1962, 10, p. 54) it should be possible to increase the timber stock in forest-deficit regions by a total of 2,500 million cubic metres over the next 20 years through intensified silvicultural measures (that is, by 20—25 m³/ha), which would mean an increase in the effective productive capacity of these forests. Certain definite plans for increasing the productivity, in terms of annual average increment, have also been compiled. A plan for the increase of growth in forests in use by Soviet republics in 1958—1965 is shown in Table 2—16.

Table 2—16. Plan for Increase of Average Growth, by Soviet Republics, in Forests in Use, 1958—1965

Soviet Republics	Total average growth in the beginning of the period (1958) thousand cubic metres	Area of Improvement (Silvicultural) Measures				Expected increase by the end of the period (1965) thousand cubic metres	Percentage increase of growth	
		Artificial regeneration	Drainage of forest land	Complementary measures for natural regeneration	Natural regeneration			Total
1. Russian SFSR.....	426,239	3,467	322	6,373	23,143	33,305	48,728	11.4
2. Ukraine.....	15,324	1,191	111	132	28	1,462	3,536	23.1
3. Belorussia.....	10,165	278	171	95	43	587	1,232	12.1
4. Kazakhstan.....	5,532	463	—	135	125	723	821	14.8
5. Georgia.....	3,599	20	2	167	—	189	501	13.9
6. Latvia.....	3,123	71	247	22	48	388	376	12.0
7. Lithuania.....	2,295	109	99	22	—	230	370	16.1
8. Estonia.....	1,788	66	172	30	9	277	312	17.4
9. Aserbaïdzhan.....	1,158	27	—	35	—	62	135	11.6
10. Turkmenia.....	491	170	—	1	—	171	34	6.9
11. Moldavia.....	485	12	—	7	1	20	43	8.9
12. Armenia.....	400	18	1	36	—	55	60	15.0
13. Uzbekistan.....	295	412	—	67	10	489	98	33.2
14. Kirgizia.....	247	57	—	31	8	96	40	16.2
15. Tadzhikistan.....	86	32	—	1	—	33	12	14.0
16. Total for the U.S.S.R.....	471,227	6,393	1,125	7,154	23,415	38,087	56,298	11.9

Source: Institut Lesa AN SSSR. *Problemy pozyshenia produktivnosti lesov, Goslesbumizdat*, Table 4, p. 38; reprinted in Vasiliev, P. V. *Ekonomika ispolzovania i proizvodstva lesnykh resursov*, Moscow, 1963, Table 85.

This singular report is the product of the leading Soviet research institution, namely of the Forest Institute of the U.S.S.R. Academy of Sciences (*Institut Lesa AN-SSSR*). The interesting feature is that it is hoped to increase the growth rate in the forests of the U.S.S.R. by 11.9 per cent in as short a period as seven years, and this by conventional silvicultural measures. As is evident from the table, the planned targets in certain areas are remarkable; for instance, in the Ukraine the growth rate is to be increased by 23 per cent and in Uzbekistan by 33 per cent. According to Soviet authorities themselves (Vasiliev, 1963, p. 382), the plan in question was not at all popular and no data on its actual fulfilment are available. Comment in this context is unnecessary.

However, such operational goals should be considered right in principle. They show that great efforts are in fact being made by the specialists to improve the general condition of the forests. However, it might seem that the U.S.S.R., the model country of planning, has not followed the same lines in forestry planning which are characteristic of such planning in the West. The expression of operational goals in concrete terms, a description of the future composition and volume of stands, the image which is to be attained, seem to be lacking in the Soviet planning system, despite the fact that the setting of definite targets and their attainment should be the cardinal method of the Soviet system.

5. The Doctrine of "Expanding Reproduction" in Theory and Practice

5.1 "Sustained Yield" versus "Expanding Reproduction"

The principle of sustained yield has been the guiding principle of organised forestry from its very beginning. All calculations and prognoses in classical forest economics, known as forest statics, are based on this principle. The compilation of "working plans" or "management plans", which is the main purpose of forest regulation, has inevitably been linked in the past, as well as at the present time, with the problem of the rotation, which in its turn is linked directly with the principle of sustained yield. It has been maintained that a denial of this principle is also a denial of the very science and art of organised forestry. The great champion of forestry science, an expert in the economics of forest management in Russia, Professor M. M. Orlov, wrote as late as in 1931, immediately before he vanished from public life (quoted from Vasiliev, *T.I.L.*, 1953, p. 42): "Sustained yield is

the dogma of forest management. It is possible not to accept this dogma, but one must then disclaim forest management and speak of forest exploitation.”

It cannot be denied that the principle of sustained yield derives originally from a static view of the course of events, and from a static construction of economic equilibrium. The originators of the principle imagined an unchangeable world where conditions would remain the same not only during one rotation, but during an indefinite number of rotations, without any interruptions.

The essential question here is whether the sustained yield principle is theoretically applicable to static conditions only, or whether it is also applicable under dynamic conditions leading to incessant changes in both the inner and outer circumstances governing forest management. To answer this question, we must first of all establish what is meant by sustained yield. This is not at all self-evident and unequivocal, although the term has been consistently used in forestry literature ever since forestry science came into being, and although it can be said that it is one of the oldest forestry terms in existence. Professor Saari (1950, pp. 277—278) supplies the following four different interpretations, which according to him have usually been attributed to the term in question.

1. The concept of sustained yield in forestry means that the forest area is permanently kept in productive condition, i.e. the forested area is unchanged. This goal is attained by replacing a stand, whether felled or destroyed by natural causes, with a new timber stock by means of natural or artificial regeneration.

2. Sustained yield means equilibrium between growth and drain. This goal is attained by keeping the volume of the growing stock unchanged. A reduction of the growing stock, which occurs when the average annual cut exceeds the average annual growth, is interpreted in forest balance calculations as over-cutting.

3. Sustained yield management means a stable supply of forest products, and is achieved by a steady and unchanged annual cut. The maintenance of an unchanged growing stock, however, does not imply that the annual timber output is constant.

4. Sustained yield forestry on a commercial basis means unchanged income from forestry operations.

For the time being we can limit ourselves to the above four definitions of sustained yield. It should be added, however, that other definitions are possible.

The criticism, by Marxist forest economists, of the sustained yield

principle as a “capitalist” concept, is primarily ideological, while factual arguments are of secondary importance. Professor Vasiliev’s argument, which we shall here quote in unauthorised translation, is very relevant:

“The most important law of the development of Soviet forest economy—as well as of the entire national economy of the U.S.S.R.—is the law of expanding socialist reproduction (*zakon rasshirenno sotsialisticheskovo vosproizvodstva*).

“The fundamental difference between expanding socialist reproduction and capitalist production, as we know, is that the former takes place in the ever-growing dimensions of socialist production conditions, increasing socialist wealth and securing an ever-improving flowering of socialist culture. Direct progress is thus assured onwards on the path towards the building up of communism” (Vasiliev, *T.I.L.*, 1950, p. 17).

He says further that no branch of socialist economy can independently pursue economic growth. For this reason the law of expanded reproduction, when applied to separate sectors of economic activity including forestry, indicates a development in which each individual sector—on the basis of expanded reproduction in its own productive activity—participates in the aggregate economic growth of the country. Consequently, the development of forest management, under the law of expanding reproduction, demonstrates in practice its “progressive development” (*postupatelnoye razvitie*) which secures a “continuous increase in the role played by forestry” (*neproryvnoye uvelichenie roli lesnovo khozyaistva*) in the general expansion process of economy.

“In the socialist society”, the same author says in another context (Vasiliev, *T.I.L.*, 1953, p. 8); “reproduction, compared with conditions under capitalism, has in principle a new content and form (*printsipalno novoye sodержanie i formu*), appearing as socialist reproduction. This reproduction process comprises all movements of social production, all its circulation, all productive branches of economy . . .” Socialist reproduction is always accomplished on an enlarged scale, contrary to the simple reproduction which is defined as “a repetition of production on its former scale” (p. 9). The practical application of “simple reproduction” in forestry is identical with sustained yield management. “The bourgeois theory regarding both forest economics and forest regulations has regarded it, almost from the very beginning, as a general principle of forest management . . .” (p. 19). . . . “Its economic purpose and significance is the protection, and

the guarantee to the forest owners of their annual rental income (*yezhegodny rentny dokhod*) from forest properties" (p. 20).

It is thus more for ideological than for factual reasons that Professor Vasiliev evaluated the sustained yield principle as follows (*T.I.L.*, 1953, p. 40): "The principle of sustained and uniform yield, described above, is deeply foreign to Soviet forest management. . . Equally foreign and unacceptable to forest management are all the variations and modifications of that principle, such as the 'principle of steady use' (*printsip postoyanstva polzovania*), the 'principle of inexhaustible use' (*printsip neistoshchitel'novo polzovania*), the 'principle of continuity in forestry production' (*printsip nepreryvnosti lesokhozyaistvennovo proizvodstva*), etc., which were disseminated by our forestry literature until recently. None of these 'principles' derives from the law of expanding socialist reproduction. . . they express, instead, in the best cases, the possibility of developing forest management within the framework of the conception of simple reproduction. Therefore, they are not so much needed by Soviet forest management as hostile to it. . . The principle of continuity and evenness of the timber output, if applied to the forest management conditions in the U.S.S.R., does not indicate anything over and above the recognition of the possibility of a peculiar eternal balance (*priznanie vozmozhnosti svoeobraznovo vechnovo ravnovesia*) first, within the forest management itself, on the basis of repeating the production on its former scale and under unchanged conditions, i.e. simple reproduction, and secondly a stable ratio between a backward forest economy and all the other expanding branches of socialist production" (p. 42).

The author states further that adherence to sustained yield forestry was widespread among practical foresters. In this connection he reproaches the theoreticians of the old school whose ideas, more than anything else, had gained such an influence over practical foresters that they were unable to see the error of their ways.

But let us now quote further Professor Vasiliev (*T.I.L.*, 1953, p. 42): "This is why the struggle against this principle, which had begun already in the 1930s and which was waged quite openly in our literature in 1940—1947, attracted so much attention among the professional workers in forestry.

"It was a struggle of the new, socialist way of developing forest management in the U.S.S.R. on the basis of the principle of expanding socialist reproduction approved in the forestry practice of the U.S.S.R. at that time, against the obsolete, defunct method functioning according to the principle of simple reproduction, and hostile to socialist

economy. Naturally this struggle ended in a complete destruction of the 'principle of sustained and uniform yield' of timber utilisation with all its varieties (*eta borba zakonchilas polnym razgromom 'printsipa postoyanstva i ravnomernosti' polzovania lesom i vsekh yevovariatsii*)."

No comment on the above quotation is required.

5.2 Marxist Doctrine of Expanding Reproduction

In the preceding chapter we have tried to clarify the differences between the two theoretical basic principles governing the organisation of long-term forestry operations. We have already proceeded from the assumption that the objective of forest management is expanding reproduction.

The purpose of the present chapter is to show the doubtful validity and inadequacy of the conception of expanding reproduction when it is applied to biological forest production. As the doctrine in question has been formulated by Karl Marx, it seems advisable to examine how he himself imagined economic growth or expanding reproduction in industrial production, which conceptions he analysed theoretically. It should be stressed that the Soviet "law of proportional economic growth" of national economy is in theory essentially derived from this Marxist doctrine. This is particularly stressed by Lenin, and others (1956, pp. 28--36).

Growth as a goal of economic policy, and growth rates, occupy a central position nowadays. In the Western world, the current interest in growth is due to the awareness that full employment without economic growth is impossible, and that growth is determined by the basic structure of modern society (Domar, 1957, p. 18). Of course, the different schools of economics treat the problem of growth differently. In our case the Marxist proposition, i. e. the doctrine of expanding reproduction (*erweiterte Reproduktion, rasshirennoye vosproziwodstvo*) is of the greatest interest, and this primarily because we are concerned with the theoretical background and with the ideas on which the Soviet economic system is based.

It should be stressed once more that Marxist forest economists are of the opinion that forestry, as a sector of national economy, could, from the theoretical viewpoint, be treated in the same way as the industrial sector, i.e. the doctrine of expanding reproduction is assumed to be applicable to primary or biological forest production, as well as to industrial production.

Before discussing this expanding type of forestry in more detail, we should examine the so-called simple reproduction which Soviet authorities consider to be the model of capitalist production, and for this reason unacceptable to progressive Soviet economy.

According to Marx, the production process is simultaneously also a process of reproduction. It must be a continuous process, because no society can reproduce unless it constantly reconverts part of its products into means of production. The maintenance of the production on the same level is accomplished by replacing the means of production consumed by an equal quantity of the same kind of articles, which must be separated from the mass of the yearly products. The continuity of the process, constantly renewed and perpetuated by simple reproduction, is a mere repetition of the production process on the old scale (Marx, I, 1915, pp. 620, 621). Briefly, there is no economic growth and the net investments are zero.

The periodical reproduction of the means of production on the same scale, however, is generating surplus value (= property income), which enters into individual consumption of the capitalist or owner of the means of production. The production process itself is accomplished through capital rotation which follows a certain pattern. Here it should be pointed out that this capital circulation scheme, as presented by Marx, cannot be considered to be valid in forest production. But let us nevertheless follow this scheme and the symbols used by Marx in his work.

The rotation of productive capital is expressed by the formula (Marx, II, 1915, p. 73) $P \dots C^1 - M^1 - C \dots P$, where:

P = total value of productive capital (output)

C^1 = produced commodity capital = $C + c$

M^1 = produced money capital = $M + m$

C = original commodity capital

c = surplus value of commodity capital

M = original money capital

m = surplus value of money capital

The production process starts with the realisation of the capital value P , which exists as the commodity capital C^1 at the starting point of the circulation. The first phase of the circulation, the function of commodity capital $C^1 - M^1$, ends with the realisation of C^1 , equal to commodity value C plus surplus value c , and exists now in the form of money value M^1 .

After the transformation of the commodity capital C^1 into the money

capital M^1 , which thus consists of the original money capital M plus surplus value of money capital m , the second cycle of the circulation begins. Under the conditions of simple reproduction, the entire surplus value pursues its own course, i.e. enters into individual consumption or disposal of the owner of the means of production. The part of money which represents the original money capital, M continues in the production process and now opens the second stage in the circulation cycle. It follows that the realisation of the commodity capital in the process $C^1 - M^1$, or $C^1 - (M + m)$ separates the courses of capital value and surplus value, which are united as long as they both are embodied in the same mass of commodities in $C^1 - M^1$. The continuous production process on the same scale, i.e. through simple reproduction, thus proceeds on the assumption that surplus value is separated entirely from the production process. In the second cycle the capital value has again the same extent as it had in the first stage of the cycle of money capital, $M - C$.

Under the conditions of expanding reproduction, i.e. when the capital is reproduced on an enlarged scale and with enlarged values, the surplus value is not entirely separated from the circulation of industrial capital. In this case the original money capital (M) and part of the surplus value, which can be expressed by the symbol im ($i =$ per cent of m), will continue their course together. At the beginning of the second cycle we now have a larger money capital than we had at the beginning of the first cycle. In the second cycle of production the increased money capital, after its transformation into the natural elements of productive capital, furnishes also an increased product. The remaining part of the surplus value, which can be symbolised as $(l - i)m$, is taken out of the production process for consumption. The output or aggregate production (P) at the end of the second cycle can thus be expressed by the formula:

$$P = C + im + (l - i)m$$

This is the simplest formula of expanding reproduction. The organic composition of the commodity capital (C) and the character of the products play an important role in Marxist analysis, which distinguishes between constant capital (fixed capital) and variable capital (wage fund).

The sum total of the means of production used—the machinery, the tools, the buildings and the raw and auxiliary materials—constitute the constant capital.

The value of the social manpower (= the sum total of the wages) comprises the variable capital.

Marx divides the social total output (P), and consequently also the total output of the society, into two big sectors: sector I is the production sector producing commodities consumed for the purpose of production, i.e. produces means of production. Sector II produces commodities which are designed to be consumed privately by the capitalists and the wage-earners, i.e. it produces consumer goods.

These distinctions are of great importance for an analysis of industrial growth in general. In our case, in which we are concerned with the growth problems in primary or biological forestry production, their solution would be complicated even further if we introduced these conceptions also. The most essential problem in this connection is to establish how the *im* part of surplus value, designed to accomplish reproduction on an enlarged scale, will actually function in forestry production. We should not forget in this connection that, according to Marx, reproduction on the same scale has already been achieved through the functioning of the original commodity capital (C). Simple reproduction implies the existence of an organised forestry, working as a going concern. It implies further that the cut and growth of timber are balanced, that cut-over areas are put into productive condition without delay, that the productive capacity of forest land is not diminished, and that managerial costs are sufficient to carry out these measures for continuous production. All these requirements, which in fact characterise sustained yield management, must be fulfilled before we can even start reproduction on an enlarged scale, disposing for that purpose of an increased money outlay which must be separated from the operating surplus of sustained yield forestry. In principle there exists no difference between "operating surplus" in the ordinary sense and the conception of "surplus value". The essential question, therefore, is the cost of the economic growth of forestry, i.e. the cost of improvement and expansion in primary forest production as an aggregate of all forest enterprises. Unfortunately it is impossible to answer this question, owing to lack of data. On the other hand we have already established in the preceding sections that the requirements of sustained yield have not been fulfilled in the forests of the U.S.S.R. and that consequently the requirements of simple reproduction according to the Marxist scheme have not been met. What, then, are the measures which the Soviet experts consider to be parts of what is labelled as expanding reproduction? We shall discuss this in the following section.

5.3 Criticism of the Practical Application of the Doctrine of Expanding Reproduction

The very content of the principle of expanding reproduction, as a general objective or broad goal for forest management activities in the U.S.S.R., requires in its practical application that priority must be given to such means as will secure the largest possible volume of timber of the highest possible quality, from each area unit of forest land, in the shortest possible time (Vasiliev *et al.*, 1959, p. 68). The same idea, expressed bluntly as an operational goal by Professor Vasiliev (1960, p. 455), "means practically that two to three cubic metres of timber must be grown for future generations where one to two cubic metres are now being felled."

We need not wonder how this specific task should be interpreted. Whether it is a question of doubling or trebling the growing stock or of expanding the annual increment seems to be of secondary importance in this connection. The essential factor is the statement that the objective is greater productivity in timber growing operations by means of increasing the standing timber volume, i.e. the production apparatus. In other words, we have here a situation which can be characterised as "progressive" or "appreciative" type of forest management, which provides that the growing stock must be built up to establish more normal conditions, i.e. closer to a "normal forest". The *modus operandi* at the stage of building up the growing stock should, therefore, be the real purport of the doctrine of expanded production. But let us examine in greater detail the question that arise in this connection.

To begin with, it is maintained that the main point in an expanding reproduction scheme is the reforestation and expansion of forest land (Vasiliev, *T.I.L.*, 1953, p. 30). The latter, however, is supposed not to be an obligatory course of action in itself and in all cases. It is considered indicative only in districts of timber-deficit or sparsely wooded areas, where the expansion of forest land is justified economically. The reforestation of forest land not actually covered by forests (cut-over and burned areas etc.), however, is considered to be the paramount task of expanding reproduction in forests in use (p. 32). The interesting feature in this is that this interpretation almost abolishes the supposed difference between "sustained yield" and "expanding yield". It is fairly surprising to read the following passage from an article published under the title "The Conditions and Requirements of Expanding Reproduction in Forest Management" (Abramo-

vich, *L. Kh.*, 1962, 6, p. 72): "The most important characteristic of forest management, making it different from the extracting sectors of industry, is the requirement of an obligatory replacement of forest on cut-over areas (*trebovanie obyazatel'novo vostanovleniia lesa na vyrubkakh*). This is an indispensable prerequisite for continuity and steadiness of timber use (*postoyanstvo i nepreryvnost lesopolzovaniia*). Management of forest land, freed from the observation of this demand, inevitably becomes a predatory exploitation of forests. The guarantee for sustained yield—this is what distinguishes forest management from forest exploitation."

This statement would be approved immediately by all supporters of the principle of sustained yield. One might almost think that the above ideas were not a statement published in the Soviet Union of the 1960s but a plea by Professor M. M. Orlov himself, who fought in vain for his views and thought of the welfare of future generations in Russia.

It is even more surprising when the author of the above article adds immediately to the above statement: "The realisation of expanding socialist reproduction in forest management is inseparable from adherence to the principle of sustained yield forestry... The necessity for following the principle of sustained yield has been expressed already in the first Forest Law, issued by the Soviet Government... and signed by V. I. Lenin (1918)..."

"The principle of sustained yield forestry is coupled to the scheme of the normal forest. This can be taken as the model of a progressively improved forest (*model progressivno ulushchayushchegosya lesa*). It unites the two basic requirements: an even age-class distribution by area, and the securing of the highest timber growth. Every progressive improvement of forest finally brings about its increased productivity. The even age-class distribution is best in accordance with the requirements of expanding reproduction in forest management" (p. 73).

The above statement is particularly interesting, inasmuch as it directly contradicts the view that "the principle of enlarged reproduction... requires the replacement of the normal forest scheme... by new forest schemes and models with progressively increasing growth and timber stock" (Vasiliev, 1960, p. 455). This conflict of opinions among Soviet specialists, however, does not in principle change anything.

The conclusion that can be drawn from the above-quoted argument is that sustained yield is necessary, but that it constitutes only part of the expanding yield, and this completely in accordance with the Marxist theory discussed in the preceding section. This means also,

however, that the demand for a sustained yield must be fulfilled before one can even speak of expanding yield.

On the other hand, reproduction on an enlarged scale in a forest enterprise strictly adhering to the sustained yield principle cannot be accomplished by extended reforestation measures, i.e. by putting a larger area under forest plantations, because by means of simple reproduction (= sustained yield) all available forest land is already in, or will be put into, productive condition. Only when there is idle land which was not used before for forest production, i.e. was outside the sphere of sustained yield forestry but which can be transformed into productive condition through afforestation measures, is it possible to speak of reproduction on an enlarged scale by means of silvicultural investments. The prerequisite is, however, that there must be available such idle land which could be used for forest production.

Measures designed to improve the forests as a productive apparatus have a more definite role in the scheme of reproduction on an enlarged scale. These activities are confined to the area already covered with some kind of growing stock, the actual productive capacity of which is considerably less than the potential productive capacity of the fully stocked stands. These methods include measures designed to increase productivity by changing the stand composition, i.e. by introducing more valuable tree species, by shortening the growing period (rotation) and by improving the timber quality (Vasiliev, *T.I.L.*, 1953, p. 33). Actually, the increased productivity of timber stock on the total forest-covered area is achieved if there is an overall increase of increment per unit-area in single stands. The increase in the average volume of growing stock per unit-area which is the result of keeping the actual cut below the level of actual growth cannot be defined as a productivity increase. It is merely an accumulation of the volume of growing stock. If mature timber is being accumulated by not fully utilising the annual growth, the standard recommendation quoted earlier—growing two cubic metres and cutting one cubic metre in the same area—does not lead to an increase but to a decrease in the productivity of the forests (Abramovich, *L. Kh.*, 1962, 6, p. 72).

It should also be taken into account that intensified silvicultural measures, e.g. planting the young trees more closely, may naturally increase the production of timber volume per unit area to some extent. Through intensified thinnings the quality of timber could also be improved. The upper limit that can be attained by these measures is, however, below the ideal productive capacity of the forest land. It goes without saying that in most cases it is quite possible to apply various improvement measures and thus to attain higher in-

crement, but these measures are all fully contained within the framework of sustained yield management. Nor can expanding reproduction set up concrete objectives over and above the objective of sustained yield management. One must here also reckon with the law of diminishing returns, which sets an economic limit to the intensity degree of forest management.

Finally, it must be pointed out that reproduction on an enlarged scale can also be attained by amelioration—drainage, fertilisation, etc.—and increased investments for the construction of forest roads, buildings, etc. But even these improvements and extensions are attained within the framework of sustained yield management, by a forest enterprise which is working as a going concern. Everything depends on how the principle of sustained yield is interpreted. If it is not interpreted strictly from the viewpoint of the old type of stationary economy, as advocated by the “School of Forest Statics” and defined by Marxist forest economists as “stagnation” or “reproduction on an invariable scale”, but regarded as a dynamic concept, there is no need to reformulate the term “sustained yield”, which has been suggested by the well-known Western forest economist, Professor Saari (1950, p. 279). The present writer has in another connection (Algere, 1963, p. 121) defined sustained yield as “a complete utilisation of land as a factor of production, and avoiding situations where proper use is not made of the productive capacity of the land.” Sustained yield forestry can therefore also be progressive, i.e. its long-term objective is the harmonious development involving increasing productivity and regeneration.

Briefly, it can be said that in theory the difference between traditional sustained yield management and reproduction on an enlarged scale, as formulated by the Marxist forest economists, is fairly vague and practically non-existent in primary or biological forest production. It may be added that Professor Vasiliev, who has been cited frequently in this thesis, speaks only of “sustained yield” (*nepreryvnoye polzovanie lesom*) and avoids the term “expanding reproduction” in his latest article (*L. Kh.*, 1966, 2, p. 6), which was published after the administration reform of 1965. The latter term no longer seems to be used by the men in leading positions in Soviet forestry.

6. Summary of Conclusions from Part II

In Czarist Russia with her capitalist system, forestry was generally held to have two primary objectives: the society as a whole considered

sustained yield desirable, while the private forest owner was interested in financial profits. Immediately after the Soviet take-over, the authorities rejected profit as a motive for organised forest management. Sustained yield, however, was formally retained as an objective of forestry throughout the first decade of Soviet rule, although it was frequently neglected in fact. It was officially rejected only after it proved embarrassing, as adherence to sustained yield would have made impossible what was more important for the economic plan—the satisfaction of the immediate timber requirements of the economy.

To justify the rejection of the sustained yield principle, at least from the viewpoint of Communist ideology, it was necessary to create a new socialist theory or principle of organised forest management. Its formulation took almost 20 years. This new principle is expanding reproduction, derived from theoretical Marxism. It was judged to be more advanced and to harmonise better with a progressively expanding economy than the sustained yield principle, which was described as stagnation. Expanding reproduction as a general objective for primary or biological forest production is pointless unless the objectives of sustained yield have been attained. Sustained yield in the sense of retaining forest land (as a productive factor) in productive condition does not in itself exclude the possibility of an expanding production.

Both the profit and the satisfaction of requirements as objectives of timber management have conflicted with endeavours to retain the productive capacity of the forest, i.e. to retain forest land (as a productive factor) in a productive condition. The conviction of the necessity of forest conservation, however, is discernible in all economic systems in Russia. The institutions and political measures regarding the forests, employed under capitalism to neutralise the harmful effects of “profiteering” in the forests, proved practical and relatively effective. This is proved by the volume of the timber stock in the more or less densely populated regions which the Soviet regime inherited from Czarist Russia, and which contributed to a considerable degree towards the establishment of the Soviet system in its beginnings. The institutions of Soviet planned economy, however, could not avert the short-term objective of immediate satisfaction of the need for timber, and the forests of European Russia, spared under capitalism, fell victim to this urgent need.

The Soviet leaders have acted at decisive moments in the forestry sector as a capitalist enterprise adhering to a *laissez-faire* policy would have acted under similar circumstances. For this reason, it

seems justifiable to compare the Soviet Union to a giant capitalist enterprise. As a commercial organisation, it has a uniform leadership and the various branches of economy act, broadly speaking, as branch offices of an enterprise. As is also the rule in a private enterprise, the all-embracing State enterprise demands that its branches, i.e. the various sectors of economic life, must adapt their activities to the overall objective of the organisation. The ultimate goals of a totalitarian state of the Soviet type are primarily political and secondarily economic. The satisfaction of general social interest comes third only. Forestry cannot, therefore, always protect its special long-term interests. These are simply ignored, should the short-term objectives of the moment so demand. Such deliberate neglect can have catastrophic results in a totalitarian society, because it concerns the country as a whole, and not a single enterprise or a special category of owners, as would have been the case under the capitalist system. Consequently, there is no proof that the central planning system for forestry would be superior to a capitalist system under which the State took care of the general social interests.

It cannot be proved that forest administration, management planning and silvicultural measures as a means for attaining goals under the Soviet system should be superior to and more effective than the methods employed in Czarist Russia, apart from the purely technical side. Forest management requires stability. Sudden and repeated institutional changes seem to be incompatible with the lengthy process of growing trees which reach maturity after several human generations. The most characteristic feature of forest administration under the Soviets is cardinal change, at almost regular intervals, which excludes any possibility of a continuity and purposefulness in forest management.

The Soviet-type planned economy does not know or use any special planning instrument which is better than the working plan of the capitalist era, or which could replace it entirely. It seems that cutting regulations and management planning in the Soviet Union are still in a state of flux, and that no unequivocal planning trends are discernible. The fixed forms and purposeful planning of forest management such as existed in Czarist Russia seem to be lacking in the centrally directed Soviet economy, although the Soviets believe the contrary.

The standard of cutting practices in the Soviet Union, seen objectively, is generally strikingly inferior to the felling methods used in Czarist Russia. This is to great extent due to mechanised logging operations, which of late have increasingly replaced manual labour in the

fellings and haulage of timber in the forests. An improvement in cutting methods is at present a topical subject in the Soviet Union, but the "new" methods suggested do not differ in any way from the cutting practice employed anywhere in other countries with organised forest management under the same site conditions.

The techniques of artificial regeneration show hardly any differences under the old and under the new regime, if we exclude mechanisation. Silvicultural measures as a means of attaining goals in sustained yield forestry, and even more as a means in a forest management aiming at an expanding yield, have clearly been insufficient, if we consider the period of Soviet rule as a whole. An immense silvicultural backlog has come into being, as can be seen from the fact that the forest land not covered by growing stock (cut-over and burned areas, etc.) has increased greatly, and that large areas formerly covered with conifers have gone over to the less valuable deciduous species, primarily aspen and birch. As a result, the total accessible timber stock has decreased both in volume and in value during the half century of Soviet rule, compared with the forest heritage from Czarist Russia to which the Soviet succeeded.

It may be said in conclusion that the link between the Czarist past and the Soviet present is remarkable, although the Soviets have desired to build a new society employing completely new methods in all activities. In forest management, the foreign observer is struck by the similarity of methods used now and formerly, although the results achieved by these methods are different. And as regards the results, there is little to indicate the superiority of the Soviet system over its predecessor. On the contrary, signs indicating its inferiority are much more frequent.

Part III

INDUSTRIAL EXPANSION AND
POTENTIALITIES OF TIMBER-SURPLUS
REGIONS

Industrial Expansion and Potentialities of Timber-Surplus Regions

I. Introduction to Part III

1.1 Formulation of the Problem

The potential timber resources for the development of forest industries in the U.S.S.R. are undoubtedly enormous. However, the great disadvantage of the timber supply of the U.S.S.R. is that there are too great distances between the timber-surplus regions and the wood-consuming regions. The location of wood-processing industries in relation to the main logging areas is also unfavourable.

This has resulted in a shortage of wood products, despite the great timber assets of the U.S.S.R., and the demands for timber of a large part of the population have not been met. This incongruity has not arisen solely because of the constant devastation of forests in the deficient regions during the past centuries; there has been a lack of wood in some areas since the earliest times.

As has been mentioned before, a type of cutting is practised in the timber-surplus regions which leaves cut-over and devastated forest land. This forces logging operations to be moved unceasingly to new areas. Until now, the harvesting of timber in the north has mostly taken place along the banks of the main rivers, where indeed the best forests grow. On the other hand, in the south, the type of cutting practised has virtually removed all the available timber from some areas. When the timber has been exhausted in these areas, it has been necessary to reduce the volume of timber cut, and to transfer the logging enterprises elsewhere (Galasiev, *Pl.Kh.*, 1959, 11). This is the reason why the transference of logging operations to the virgin forests of the north and east has become a matter of major concern for the Soviet planning authorities, and for the forest industry itself. Nevertheless, this need for a transfer should not be regarded as transitory or unique, but of a more permanent character in consequence of the cutting system which has been applied.

In the first instance, in such a transfer of forest industries the following questions must be answered:

1. Is there sufficient timber in these virgin forest areas?
2. What facilities are there for dealing with the supply of timber?

In other words, it is the physical accessibility of these forests in the northern regions which should be the subject of a closer study.

Owing to the migration of logging operations from the settled areas of European Russia to the more remote virgin forests of northern Russia and Siberia, the supply of roundwood has had to be transported over constantly increasing distances. This is because the wood-processing industry has not followed the logging industry. A large part of the forest industry is still in the old logging areas, and to a large extent also in the timber-deficient regions in the western and southern parts of the country, yet these industries now obtain their raw materials from the remote areas in the north and east. In 1963, the distance over which timber was transported by rail averaged 1,572 kilometres (cf. Part I, p. 102).

In view of this the following questions may be put:

1. Is it justifiable from the economic point of view to transport roundwood over such great distances?
2. Why has the wood-processing industry not been located closer to its supply of raw material? What are the obstacles which have prevented this?
3. What measures are being considered for improving the unsatisfactory localisation of the wood-processing industry?

It is obvious that the transport distance for the delivery of roundwood to some special industrial activities cannot be reduced but the more important wood-processing industries, such as pulp and paper mills, as well as sawmills, can be moved closer to the main logging areas. Such a move is of the utmost importance, because it will save a great deal of space and cost in the railway transport of roundwood. The transfer of wood-consuming industries to the timber-surplus regions is gradually proceeding as a matter of course, but there are various obstacles which check its progress.

In order to make a more detailed survey of these obstacles and the main expansion possibilities for the forest industry, it is appropriate to look at the large timber-surplus regions individually, and this will be done in this part of the work.

1.2 Definition of Means and Ends for Industrial Expansion in the Timber Sector

Marxists emphasise that economic expansion is one of the main ends of the Soviet system, and that the means of achieving it are industrialisation and mechanisation. The maximum satisfaction of needs is the

motive behind this. Hence it has been postulated that the target to be set for the forestry sector should yield sufficient forest products to cover the growing need of the Soviet economy for timber. The accessibility of timber resources plays a decisive part in the forestry sector. Consequently, mechanisation and industrialisation, as the means of achieving this end, should begin by considering the geographical location of the timber supplies, as well as the possibilities of utilising them. The geographical distribution of logging operations and wood-processing industries thus constitutes a part of the means or subsidiary instruments, by the help of which the final end—the satisfaction of the need for forest products—can be achieved. It may be added that the correct use of these instruments over a wide field can prove to be most decisive, overshadowing all else, when it comes to solving the problem of organising the Soviet timber industry in the most efficient way. Before the planning and erection of new installations for wood processing can begin—and this is especially the case where these installations are to be situated in the vast virgin forests of the U.S.S.R.—the rational distribution of the industrial units must be considered.

The transfer of logging operations from the timber-deficient regions of central Russia to the timber-surplus regions of northern Russia and Siberia has been a topical question for quite a long time. One can say that it has been set up as a target in all five-year plans, and particularly in the Seven-Year Plan. When Stalin began to industrialise the U.S.S.R. and set aside the principle of sustained yield forestry in the timber-deficient regions of European Russia, the consequences of which were that the more accessible forests were cut over very quickly, the solution of the problem of the future supply of timber was considered at that time to be the utilisation of the virgin forests. The geographical relocation of logging operations, which had at first been considered more an excuse for justifying the devastation of the forests in the more heavily populated areas of the southern and western parts of the U.S.S.R., gradually became necessary for meeting the country's requirements of timber. This also explains why the Soviets have been obliged to adhere to this policy.

The need for a geographical relocation of the logging operations brings to the fore the disposition of the wood-processing industry. This is connected with the theory of location of industry. In brief, it can be expressed as follows: Shall industrial installations for wood processing be built in the regions where logging operations are carried out, or shall wood processing be done away from the source of the raw materials, in regions where the conditions are more favourable for

industrial wood conversion, and where the advantages of the site outweigh the disadvantages of having to transport the raw materials to it?

Here it is a matter of choice between different means which can be utilised to solve the problem, but the practical application of which is in itself no guarantee of the attainment of the final end in this connection, that is, the satisfaction of the growing need of the economy for forest products.

One can state the matter in the following way: the survey of the expansion of logging operations and the wood-processing industry in the virgin forest regions is a partial target or bench-mark goal within the framework of the general objective for meeting the country's requirements for timber. At the same time, an examination must be made of the means which are to be utilised to attain this partial end, and of the conditions existing for the achievement of the target. In the actual case, this means that one must first obtain a detailed knowledge of the natural and economic conditions which form the background and which will be involved when it becomes a matter of applying the technical means, i.e. the forest industry as such. First of all, both the extent of the timber resources and their geographical location must be surveyed very thoroughly. This means that the analysis must be centred on the physical and economic accessibility of the timber resources, because these factors are regarded as being vital for the achievement of the goal. Of necessity, such an analysis must be carried out on a regional basis, and special attention must be devoted to the geographical aspects which are involved in the utilisation of the timber resources.

1.3 Conditions for the Regional Division of Forest Economy

Forest production and forest area are two factors which are very closely connected. The study of these conditions, which strictly speaking can be regarded as a part of economic geography, thus occupies a central position in the question of logging operations. The geography of forest production, which here should be considered as being identical with the term geography of timber harvesting must be regarded as influencing the nature of the various timber products, and the possibility of harvesting the timber within the area as a whole. Extensive areas are not considered in this context; only the assessment of the determining factors for forest production, and their relevance to the particular area, are dealt with. This method of approach is probably in keeping with the ideas which have recently been applied to economic geography (Lütgens, 1952, p. 14). The ends and means of production are related

both to the geography of forest production and to the area in question; the conditions and development of the area have proved to be inseparable from the context of the region as a whole and, at the same time, the U.S.S.R. itself cannot be treated as a single entity, but only by its constituent regions.

The natural conditions for forest production, the structure of the wood-processing industry, and the possibilities for marketing the products can be regarded as the basic criteria for the regional division of forestry production. It must be pointed out that the boundaries of such forest economic regions rarely coincide with the administrative and political boundaries. As a rule, statistical material is only available for production by administrative and political regions, and this applies in particular to Soviet planning. It does not seem to be possible to rearrange logging statistics in such a way that they will correspond to the "natural" regions, at least if one does not have access to the basic sources. For this reason, an historical survey of the principles and viewpoints concerning the division of the U.S.S.R. into forest economic regions seems to be appropriate.

In the Soviet system, the division into regions can be regarded as an instrument for planning and administration. The planned utilisation of the forests and the efficient distribution of forest products are facilitated if forestry plans are compiled on a regional basis, at least in a country like the U.S.S.R. One can therefore readily understand why the Soviets began at a very early stage to divide their country into regions on the basis of the nature of the forest economy.

Professor M. M. Orlov (1924, pp. 20-53) first proposed that the forests of European Russia be divided into three zones: northern, central and southern. Within these zones he drew up forest economic regions and sub-regions on the basis of natural, economic and special forest management factors. However, the main criteria for the regional divisions were local wood requirements and the marketing of forest products in each particular area, and, as a consequence of these conditions, the normal profitableness of forestry practice per unit area of forest land. The basis for the calculations of the profitableness has been derived from the working statistics used by Czarist Russia for the period 1911-1913. This was why Orlov's 1924 plan for regional divisions was later subjected to violent criticism and, in fact, was never used for any practical purpose.

Ivanovsky (1928), in his plan for regional division, made four main forest regions, which were formed by bringing together administrative districts or provinces (*guberniya*): 1. export areas; 2. Asiatic area;

3. areas supplying domestic market; 4. consumption areas. Even this plan was rejected, particularly because Belorussia was classified as an export area.

Professor M. M. Orlov (1931), in his second plan for regional divisions, divided the entire U.S.S.R. into 13 forest regions on the basis of economic and special forest management practice, the latter including dominant tree species, age-class distribution, etc. He emphasised that the regional divisions proposed under this plan differed from the administrative regions, because the two principles of division employed were of a different nature on the whole. The divisions into "economic" regions and "administrative" regions must therefore not be confused.

This theoretical view has been criticised by Soviet economists as an erroneous conception of bourgeois economists and geographers who believe that the natural conditions of the land determine its economic development (Nevzorov, 1959, p. 100). The bourgeois academics are said to base their regional divisions only on physical and geographical factors, which in practice become artificial and often meaningless. It is considered that, in a planned economic system, a political territorial division is the only one possible, and the only one which can serve any practical purpose. The bringing together of basic administrative divisions into large geographical units under what was called the "ministerial" system, which ended in 1957, was only for the purpose of convenience. One can regard these as statistical regions (Balzak-Vasyutin-Feigin, 1959, Fig. 7), which facilitated the compiling of various statistical data, and which could be used for planning to a limited extent only. The entire U.S.S.R. was divided into 13 major regions, but in these there were no institutional bodies which could co-ordinate the economic activity on the spot.

After the introduction of the *Sovnarkhoz* reform in 1957, the division into economic regions was given a direct technical planning purpose within the administrative machinery. The reorganisation of management on a territorial basis made the division of the country into regions unavoidable.

In 1960, there were formed major economic regions (*krupnie ekonomicheskie rayony*), which in the main were based on the old division into 13 regions with only minor adjustments of boundaries and certain territorial revisions (Tokarev-Alampiev, *Pl.Kh.*, 1961, 7, p. 37). The most important change was that the border between Russia in Europe and Russia in Asia was eliminated; this was done by transferring the Tyumen district from Western Siberia to the Ural Region.

In 1961, the number of major economic regions was increased to 17, and in addition there were the two economic administrative regions of Belorussia and Moldavia.

In 1963, a new adjustment of the regional boundaries was made. The most important changes were that Yakut ASSR was transferred from Eastern Siberia, and became part of the Far East Region, while Bashkir ASSR was transferred from the Ural Region to the Volga Region. This last readjustment of the regions resulted in a total of 18 major economic regions (Ivanov, *Pl.Kh.*, 1963, 11, p. 89).

In the main, these regional divisions correspond to the needs of the forest economy. From the forestry standpoint the division of the central and southern parts of European Russia into five economic regions (Central, Volga-Vyatka, Central Chernozem, Volga and North Caucasus) was not really necessary. The division into regions was done mainly with regard to industry and agriculture, but the density of population in these areas was also taken into consideration. As this administrative re-grouping, which should have taken into account forest production and the consumption of forest products, is rather difficult to master, an amalgamation of these five regions into one entity would be more appropriate. Also, the amalgamation of the three regions of the Ukraine, Belorussia and Moldavia into one entity seems to be necessary.

These changes have been made in the division into forest economic regions referred to throughout this work (for first reference, see Table 1—4, p. 71). Otherwise the division into forest economic regions is based on the map which has been published in the official organ of the Soviet Planning Commission (*Pl.Kh.*, 1961, 7).

On the whole, the 1961 divisions, and not the 1963 divisions, have been followed. However, certain adjustments have been made on the basis of the latter. For example, we have transferred the Kaliningrad District (East Prussia) to the Baltic area, as was done in the 1963 division. Through this amalgamation, the number of regions has been reduced from 18 to 10, and the forest economic features of these regions will be dealt with in detail later in this part of the work.

2. Planned Targets for Consumption and Output of Forest Products

2.1 Some Remarks on Consumption Planning for Forest Products

The existing economic system, the pace of general economic progress, the living standards and population developments in a country, are important factors, all of which determine the timber consumption. Con-

sumption *per capita*, regarded against the background of changes in the national product, not only elucidates the past developments, but also makes it possible to assess future developments. To establish trends of timber consumption, it is necessary in the first place to establish the size and composition of the population. Here it is not only the population statistics of the past which are of interest, but also what may be expected in the future. One is obliged to make forecasts; this is difficult and frequently in the light of later events such forecasts prove to be inaccurate.

Another essential factor which influences timber consumption is the standard of living. An improvement of this standard, under conditions of a capitalistic economic system and market economy, will influence the actual timber consumption in a very complicated manner, partly increasing and partly decreasing it. In the capitalistic economy, the necessary balance between supply and demand is achieved through the price mechanism. In the long run demand will regulate consumption, and this is also the case with forest products.

Conditions are different in a centrally directed economic system which has a planned economy with all its consequences. In such a system, consumption is not regulated by the potential demand, but by the plan governing the whole of the economy and which has been approved by the supreme leadership. Economic developments, as well as the standard of living of the population, are directly dependent on the plan which regulates both production and consumption. The authority which determines the pace of the general economic progress in the U.S.S.R. is the State Planning Commission (*Gosplan*). It determines which forest products shall be produced and consumed every year, and in what quantities; and it decides what changes shall be made in the consumption structure in the long run. It follows that this authority also decides which forest products shall be replaced with other materials, and what saving measures shall be applied to the timber consumption as a whole. Naturally, the real needs of the population are of considerable importance in a centrally directed economic system, but the effects of these make themselves felt only slowly and indirectly.

In the short run it is the Soviet planning authorities who determine the need for timber as a raw material, which in its turn comes from the production and use of the end-products. The output targets for the industrial end-products are of the greatest importance for timber harvesting in the forests and for the distribution of timber products among the wood-consuming industries. But it is impossible to ignore the fact that the internal supply of roundwood, the volume of which can

fluctuate only to a limited extent if sustained yield management is being strictly applied, has a relatively low elasticity, and that in the long run it is impossible to increase the supply. In other words, the consumption plan must be devised on the basis of the raw material. In the Soviet type of economy, no consideration has been paid in the past to the necessity for continuity in the production of forest crops. This has been possible because the country has large virgin forests. However, it is clear to anyone who has had the occasion to study Soviet literature on forestry planning that recently attention has been concentrated increasingly on the aspect of supply, i.e. the timber resources which it is possible to exploit. It might be said that the key to the entire planning system is in the organisation of material supply (Nove, 1961, p. 79).

Input and output calculations are necessarily connected in the planning process, and they interact. A contradiction which is inherent in the centralised economic system must be taken into account when demand and supply are being considered. While the general economic plan must be determined centrally, in order to achieve a co-ordination in the targets for the whole economy, the personnel of the basic production units must at the same time participate in the actual planning if unrealistic production goals for individual enterprises are to be eliminated. Soviet theorists define the problem as the need for "planning from above and from below" (Granick, 1954, p. 64). The central planners must primarily take into consideration the broad objectives set for the expansion of the economy, expressed in consistent series of output targets and at the same time take into account the actual production possibilities, and try to maintain a balance between supply and demand. The output of industrial roundwood, for instance, must be large enough to supply the needs of all those who require timber for producing their output, such as the paper industry and the building industry, otherwise there will not be enough paper and housing facilities. The achievement of this balance between supply and demand must be accomplished in the most efficient way. Producing sufficient sawnwood for housing is not justifiable in itself if building requirements could be met more economically by using construction materials other than wood. Moreover, the criterion of efficiency demands that the smallest possible input of resources should be used to meet a required output. If the economic system is to be rational, the balancing of supply and demand is a matter of calculation and co-ordination to obtain the biggest output from the smallest input (Campbell, 1960, pp. 84-85).

In reality, it is impossible to plan the activity of different economic sectors in isolation and without reference to the rest of the economy. The practical application of the "method of balances", frequently referred to by Soviet planners, requires that the over-all national economic plan be constructed in such a way that "the total output of each kind of goods be equal to the quantity which all its users are supposed to receive" (Leontieff, 1960; cf. Leeman, 1963, p. 93). It involves a form of simplified input-output procedure in predominantly physical or quantitative terms. Long-term planning, paying more attention to the needs of the future than to those of the present, is an essential feature of the Soviet system. This appears primarily in the well-known five-year plans, and the Seven-Year Plan of 1959-1965.

Under the five-year plans and other long-term plans, which are not "operational" no direct orders are given to an enterprise. The short-term (annual, quarterly, monthly) plans, by contrast, are of operational significance. They are derived basically from the long-term plans, and related to them in the sense that they are the practical expression of the same economic policy.

2.2 Determination of Output Targets for Logging Industry

The planning process starts, as a rule, in the State Planning Commission with the general goals, which have been formulated by the Council of Ministers. But the whole plan is not drawn up at the centre; the entire hierarchical pyramid of Soviet administrative and economic organisations participates in the planning activity. This applies also to the forestry sector. Not only do the agencies for forest administration and logging enterprises take part in the planning of the timber output, but also the industrial enterprises which are using wood as raw material, or which otherwise use forest products.

At the primary stage, planning consists mainly of making intelligent projections based on historical trends. Detailed calculations need not be made at the very beginning, but an actual operational plan must be more specific and should contain all the necessary details. This is done in the next planning stage, which starts when the specified directives regarding timber output, issued by the *Gosplan*, have passed through the administrative hierarchy.

The projected cutting volume, referred to in the annual plan and in the five-year plans, is basically derived from the "production and consumption balances for forest products" (*balans proizvodstva i potrebleniya lesomaterialov*). These balances are computed regionally,

i.e. a kind of an input-output table is compiled for every geographical-administrative district. On one side of the ledger are listed all sources of different timber products; on the other, the requirements of all potential consumers of these particular products are shown. These tables are based on a detailed analysis, the more important components of which are the structure of timber consumption, the available forest resources, the possible cutting volume, and the manpower and transport facilities (Nevzorov, 1959, p. 165). Clearly such a balance cannot include all the information necessary for planning purposes, but it is considered to fulfil its purpose inasmuch as it enables a higher authority to determine the cutting volume in a given area during a given period. It might be added that this does not constitute the final approval of the production plan. At this stage there will be arguments back and forth between the different administrative agencies and business enterprises concerned. When finally approved, however, the plan is the equivalent of a law, and under the Soviet law (*ukaze* issued by the Supreme Soviet of the U.S.S.R., on 24 May 1961, *V.E.*, 1961, 6), non-compliance is punishable with up to three years' imprisonment.

A preliminary proposal concerning the annual cutting volume (*lesosechny fond*) is submitted to the State Planning Commission (*Gosplan*) by the formal owner of the forest; until late in 1959, this was the Department of Forests and Shelterbelts in the Ministry of Agriculture of the U.S.S.R. After the 1959 administrative reform, when the Central Forest Administration (*Glavleskhoz*) was created in the Russian SFSR, the Republican Governing Boards and Regional Economic Councils (*sovnrarkhozy*) of the constituent republics seem to have become the formal owners of the forests. The Ministry of Forest Management (*Ministerstvo lesnovo khozyaistva RSFSR*), created in 1965, now again exercises control over the allocation of stumpage to the government enterprises responsible for timber harvesting in the Russian Federation. The basic forest administration units (*leskhozy*) have little to say about the volume of timber in the annual cutting budget, and their powers are fairly limited in this respect (Voronin *et al.*, 1960, p. 138).

The allocated cutting volume is distributed, as a rule, between *leskhozy*, provinces and constituent republics on the basis of the "allowable cut", which is calculated by the forest regulation offices. The Soviet conception of "allowable cut" in this context involves only that part of the cutting volume which can be defined as "final cut", i.e., where all saleable timber is removed on the cut-over area, and where a new forest generation must be established through regenera-

tion measures. The intermediate cut (thinnings, salvage cuttings) is determined only approximately by the working plan and, as is evident from the Soviet statistics, its extent is relatively small in comparison with the total cutting volume.

In the operational cutting plan which determines the actual allocation of timber for harvesting, the calculated allowable cut is of major importance only in the timber-deficit regions. Its importance seems to be very limited in the allocation of timber for cutting in the timber-surplus regions. To explain the deviations, it is usually said that the allowable cut is determined on the basis of biological criteria, irrespective of economic conditions and the timber requirements of Soviet economy (Nevzorov, 1959, p. 173). The practical application of the allowable cut in the well-forested areas would mean in some districts a discontinuation of logging or a decrease in the volume of timber output (Perepechin—Filinov, 1964, p. 47), which would be incompatible with the country's timber requirements. It is not only the domestic Soviet timber demand which determines the total cutting volume and assortment. Timber exports (Nevzorov, 1959, pp. 166-167) are also an important factor. Here the problem of priorities must be considered. Conflicting interests must be balanced against each other, and this must ultimately be done by a superordinate agency empowered to solve arbitrarily the conflict of interests between different parts of the Soviet Administrative apparatus.

2.3 General Trends in Timber Consumption

The total timber consumption of the U.S.S.R. has increased consistently from year to year. On the other hand the role of timber as a building material has declined gradually in comparison with other building materials, such as steel, concrete, brick and cement. In the case of fuel supplies various industries are now using fuels other than wood.

The industrial timber consumption per million roubles of the Gross National Product was 8,300 cubic metres in 1928, compared with about 700 cubic metres in 1958. The timber consumption per million roubles of capital investments decreased from 3,400 cubic metres in 1928 to 400 cubic metres in 1958.

The decrease of the relative timber consumption in the U.S.S.R. is also evident from the fact that from 1913 to 1958 the coal output increased 17 times, the steel production 13 times, and the cement output 22 times, while the felling of timber for building increased only 8.6

times, the output of sawnwood 5.7 times and the manufacture of plywood 6.5 times (Vasiliev *et al.*, 1959, p. 78).

The most striking structural change in timber consumption is the diminished share of fuelwood. The consumption of fuelwood has decreased not only in industry but also generally. It is remarkable that the fuelwood consumption has declined even in rural areas. This shift in consumption has been helped by the availability and the relatively low price of other fuels. Calculated per ton of conventional fuel (equal to 7,000 calories), the cost price of fuelwood in 1957 was 200 roubles compared with 96 roubles for coal, 32 roubles for oil and 12 roubles for natural gas. The decrease of fuelwood consumption has resulted in a decrease of the share of fuelwood in the total cutting volume. In 1913, fuelwood constituted 55 per cent of the total timber output, and had fallen to 50 per cent by 1940, to 40 per cent in 1950, and was down to 37 per cent by 1955. In the Seven-Year Plan, the share of fuelwood was put at only 24 per cent of the total cutting volume for 1965, and in the years 1970-1975 a further decrease of two to three per cent is expected.

The total timber volume consumed annually in the U.S.S.R. during the Fifties was 350-360 million cubic metres, of which 65 per cent was timber for building and industrial purposes (Barsky, *L.P.*, 1958, 4).

The consumption of timber by end-uses is classified as follows:

52.0 per cent as sawnwood

5.0 per cent as railway sleepers

6.3 per cent as pulp and chemical products

35.0 per cent as props, building timber and other roundwood

1.7 per cent as plywood and matches

The industry which uses most of the timber is the building industry, which consumes about 60 per cent of the total volume of sawnwood for industrial construction, and for building residential houses. In 1955, the combined volume of lumber and round timber used by the building industry was 110 million cubic metres, or 33 per cent of the total timber cut and 52 per cent of the total output of timber for building and industrial purposes.

In the U.S.S.R. the building of residential houses has increased by 60-70 per cent every five-year period to date. The consumption of timber per housing unit has, on the other hand, decreased. Despite this, we can calculate that the total timber consumption in the building industry will double in the next 15 years, provided that building activities retain their post-war rate of expansion.

The second largest timber consumer is the mining industry. The coal-mining industry uses 80 per cent of all props produced in the

country. It is estimated that the total consumption of props in the mining industry will be about 30 per cent higher in 1975 than it is at present.

The railways also use large quantities of timber. The annual output of sleepers is more than 10 million cubic metres, and a few million cubic metres of high-grade timber are used for the construction of railway waggons, etc. The total consumption of wooden sleepers will probably increase by 10—15 per cent in the next 15 years.

The shipbuilding industry consumes more than 2.5 million cubic metres of timber annually. The timber used for piles and posts amounts to about two million cubic metres.

About 25-26 million cubic metres of timber are used for crates and boxes each year. Provided that wood will be used for this in the future to the same extent as before, the total demand for timber by the packaging probably increase by 10—15 per cent in the next 15 years.

The furniture industry annually consumes four to five million cubic metres of timber. The manufacture of furniture will increase five times in the next 15 years. Provided that the present production methods are largely used in the future also, the total timber consumption of this industry is estimated to increase about four times by 1975. Often the wood used by the furniture industry is of a processed nature, such as veneer or plywood, and more recently also as fibreboard or particle board.

The veneer and plywood industry consumes about two million cubic metres of logs annually.

The match industry uses about one million cubic metres of logs a year.

The share of the pulp and paper industry in the total timber consumption is relatively modest, compared with other countries rich in timber. In 1955, the consumption of pulpwood for manufacturing chemical and mechanical woodpulp amounted to 10 million cubic metres (stacked measure) or 7.2 million cubic metres (solid measure), i.e. 3.4 per cent of the total annual cut.

Depending on the growth of the population and on improved standards of living the output of all branches of industry will increase considerably in the near future, and, consequently, the timber consumption will also be greater.

Provided that the economic expansion continues at the same pace, and that the existing structure of timber consumption is retained, the total requirement of building and industrial timber will be almost 510 million cubic metres by 1975, according to certain estimates (Barsky,

Table 3—1. Projected Requirements for Wood by End-Uses (roundwood equivalent)

Consuming industry	Consumption 1955		Calculated consumption 1975		Increase of requirements in 20 years
	<i>million cubic metres</i>	<i>per cent</i>	<i>million cubic metres</i>	<i>per cent</i>	
Building industry.....	103.3	48.5	211.0	41.5	104 per cent
Mining industry.....	21.5	10.1	28.5	5.6	33 per cent
Packaging industry.....	26.6	12.5	140.0	27.5	5.3 times
Furniture industry.....	5.8	2.7	24.8	4.9	4.3 times
Railway sleepers.....	10.0	4.7	11.0	2.2	10 per cent
Pulp and paper industry....	8.9	4.2	33.4	6.6	3.8 times
Other uses for timber products	36.7	17.3	59.6	11.7	62 per cent
Total	212.8	100.0	508.3	100.0	139 per cent

Source: Barsky, A., "Voprosy perspektivonovo potrebleniya drevesiny", *Lesnaya Promyshlennost*, 1958, 4.

L.P., 1958, 4). This means that the annual total cut must amount to 770—780 million cubic metres, because fuelwood is the joint product of roundwood for building and industrial purposes. It is also estimated that the total timber requirements may rise to 1,000 million cubic metres by 1980 (Vasiliev, *L.Kh.*, 1962, 3 and Sprintsyn, *L.P.*, 1964, 2), even if the timber consumption quotas be reduced to two-thirds or a half of the present level on account of technical progress. The estimated requirements for roundwood in 1975 by the various consumer groups are given in Table 3—1.

The above forecasts of the potential timber requirements in 1975 are based on the assumption that the present technology will remain more or less unchanged, or, in other words, that the old structure of timber consumption will be retained. But this is not so. The Seven-Year Plan provides for far-reaching changes in the consumption structure, so that the forecast for timber requirements in 1975 will be quite different from those presented in Table 3—1 above. We shall examine the matter in more detail in the next chapter.

2.4 Timber Consumption according to the Seven-Year Plan 1959—1965

In the compilation of the Seven-Year Plan, two alternatives were possible for satisfying the total need of the economy for forest products.

The first alternative, submitted in the preceding chapter, aimed at satisfying the growing need of the country for forest products while retaining the existing production and consumption structures. This alternative provided for an extensive increase of the total cut, which

was to correspond to the potential demand for forest products up to 1975. The implementation of this plan, however, would have meant not only an expansion in the capacity of the forest industry, but also a considerably increased demand by this industry for raw materials. In order to meet this demand, the total volume of the timber cut in 1965 would have had to be 520—530 million cubic metres, and in 1975 no less than 770-780 million cubic metres, or almost twice as much as in 1958. This cut was considered to be too large, and to be likely to lead in the long run to an exhaustion of the timber resources. Moreover, such an expansion of the timber output would have required large-scale investments in the logging industry; the geographical relocation of the logging areas, which can be carried out gradually, would also have met with unsurmountable difficulties. For these reasons this alternative for the planning of timber consumption was rejected.

For the Seven-Year Plan it was decided to implement the second alternative which was based on a structural change in both the production and the consumption of timber. The basic idea was that the industries using timber should go over to production methods which were more economical on raw materials. At the same time, there was to be a general attempt to decrease the timber consumption volume, while the timber to be consumed would be in a more processed form. To achieve this, it would be necessary to expand the capacity of the existing wood-processing industries and to establish a number of new plants for manufacturing new timber products.

At the same time, however, the Seven-Year Plan provided to meet the total timber consumption needs of the economy. This objective could be reached only if the planned timber consumption of the various sectors of industry based on wood were to decrease in relation to the volume of their end products, and if there were a corresponding decrease in the total consumption of wood by industry. In other words, timber as a raw material and a construction material would be replaced to the greatest possible extent by other materials. The timber supply plan for 1959-1965 was drawn up on the premise that such a structural change would in fact take place.

According to the Seven-Year Plan, the wood consumption for industrial purposes in the U.S.S.R. was not to increase in proportion to the total industrial expansion. The development of the metal industry was considered to be the most important for the Soviet economy, followed by an increase in the output of oil, gas and chemical products. The accelerating expansion of the gas and oil industry will alter the structure of the country's fuel market, and thus provide the basis for an ex-

Table 3—2. Development of Wood Consumption in 1950—1965

Type of wood consumption (in roundwood equivalent)	1950		1958		1965	
	million cubic metres	percentage of total consumption	million cubic metres	percentage of total consumption	million cubic metres	percentage of total consumption
Industrial consumption (capital constructions, industrial raw material, etc.)	147.8	96.8	194.2	88.6	237.9	85.6
Private consumption (timber sales to the <i>kolkhozy</i> and to the population) . .	2.3	1.5	15.4	7.1	25.4	9.2
Other uses ¹	2.7	1.7	9.4	4.3	14.4	5.2
Total	152.8	100.0	219.0	100.0	277.7	100.0

¹ This refers presumably to the timber exports.

Source: Yarmola, I. S. "Potreblenie drevesiny vi semiletii 1959—1965", *Lesnaya Promyshlennost*, 1958, 12, p. 2.

pansion of the chemical industry. The Seven-Year Plan provided for the total timber output to increase from 325 million cubic metres in 1958, to 385 million cubic metres in 1965, that is, by 15 per cent. The plan provided for an increase in the output of industrial roundwood from 219 to 278 million cubic metres during the same period. The actual removals of timber for building and industrial purposes totalled 258 million cubic metres in 1965 (*L.P.* 3 Feb. 1966).

According to the calculations on which the Seven-Year Plan was based, the ratios of wood consumption for industrial and for private purposes were to change noticeably in 1959—1965, as can be seen in Table 3—2.

The actual wood consumption in the past and the planned wood consumption in the future in certain sectors will be compared in greater detail below.

According to Yarmola (*L.P.*, 1958, 12), the wood consumption in the building industry, calculated per million roubles (old) of total building costs, decreased between 1950-1958 from 840 to 405.6 cubic metres, in terms of roundwood equivalent. For 1965, the corresponding figure was put at 315 cubic metres, i.e. 90.6 cubic metres or 22.3 per cent less than in 1958. This would save a total of 20 million cubic metres of timber. According to more recent data (Popov, *L.P.*, 1963, 10), the timber consumption of the building industry should have decreased by 42 per cent by 1965.

The relative decrease in the timber consumption of the building

industry has been attained partly by replacing timber by concrete, and partly by replacing sawnwood by fibreboard and particle board.

The average consumption of concrete per million roubles (old) of building costs was to increase from 142 cubic metres in 1958 to 203 cubic metres in 1965; the consumption of concrete in the construction of residential houses should have increased from 182 cubic metres in 1958 to 385 cubic metres in 1965.

The reduction of timber consumption quotas (standard consumption) in other sectors of industry was intended to save 11.3 million cubic metres of round timber, including 3.9 million cubic metres of props, which were to be saved in the mining industry by replacing them to the same extent by other materials (concrete, metal).

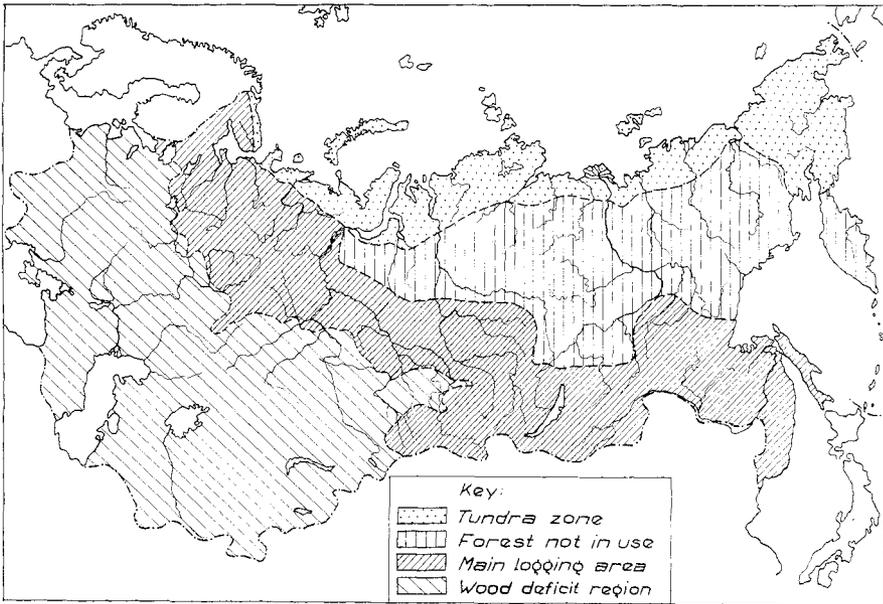
It was intended to save no less than 5.9 million cubic metres of sawnwood (in terms of roundwood equivalent) in the manufacture of prefabricated timber houses and other building details by replacing timber by various substitutes. The wood consumption for the manufacture of one square metre of floor space would have decreased from 0.51 cubic metres in 1958 to 0.35 cubic metres in 1965, according to the prescribed standards.

The consumption of pulpwood for the manufacture of one ton of cellulose would be cut from 5.21 cubic metres in 1958 to 5.0 cubic metres in 1965, according to the Seven-Year Plan. This was intended to reduce the total pulpwood consumption by several million cubic metres. The pulp industry was to go over to using sawmill waste, reeds, straw, various kinds of grass, etc., as raw material instead of pulpwood from conifers. Timber from deciduous species was also to be used as raw material for pulp production on a relatively large scale.

It was forecast that these raw materials would replace more than eight million cubic metres of pulpwood.

It was planned to replace wooden crates and boxes by paperboard containers. This in its turn would increase the share of paperboard in the total volume of packaging material from 5.4 per cent in 1958 to 33.4 per cent in 1965, thus saving 14 million cubic metres of roundwood.

According to the original Seven-Year Plan, the coal output was to increase by 24.2 per cent, and the output of iron ore by 71 per cent. The consumption of props during the same period was, on the other hand, to increase by only 5.2 per cent or 1.2 million cubic metres. This decrease in the relative consumption of pit-props was due to improved mining methods. In 1958, the consumption of props was 36.4 cubic metres per 1,000 tons of coal mined, while the corresponding figure for 1965 would be 30.2 cubic metres.



Source: Perepechin-Filinov, *Lesopolzovanie v SSSR 1946—1962 gg.*, 1964

Fig. 3:1. Principal Zones of Logging Operations

Railways were to be expanded considerably under the Seven-Year Plan although the timber used for railway sleepers was to increase by only 12.4 per cent from 1958 to 1965. Impregnation methods would be used to prolong the service life of sleepers to 19 years by 1965 from the average of 13.4 years for the Fifties. This would mean a saving of 12 million sleepers during the Seven-Year Plan. Also five million concrete sleepers were to be put down during the period of the Plan.

According to the original Seven-Year Plan, the manufacture of furniture was to increase 2.4 times between 1958 and 1965. However, the total wood consumption in the manufacture of furniture would increase by only 27.9 per cent or 6.3 million cubic metres; this would be attained by using particle board, which was to replace 48.5 per cent of all sawnwood used in the furniture industry by 1965.

The changes in the wood consumption outlined above, from which the compilers of the Seven-Year Plan proceed, indicate the development planned for wood consumption. Possibly the actual consumption has differed from the original long-term plan, which should be regarded more as a forecast or flexible plan for the determination of the main lines of balance between the timber supply and the timber requirements. The annual production plans depict the actual situation much

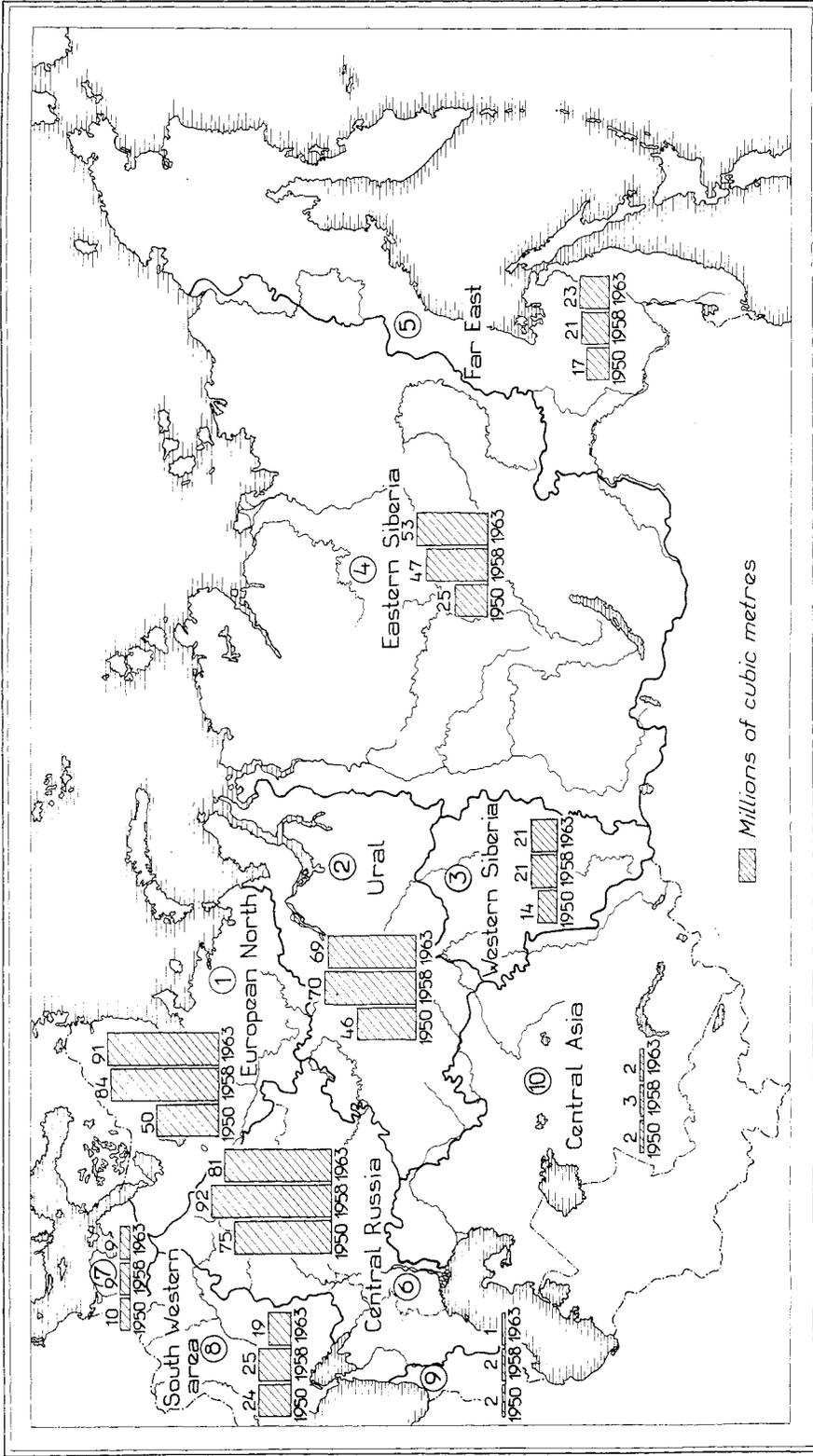
better, especially in cases where the long-term development plans could not be fulfilled. But what can really be deduced from the above report are the long-term trends in wood consumption, which in western countries are determined by supply and demand in the timber market, but which in the Soviet system are determined by the economic plan. The interesting feature here is that the model for the planned wood consumption of the U.S.S.R. seems to be the western model, although the Soviet plan suffers from being outdated in some respects. The targets of the Seven-Year Plan reflect the trends in wood consumption prevailing more than ten years earlier in the western world under open competition.

2.5 Geography of Timber Harvesting and Processing

Soviet forest resources are very unevenly distributed territorially, as has been pointed out earlier, and this also applies to the timber removals. Figure 3: 1 shows the principal zones of logging operations. However, this map does not give a complete picture of the situation: more detailed descriptions of the geographical distribution of timber output and developments during the period 1950-1963 are contained in diagrams in Figure 3: 2. Here can be seen the quantities of timber which have been harvested in the major economic regions of the U.S.S.R., and how the volume of timber removed in the different regions has changed during this period.

From very early times, the centre of timber harvesting has been the most easily accessible forests of European Russia. The less accessible forests of the northern part of European Russia and of Siberia remained almost untouched during the Czarist era, and it is only in recent decades that logging operations have been carried out in these virgin forests; they are now being worked on an ever-increasing scale. Table 3—3 shows the gradual transfer process of the timber output within the major geographical areas during the period 1913-1963. The percentages given show that the timber removals in 1963 were considerably greater than those of 1913 in the timber-surplus regions of European Russia, and especially those of Siberia. In the timber-deficient regions the relative share of the removals has fallen, but in absolute figures the decline is insignificant or almost non-existent.

The transfer of logging operations from the timber-deficient to the timber-surplus regions seems to be far from complete. However, the rate of transfer has recently been slowed down by the fact that the building of wood-processing installations in the new locations for the



Source: Narodnoye Khozyaistvo SSSR v 1963 godu, 1965

Fig. 3: 2. Removals of Roundwood in Main Economic Regions, selected years, 1950—1963

Table 3—3. Percentage Distribution of Timber Output, by Major Geographical Areas, in the U.S.S.R., selected years, 1913—1960

Major Geographical Areas	1913	1940	1955	1960
	<i>per cent</i>			
Timber-surplus regions in European North and the Urals.....	25.4	40.7	41.1	45.1
Timber-surplus regions in Siberia.....	8.0	20.2	22.4	23.0
Timber-deficit regions.....	66.6	39.1	36.5	31.9
Total	100.0	100.0	100.0	100.0

Sources: (1) *Narodnoye khozyaistvo SSSR v 1960 godu*, Moscow, 1961, pp. 298—299.
 (2) Vasiliev-Voronin-Motovilov-Sudachkov *Ekonomika lesnogo khozyaistva SSSR*, Moscow, 1959, p. 203.

industry has been delayed. Consequently, roundwood has had to be transported over longer distances to the places where it is consumed and where until now wood processing has been carried out. It has been found that roundwood is a raw material which it is undesirable to transport over long distances, and that the correct solution is to transport instead timber products, i.e. lumber, plywood, pulp and paper. However, the present location of the wood-processing installations in the U.S.S.R. (see Figure 1: 12, and Figure 1: 13) makes it impossible to realise this ideal.

Table 3—4 shows the volume of growing stock and annual cut as well as the output of lumber, plywood and paper products, including paper-board, in 1960 in the various economic regions. As can be seen, the output of these processed products is very modest in the eastern parts of the country. A comparison between the timber resources, timber cut and wood processing for the different regions shows how great is the disproportion between these basic production items in the forestry sector in the Soviet economy. The table shows the tremendous underdevelopment of industrial production or wood processing in the eastern parts of the country. In Eastern Siberia, where half the forests (in terms of volume) of the U.S.S.R. are situated, the timber removals account for only 0.1 per cent of the existing timber stock, while only 41 per cent of the roundwood is processed within the region. The remaining roundwood is sent in an unprocessed state to other regions or else it is consumed directly on the spot. Furthermore, it can be seen from the table that the timber-deficient regions in the western and southern parts of the U.S.S.R. (economic regions 6-10) together account for almost 32 per cent of the total timber harvest and for 53 per cent of wood processing. It should be added, that this table does not

Table 3—4. Volume of Growing Stock, Annual Cut and Output of Processed Forest Products, by Regions, 1960

Main Economic Regions and countries	Volume of growing stock in the State Forest Fund million cubic metres	Volume of annual cut		Production of processed forest products				
		million cubic metres	as a percentage of growing stock	Lumber million cubic metres	Veneers and plywood thousand cubic metres	Paper and paper-board thousand tons	Total	
							expressed in round-wood equivalent ¹ thousand cubic metres	as a percentage of annual cut
Regions of the RSFSR:								
1. European North	7,396	90.2	1.2	16.8	235.7	957.7	31,538	35
2. Ural.....	8,334	76.3	0.9	15.3	225.7	531.3	27,841	36
3. Western Siberia...	4,025	18.8	0.5	6.1	5.9	1.4	10,206	54
4. Eastern Siberia...	38,783	49.2	0.1	12.1	17.3	13.3	20,289	41
5. Far East.....	12,053	16.9	0.1	4.6	31.1	226.5	8,463	50
6. Central Russia....	3,513	85.0	2.4	28.7	383.9	700.9	70,478	83
Total RSFSR.....	74,104	336.4	0.5	83.6	899.6	2,431.1	168,815	50
7. Baltic area								
Estonia.....	88	2.0	2.3	0.9	23.1	97.1	1,874	94
Latvia.....	170	4.4	2.6	1.2	120.2	98.3	2,600	59
Lithuania.....	111	1.8	1.6	0.9	27.9	83.4	1,797	100
Kaliningrad.....	22							
Total.....	391	8.2	2.1	3.0	171.2	278.8	6,271	76
8. South-Western area								
Belorussia.....	365	7.3	2.0	3.0	169.7	101.6	5,721	78
Ukraine.....	638	13.5	2.1	10.5	104.1	361.2	18,666	138
Moldavia.....	16	0.2	1.3	0.5	—	—	0,835	418
Total.....	1,019	21.0	2.1	14.0	273.8	462.8	25,222	120
9. Transcaucasia								
Georgia.....	371	1.2	0.3	0.8	6.3	33.7	1,461	122
Armenia.....	31	0.2	0.6	0.2	2.4	2.0	0,345	173
Azerbaijan.....	98	0.2	0.2	0.5	—	0.8	0,836	418
Total.....	500	1.6	0.3	1.5	8.7	36.5	2,642	165
10. Soviet Central Asia								
Kazakhstan.....	286	2.0	0.7	2.4	—	—	4,008	200
Kirgizia.....	21	0.1	0.5	0.2	—	0.3	0,335	335
Turkmenia.....	10	0.2	2.0	0.2	—	—	0,334	167
Tadzikistan.....	5	—	—	0.2	—	—	0,334	
Uzbekistan.....	8	0.1	1.3	0.5	—	17.3	0,880	880
Total.....	330	2.4	0.7	3.5	—	17.6	5,891	245
Grand total for the U.S.S.R.....	76,344	369.6	0.5	105.6	1,353.3	3,226.8	208,841	57

¹ Calculated on the basis of FAO conversion factors (*Yearbook of Forest Products Statistics, 1963*).

Source: Vasiliev, P. *Ekonomika ispolzovania i vosproizvodstva lesnykh resursov*, Moscow, 1963, p. 105.

Table 3—5. Output of Roundwood and Main Processed Forest Products, Actual and Planned Figures, selected years, 1958—1965

Products	Actual production			Planned production for 1965	
	1958	1962	1964	According to the original Seven-Year Plan	According to amendments of the Seven-Year Plan
Removals of industrial roundwood, <i>million cubic metres</i> .	251	256	277	275—280	(unaltered)
Production of sawnwood, <i>million cubic metres</i>	94	105	111	92—95	(alterations not known)
Production of wood pulp, <i>million tons</i>	2.1	?	?	4.8	6.2
Production of paper, <i>million tons</i>	2.2	2.8	3.0	3.5	4.2
Production of paper-board, <i>million tons</i>	0.7	0.9	1.1	2.8	3.6

Sources: (1) *Izvestia*, 14 November 1958. (2) *Bumazhnaya Promyshlennost*, 1959, 1 and 1960, 11. (3) *Narodnoye khozyaistvo SSSR v 1964 godu, 1965*

include all wood processing, but only the products from sawmills and the plywood and paper industries. However, it is these branches of industry which process the greatest part of the timber (regarded as raw material); thus the supplementing of this table with the volume of production of the remaining branches of this industry would not bring about any great changes in the general picture. Moreover, to supplement the table in this way would favour the timber-deficient regions, as the production of the other branches of this industry, i.e. fibreboard, particle board, matches, furniture, etc., is mainly concentrated in the timber-deficient regions.

There will be a gradual change in the geographical disproportion between timber as a raw material, on the one hand, and the processing of this timber carried out under the plans, on the other hand. With this as a background, let us take a closer look at the production plans drawn up for the future.

2.6 Production Targets for Forest Industries and Fulfilment of the Plans

The Seven-Year Plan provides a general outline of projected development in the forest industry during the period 1959-1965. It fixes the production targets, in terms of volume, for the main forest products for 1965. As a matter of fact, over 60 per cent of capital investment in the

forest industry over the seven-year period was intended for the pulp, paper and wood-processing industries. In previous years, the largest share of the investments was allocated to the development of the logging industry.

By 1965, the total removals of timber or annual cut (excluding cuttings in *kolkhoz* forests) are planned to reach 373—378 million cubic metres, of which 275-280 cubic metres will be industrial roundwood. As is shown in Table 3—5, in comparison with the base year 1958 on which the projections were made, this output target for industrial roundwood appears to be modest. The tables show that the output target for 1965 in the sawmilling industry was also set relatively low and in fact, from 1958 to 1965 no increase was planned.

According to the original Seven-Year Plan (published in *Izvestia*, 14 Nov. 1958) a production increase of 33—38 per cent was expected, as the 1958 production of sawnwood, at that time, was estimated at only 69 million cubic metres. However, in the statistical yearbooks (*N.Kh. SSSR*) for all the years from 1960 to 1963, the published figure for the 1958 production of sawnwood in the U.S.S.R. is 93.7 million cubic metres; this figure has been rounded off to 94 in Table 3—5. These sources indicate that the actual production of lumber in 1962 exceeded the output target for 1965, and this in itself gives rise to doubts as to the correctness of the figure cited in the 1965 plan.

According to the original target of the Seven-Year Plan, the production of wood pulp should increase to 4.8 million tons by 1965. The corresponding production target for paper was set at 3.5 million tons, and for paperboard at 2.8 million tons. For these products the rate of growth originally anticipated was considerable. However, it soon became evident that the demand for paper and paperboard would be greater than the production target of the original Seven-Year Plan, and that there would be marked deficits in the supply of these products. Consequently, the original Seven-Year Plan was changed in 1960, and the following production targets were set up for 1965 (*B.P.*, 1960, 11): pulp 6.2 million tons, paper 4.2 million tons and paperboard 3.6 million tons. However, these new production targets, could not be achieved in practice. Table 3—5 shows the great differences between the 1965 production target of the Seven-Year Plan and the quantities of paper actually produced in 1964. However, no figures for pulp production are published in the official statistics, but it seems likely that the differences between the figures of the long-term plan and the actual production will be even larger than the differences in the case of paper.

The greatest relative production increase in the Seven-Year Plan is

for particle board and fibreboard. As part of the wood-economy campaign, it was originally planned to increase the production of particle board to 3.5 million cubic metres, and of fibreboard to 300 million square metres annually by 1965. These branches of the industry were relatively undeveloped at the start of the Seven-Year Plan in 1959. The production of particle board in 1964 was 0.6 million cubic metres and fibreboard 118 million square metres (*N.Kh. SSSR*, 1965).

One can conclude from the above that the targets set in the Seven-Year Plan for the wood-processing industry, with the exception of saw-mills (no data is available concerning the production of plywood), have not been attained. This is now also officially admitted by the Soviet authorities (Popov, *L.P.*, 1966, 1, p. 4). One can thus take a sceptical view of the possibility of reaching the long-term production targets which have been published regularly in technical journals. For example, in 1962 certain figures were published for the long-term plan up to 1980 (Vasiliev, *Pl.Kh.*, 1962, 9; Vasiliev, 1963). In the changed circumstances which prevail now, and particularly taking into account the fact that the situation in 1965 was quite different from that which was anticipated to be the case three or four years ago, these long-term forecasts are of rather limited value. One can take only the trends from them and see in which direction the Soviets would like their economy to go, and what factors they have to take into account.

The new Five-Year Plan for the development of the Soviet economy for the period 1966-1970 sets the following production targets for the forestry sector for 1970 (*L.P.* 24 Feb. 1966) :

Timber removals, incl. fuelwood	350—365 million cu.m
Pulp	8.4— 9 million tons
Paper	5—5.3 " "
Paperboard	4.2—4.5 " "
Furniture	2.6—2.8 billion roubles

The success of the new Five-Year Plan will depend on the priority which the State authorities give to the expansion of the forestry sector compared with other sectors of the economy. Should top priority be given to the forestry sector within the general framework of the economic expansion of the country, one can expect a greater rate of expansion in the future in the productive capacity of the wood-processing industry, too. A regional study of the conditions for the expansion of the forest industry is therefore of great importance.

3. Potentialities of the European North

3.1 *Introductory Remarks*

The northern part of European Russia is the most important region in the Soviet Union, as far as the forest industry is concerned. The area not only has a large growing stock and a relatively well developed wood-processing industry, but its forests are also accessible. This last factor is decisive in the exploitation of the Eurasiatic timber resources. The region now holds a prominent position, thanks to its favourable geographical location and to the accessibility of its forests. There is no doubt, however, that the annual cut in certain more easily accessible forests has steadily far exceeded the annual growth, and that the growing stock has steadily declined in consequence, particularly with regard to the larger dimensions, such as sawlogs. The question is: "How large is the remaining supply of accessible, mature growing stock, and what opportunities exist for exploiting the forest resources which have so far been considered non-exploitable, either for technical or for economic reasons?"

The region is generally sparsely populated, with only three inhabitants per square kilometre. This is an obstacle to the development of the forest industry, although the exploitation of the timber resources of the area began fairly early. It is reported that commercial logging operations were taking place on the Northern Dvina in the 17th century, primarily for export purposes. In the end of the 17th, and at the beginning of the 18th century, the first large water-powered sawmills were established in the Archangel area, and somewhat later also on the mouth of the Onega.

Archangel, with its 26 sawmills, was Russia's biggest wood-manufacturing centre and export harbour for sawnwood before World War I. The region has retained its former position under the Soviets as the largest producer of lumber, and has, moreover, a number of new wood-processing industries. Roundwood removals have also increased considerably, compared with the Czarist era. At the same time, the Archangel region has undergone a thorough economic change. Other branches of industry have developed rapidly, following the discovery of apatite and naphthalene deposits in the Murmansk area, of certain useful minerals in Karelia, and of coal and oil deposits in the Pechora basin. This development has in its turn favourably influenced the forest industry. A contributory cause of the industrial development in general, and of the development of the forest industry in particular, are the

new railways, which have been constructed here on a larger scale than anywhere else in the Soviet Union.

3.2 Timber Stock

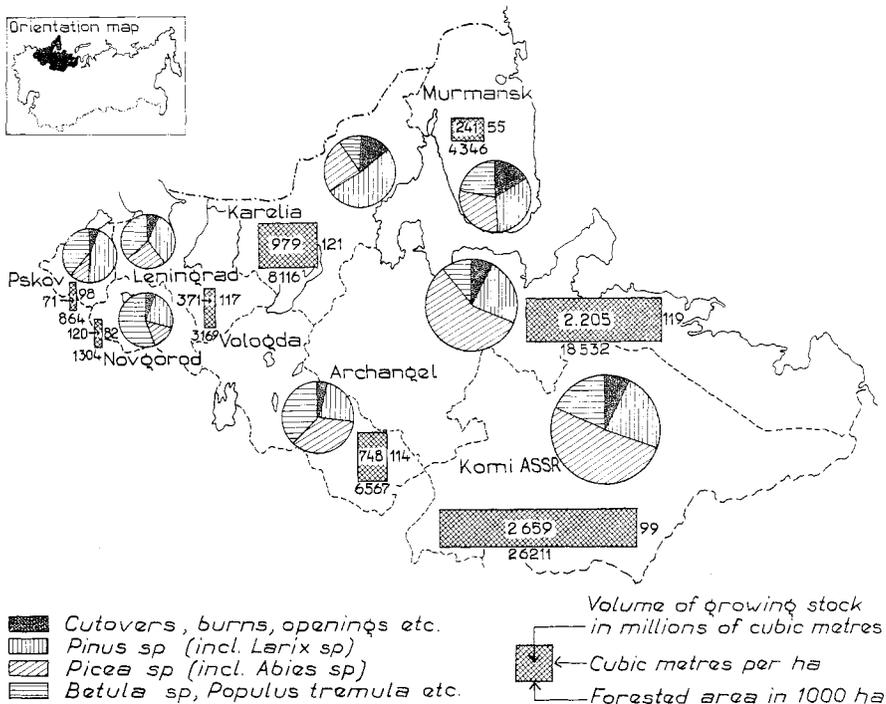
According to the last forest inventory of 1 Jan. 1961, the total area of the forest land in this region was 76.5 million hectares, of which 69.8 million hectares or 91.5 per cent were covered by some kind of timber stock. The area not covered by forests comprises the cut-over and burned areas, and semi-permanent openings which have previously been forested, i.e. in productive condition. The non-forest area (water, swamps, other impediments, agricultural land, etc., totalling 28 million hectares) is not included in the above total figure of forest land, although it is under the administration of the forest authorities.

The total volume of the growing stock in the region was estimated to be 7,394 million cubic metres, of which 5,782 million cubic metres is mature timber. The total timber stock comprises 6,517 million cubic metres or 88 per cent of conifers and 878 million cubic metres or 12 per cent of deciduous species. The corresponding figures for the mature timber stock are conifers 5,249 million cubic metres or 91 per cent, and deciduous species 533 million cubic metres or nine per cent.

The distribution of forest resources by provinces in the European North is depicted diagrammatically in Figure 3:3. The quadrangles represent the total timber resources, their width indicating the area in thousands of hectares, and their height indicating the volume in cubic metres per hectare; the numbers in the middle of the quadrangles give the total volume in millions of cubic metres. The circles represent the distribution of the forest area by dominant tree species, as well as the proportion of the forest land not covered by forest at the time of the inventory. It is noticeable that the non-forested areas are relatively large in the Murmansk district, which is due to the fact that the returning of the land to productive condition after clear-felling has proved to be particularly difficult in the regions north of the Arctic Circle.

The coniferous species cover almost 73 per cent of the total forested area. Spruce (*Picea excelsa* and *P. obovata*) predominates on "fresh" and moist soils. Overmature spruce covers immense areas in the virgin forests, more particularly in the regions farthest from the big rivers east of the Northern Dvina.

Pine (*Pinus silvestris*) predominates on dry and acid soils, as well as on the sandy soils of river banks. Pine forests occur over a large



Source: Lesnoy fond RSFSR, Statisticheskyy sbornik, 1962

Fig. 3: 3. Distribution of Forest Resources, by Provinces, in European North

area, mostly in Karelia (52 per cent) north of the great lakes Ladoga and Onega, and in the basin of the Vaga.

Deciduous tree species, predominantly birch (*Betula sp.*) and aspen (*Populus tremula*), cover 18 per cent of the total forested area. It is characteristic of the region that deciduous forests are relatively more extensive in districts where the site quality class is higher than the average. This clearly indicates that the easily accessible forests with higher productive capacity have been clear-felled on a much larger scale than the less easily accessible forests with a lower productive capacity.

The average volume of growing stock per hectare of the total forested area is highest in Karelia (121 m³/ha) and in the Archangel province (119 m³/ha), because of the prevalence of old, and the lack of young and middle-aged timber in these areas. Taking into account only the average volume of mature and overmature timber, the volume per hectare is highest in the Leningrad (178 m³/ha) and Vologda (173

m³/ha) provinces, because the average productive capacity of forest land is higher there than in districts situated in less favourable climatic zones, i.e. farther north. In the severe climate near the tundra zone, the volume per hectare of forest land is relatively low. According to the Russian classification, the average production is below that of the lowest site quality class (V-). Production increases farther south, and relatively valuable stands occur in those parts of the region which enjoy better climatic conditions. But large areas of forest land in the region are swampy, more particularly in the plains between the rivers, where marshes and bogs cover up to 60 per cent of the total area (*Selskokozyaistvennaya Entsiklopedia*, 1953, p. 46).

It is generally believed that in the virgin forests, the volume of the timber stock will not change, because growth and drain are balanced. This is applied also to the forest in north Russia (Medvedev, 1962, p. 37).

The average age of pine is estimated at 140 years, and that of spruce at 155 years, in the Komi ASSR. The corresponding figures in the Archangel province are 127 and 150 years, and in the Vologda province 135 and 137 years. Six per cent of the pine stands in the Archangel province are older than 200 years; 65 per cent of the pine and 91 of the spruce are between 100—200 years old. Despite this high age the timber felled in the northern forests is not of large dimensions. The average top diameter of the sawlogs is between 20—25 centimetres. Most of the timber harvest is pulpwood. However, the quality of the timber, owing to its slow growth, is relatively high. The timber merchants of the United Kingdom value the close-grained "Archangel redwood" as one of the best quality timber, next to the highest quality softwood imported from the Kara Sea (Mallinson—Leigh, 1964, p. 5). It seems, however, that the most easily accessible highquality timber stands in the European North have already been exhausted.

3.3 *Transport Network*

3.3.1 *River Systems*

North Russia's waterways are the most important timber transport routes in the region. As much as 82 per cent of the exploitable timber resources are located close to the waterways. The rivers traversing the northern coniferous belt in a northerly direction empty into the White Sea (the Northern Dvina, the Onega and the Mezen) and into the Barents Sea (the Pechora). The rivers flowing to the west empty into

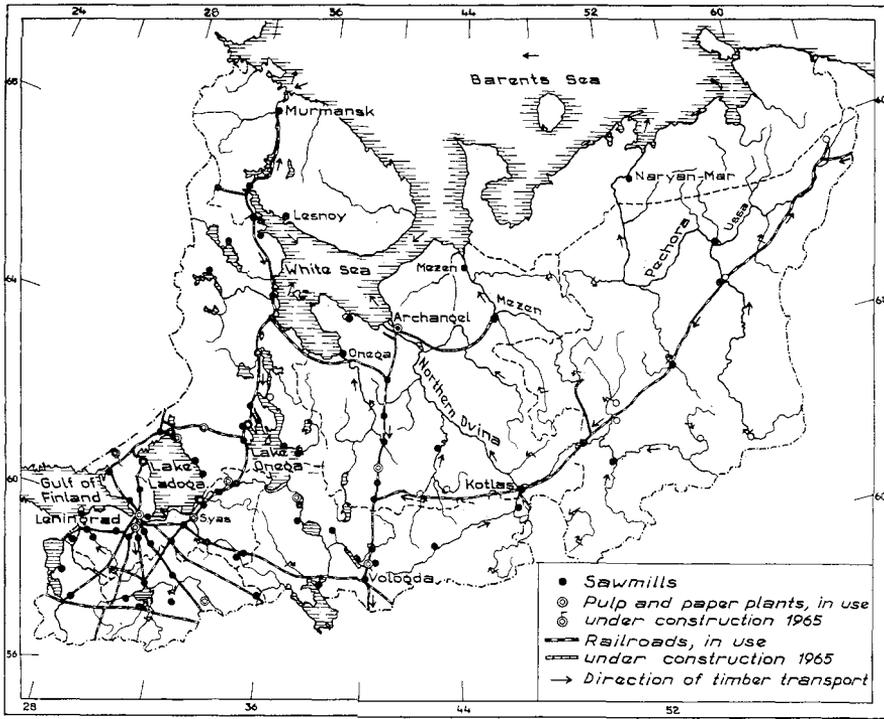


Fig. 3: 4. Geographical Map of European North

the Baltic (the Neva). The geographical location of the rivers is presented on the map in Figure 3: 4.

Lakes Ladoga and Onega are of the greatest importance for timber transport in the western part of the region; they are connected via the Neva-Svir river system with the Baltic in the south, and via the Stalin Canal with the White Sea in the north. Timber from the White Sea region can be transported to the Baltic via this waterway, and this is done on quite a large scale.

The Northern Dvina with its tributaries—the Vychegda, the Pinega and the Vaga—constitutes the main waterway system of the region. The rivers belonging to this system have a total length of 58,000 kilometres, and the total area of the basin is 360,000 square kilometres. The Northern Dvina is 750 kilometres long, the Pinega 795 kilometres, the Vaga 580 kilometres, the Vychegda 1,090 kilometres, the Sysola 500 kilometres, the Vym 395 kilometres, the Vishera 380 kilometres, the Lokchim 268 kilometres, the Jug 491 kilometres, and the Luza 560

kilometres (with tributaries 2,500 kilometres). Almost all these rivers have their source in great swamp regions.

The **Onega** waterway system comprises no fewer than 62 rivers, with a total length of 3,493 kilometres, 2,557 kilometres of which are at present floatable. The total length of the floating channels in Karelia is estimated at about 4,300 kilometres.

The **Mezen** river system comprises 194 tributaries. The total length of the rivers in the system is 129,000 kilometres, of which 10,000 kilometres are floatable. The sources of the Mezen are in the vast swamps in the vicinity of the Timan Range, and the length of the main river is 910 kilometres. Owing to its steep grade—the difference of the river's level between Rybnoye and Kamenka is 145 metres—there are numerous cataracts which make navigation difficult. Moreover, the tidal range at the river's mouth in the White Sea is so great that its effects are felt 100 kilometres inland. This has hampered the construction of harbours for timber transshipment in the lower Mezen.

The **Pechora** river system comprises 285 tributaries, which together with the main river have a total length of 26,000 kilometres, of which 22,000 kilometres are floatable. The Pechora's sources are in the northern part of the Urals, 677 metres above sea level. It is 1,814 kilometres long from the Urals to the Barents Sea.

With the exception of the Mezen and of the Pechora, the big rivers of north Russia are particularly suitable for timber floating. Most of the minor rivers have not been adapted to this work, and floating on them is rather difficult.

The floating of individual logs is the rule only in tributaries. At the confluence of the tributary with the main river, the logs are joined into rafts, which in their turn are joined into larger units or raft caravans for towing along the main stream. The rivers of the north Russian plain flow slowly as a rule, and floating down the river would take many months without the assistance of tugs.

3.3.2 Railways

The railways have played an important role in the development of the forest industry in north Russia. The region—with the exception of the Leningrad, Pskov, and Novgorod provinces, which are not included in the present discussion—has at present only two kilometres of railways per 1,000 square kilometres. Twenty-five years ago, the following railways existed in this immense area (cf. the map in Fig. 3: 4):

1. The Kirov railway, built in 1916, which runs through the western part of the region,
2. The Northern railway, Moscow-Vologda-Archangel, 622 kilometres of which run through the region,
3. The Leningrad-Vologda-Kirov railway, which runs through the southern part of the region,
4. The Kirov-Kotlas railway.

During and after World War II, the construction of railways in the area was increased, and several new lines were opened for traffic. This led to a considerable development of the forest industry in the region. Large virgin forest stands became accessible, and this was the beginning of a new epoch. The following new railways are important to the forest industry:

5. The Belomorsk-Obezersk railway connecting the Kirov railway with the Northern railway;
6. The Konosha-Kotlas-Vorkuta railway which runs 1,562 kilometres through the region. A branch railway extends a further 250 kilometres to Salekhard on the Ob, and another to Khalmeryu;
7. The Puksa-Navolsk branch railway, connecting the Plesetsk timber transfer centre on the Onega with the Northern railway;
8. The Isakogorka-Nenaksa branch railway, connecting the Severodvinsk industrial centre with the Northern railway;
9. The Mikun-Syktyvkar railway.

In addition to this, a special Ertsevsky-Mekhrensky-Monsensky forest railway has also been constructed.

The total length of the railways in the Archangel-Vologda and Komi districts is estimated at 3,600 kilometres. This railway network cannot be considered adequate for a territory of over one million square kilometres, particularly with reference to the timber exploitation facilities. To expand forest exploitation and to open up hitherto inaccessible virgin forests, the following railways are either planned or already under construction:

1. A forest railway from the Mikun railway station on the Vorkuta railway to Koslan on the Mezen river, a branch of which is to extend to Ertom on the Vashka river. Reportedly the construction has already progressed considerably.
2. A forest railway from Archangel to the Pinega; thence a branch to Leshukonskoye on the Mezen, and another branch to Ertom. Details of the exact alignment are not available.

3.3.3 Roads

In some parts of the European North, there are many roads suitable for motor transport, but the distribution of the road network is uneven. Most roads are to be found near the Northern Dvina, the Vychegda, the Vaga, the Sukhona, the Sheksna and the Suda rivers and near the railways.

A road network suitable for motor transport is almost non-existent in the immense forest area in the Mezen, Pinega and Pechora basins, and the existing roads are frequently in a bad state.

The great highway between Archangel and Vologda, and a number of other public roads which cross the rivers, are of considerable importance for timber transport. According to authoritative statements, too few roads are being constructed in the region, and many more roads suitable for motor transport are needed to cope satisfactorily with the timber transport. Most of the timber transport will be done on the waterways even in the future.

3.4 Main Centres for Forest Industries

3.4.1 Archangel

Reportedly there are now 16 large sawmills in Archangel, with a total of 117 rapid frame-saws, as well as 10 smaller sawmills equipped with 18 frame-saws. The largest sawmill, which was earlier called the Molotov Sawmill, has 24 frame-saws. The Maimaksa sawmill is said to have 2,700 workers. There are also many smaller sawmills, using largely manual labour, near the town.

A big sulphate pulpmill (annual output 75,000 tons) was opened in 1937 on Solombalsk Island, near the town of Archangel. It uses some sawmill waste in its raw material. Another paper and pulp combine (annual output 120,000 tons) is located in the town of Archangel, and there are also a few wood-chemical industries, furniture factories, etc. The total number of industrial plants for the conversion of wood is estimated at 85. The total sawlog consumption of the sawmills at full capacity is estimated to be seven million cubic metres. The corresponding figure for the pulp and paper plants is 1.5 million cubic metres of pulpwood (Medvedev, 1962, p. 98).

The port of Archangel was expanded and reconstructed to accommodate bigger ships, in connection with the export expansion in the beginning of the Thirties. One of the channels in the Northern Dvina

delta connecting the Archangel port with open sea, Maimaksa, is accessible to ocean-going vessels.

3.4.2 Other Export Ports

A number of the sawmills on the western coast of the White Sea are in Oumba (Lesnoy), Kovda, Keret, Kem and Belomorsk (cf. map in Fig. 3:4), most of them having five frame-saws each, which work mainly for export. Loading facilities in the harbours there are relatively good. The ports which are connected with the sawmills are easily accessible by ships.

Two relatively large sawmills with altogether 21 frame-saws are located in the town of **Onega**, on the mouth of the Onega river. Onega is the second largest export harbour for sawnwood in the European North, after Archangel. Large sandbanks in the mouth of the Onega are a shipping obstacle.

Shipping conditions in the mouths of the Mezen and the Pechora are even worse in some respects. Owing to the considerable tidal range there, the ships must anchor in the roadsteads, which makes loading both more difficult and more expensive. It is reported that a sawmill with seven frame-saws is working on the mouth of the Mezen. The harbour on the mouth of the Pechora is called **Naryan-Mar**, located in the tundra zone, far from the forest. Here one sawmill with four frame-saws is working.

Murmansk is also a possible timber export harbour, but also to a considerable degree an import harbour. The town is the terminus of the Kirov railway, and its port is practically ice-free the year round, thanks to the Gulf Stream. There is a sawmill, and a few other small wood-manufacturing industries, in Murmansk. These obtain their raw materials by rail from the south, or by waterways from the White Sea area and farther east.

Leningrad is the most important industrial centre and export harbour on the Baltic. Under the Soviets Leningrad has fallen behind, compared with its earlier standing, because exports have now been concentrated mainly in Archangel. However, it still plays an important role as a transit harbour for timber products from inland, thanks to its extremely favourable communication network. Its importance as a wood-manufacturing centre should not be underestimated. The town, together with its immediate neighbourhood, has about a dozen sawmills, two large paper and woodpulp combines, five furniture factories of reasonable size, and several other important woodworking industries.

Another export harbour is Viborg in western Karelia, which has a hinterland rich in forests, and a well-developed forest industry. On the southern coast of the Gulf of Finland lies Ust-Luga, on the mouth of the Luga, which can also serve as an export harbour for sawnwood.

3.4.3 Wood Conversion Centres Inland

As a rule, a wood-processing factory is established at a crossing of a river and a railway. This applies primarily to sawmills, but also to woodpulp factories, which thus have excellent transport facilities. For example, there is a number of sawmills along the Kirov railway (south of Belomorsk there are Segezha, Medvezhegorsk, Petrozavodsk, Solomenoye, etc.) as well as two large woodpulp and paper plants (Segezha and Kondopaga). On the Northern railway, there are also sawmills (Levachevo, Plesetsk, Konosha, Sukhona, etc.), a few woodpulp and paper plants (including two factories at Sokol with an annual paper output of 80,000 tons), and one plywood factory (Sukhona in the town of Sokol).

Kotlas, a town situated where the Sukhona and Vychegda flow into the Northern Dvina, is the most important wood conversion centre on the Konosha-Vorkuta railway. In the town there is a sawmill with seven rapid frame-saws, and at the Koryazhma station another sawmill with three frame-saws. In 1961, a large pulp and paper combine was set up in the town itself. As Kotlas has a direct railway connection with the town of Kirov in the south, it is an important supplier of wood products in the Soviet home market.

Along the Konosha-Vorkuta railway there are more sawmills, only one of which can be considered large (at Knyazpogost), a plywood factory (Zheshart) and other smaller woodworking industries.

Another industrial centre in the northern forest region is **Syktvykar**, located on the Sysola river not far from its confluence with the Vychegda. It has a sawmill with seven frame-saws. The construction of a large woodpulp factory has been in progress for several years. A modern sawmill with eight frame-saws has been constructed at Shangal on the Vaga, 84 kilometres from its confluence with the Ust. Several paper and woodpulp factories (Viborg, Svetogorsk, Priozersk, Läskela, Pitkaranta, Harlu) are situated in the area which was ceded by Finland to the Soviet Union at the end of World War II.

There are paper and woodpulp factories (Shash, Kamenogorsk, Kommunar, etc.) in the nearby Leningrad district, outside the town

Millions of cubic metres

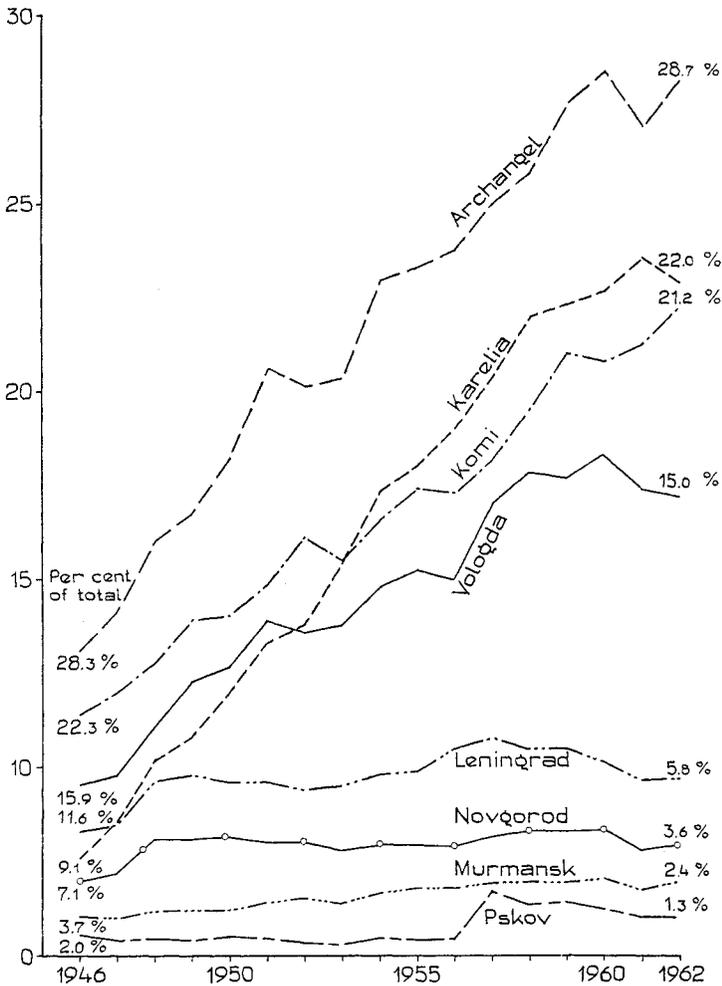
Source: Perepechin-Filinov, *Lesepolzovanie v SSSR, 1946—1962 gg.*, 1964

Fig. 3:5. Dynamics of Annual Cut, by Provinces, in European North, 1946—1962

itself, so that the area round Lake Ladoga can be described as an important centre of this industry.

But the forest industry in the region as a whole is relatively weak, compared with its timber resources.

3.5 An Appraisal of Potentialities of Timber Production

3.5.1 Development of Annual Cut

An expansion of the timber output in the virgin forests of the European North has long been considered desirable. The transferring of logging operations to the forests lying farther from human habitation and from the transport facilities is a complicated problem. In the first place, the forests must be made accessible; this requires considerable investment, for example, in the construction of roads and houses, which must precede the logging operations proper. This has proved to be the greatest obstacle to the expansion of roundwood removals from the remote virgin forest areas.

The fluctuations of the volume of timber cut annually are presented graphically in Figure 3: 5 by provinces for the European North after World War II. The figures concern the timber volume assigned for cutting, not the timber actually harvested. As pointed out before, these two quantities can differ. However, as our main purpose is to demonstrate the trends in the changing volumes of the annual cut in the various districts, these differences between calculated and actual timber removals are of minor importance.

It can be concluded from the above data that the annual cut in areas poor in forests (the Leningrad, Novgorod and Pskov districts), where forestry is practised on a sustained yield basis (Group II forests), has remained fairly constant during the observation period or, to be more precise, it has oscillated within rather narrow limits. In the other districts classified as forest surplus areas, where unrestricted cutting is permitted, the timber output has increased relatively steeply. In Karelia it increased seven times between 1946 to 1962, and in the Archangel, Vologda and Komi districts, about three times in the same period.

The total timber output in the whole region has trebled, which should be considered a remarkable achievement from the viewpoint of timber supplies, if not from that of silviculture.

3.5.2 Karelia

The south-western parts of the northern forest region—south Karelia and the Leningrad district—have been in use for a long time. The area has supplied Leningrad with timber from the time of its foundation, via the Neva-Svir river system, which is the outlet of the great lakes Ladoga and Onega. The timber resources, more particularly the stock

of larger-dimension roundwood, are not considered to be particularly extensive in the forests round the lakes.

The Karelian forests have reportedly been cut to a great extent along the Kirov railway. However, farther from the railway and the floatable rivers, considerable timber stocks still exist. Lack of local transport roads makes it difficult to exploit these remoter forests at present. The accessibility of the forests would be improved considerably by road construction and by improvement of the floating facilities of the rivers (e. g., of the Suna, Kem, Idel).

More than 90 per cent of the forests are classified as being in use.

3.5.3 The Onega Basin

The timber resources in the Onega basin are estimated to be 316 million cubic metres. It is also estimated that 4.5 million cubic metres could be cut here each year. The timber resources south of Konevo, on the upper Onega, are estimated to be 90 million cubic metres. So far, these forests have not been exploited to their full capacity. The fellings have mainly been concentrated on the lower Onega, while virgin forests can be still found on the upper Onega. As there are no pulpmills in the region, pulpwood is transported to factories in remote districts, mainly in the Baltic area. The transport is carried out partly by waterways, and partly by rail. It has been calculated (Medvedev, 1962, pp. 95-96) that the timber resources in the area justify the construction of two large pulp and paper combines (with a total annual output of over 600,000 tons) and three new sawmills, each with eight frame-saws, as well as factories for the production of fibreboard and particle board. The virgin forests in the Onega basin are considered to be generally more easily accessible than most other areas in the European North.

3.5.4 The Northern Dvina Basin

The total timber stock in the Northern Dvina basin is estimated at 1,711 million cubic metres and the technically possible annual timber removals at 28 million cubic metres, 30 per cent of which can be removed by rail and 70 per cent by waterway.

Logging operations have concentrated so far on the banks of the larger rivers and in the immediate vicinity of the railways. Reportedly the forests on the banks of the Northern Dvina have been considerably overcut, and it is thought that the forests along the railways will be exhausted within 15 years, should their exploitation continue at its

present rate (Medvedev, 1962, p.68). Removals could be expanded in the northern and north-eastern parts of the basin, where there are still considerable virgin forests. The forests on the Pinega in particular have been little exploited; the construction of the new Archangel-Korpogory railway will make the exploitation of these forests possible. The more remote forests of the Vychegda basin, including the forests on its tributary the Sysola, have reportedly been taken into use to a relatively small extent. The reason is said to be the floating difficulties on the upper Vychegda. Before removals in the area can be expanded, the worst obstacles to floating in the rivers must be eliminated and the floating channels put in order generally.

A future considerable increase of the timber removals is considered improbable, despite the large virgin forest stands in the Northern Dvina basin. Forestry specialists have pointed out that the total removals in the area must gradually decline, if the transport network is not expanded at a pace which will make possible the exploitation of the hitherto inaccessible timber stock. It is generally thought that the expansion of the forest industry, and more particularly the establishment of new pulp mills, must also be increased. According to the available calculations (Medvedev, 1962, pp. 99—103, the timber stock in the Northern Dvina basin is sufficient to justify the construction of new pulp mills and the expansion of existing ones, increasing their total annual output by 1.4 million tons; this would involve a total pulpwood consumption of 6.5 million cubic metres annually. This would be in excess of the total consumption of pulpwood by the existing mills, and of the pulpwood exports to factories outside the European North. An expansion of the output of sawnwood in the Northern Dvina basin is considered possible if the export of sawlogs to other regions is decreased or discontinued. It is taken into account in this connection that the average dimensions of the logs will decline in the future, and that the relative output of sawnwood for export will decrease.

3.5.5 The Mezen Basin

The timber stock in the Mezen basin is estimated to be 554 million cubic metres, according to the latest inventory. Despite this, logging operations in the area are comparatively negligible, particularly in comparison with the cut in the other regions in the vicinity. As was pointed out above, there is only one sawmill in the area, with an annual consumption of about 300,000 cubic metres of sawlogs. The reason for this backwardness is probably the difficulty of floating on the Mezen,

which for the time being is the only possible transport route in the area. The Mezen and its tributary, the Vashka, are navigable only for a short period every year; also it is difficult to transfer timber at the mouth of the river. The Mikun-Koslan railway is expected to solve the problem of the exploitation of forests which lie on the upper Mezen, the volume of which is estimated at 55 million cubic metres. Forest exploitation can be started in the hitherto inaccessible forest area between the Vycheгда and the Mezen, which has an estimated timber volume of 54 million cubic metres. According to the plans, a railway link will also be established with Leshukonskoye on the lower Mezen. These railway links would make possible the transport of roundwood to processing centres outside the basin, primarily to Archangel and Kotlas. But it has been said that some manufacturing should also be carried out locally, for instance, with an annual raw material consumption of 2.8 million cubic metres (Medvedev, 1962, p. 106). For this purpose, a number of new industries are to be set up, including a pulp and paper factory with an annual output of 580,000 tons.

3.5.6 The Pechora Basin

The timber stock in the Pechora basin was estimated, at the latest inventory (1961), to be 932 million cubic metres. Logging operations in the area have been fairly small and most forests there should be classified as untouched virgin forests.

There are two main reasons for the lack of large-scale exploitation of the forests, namely, a shortage of timber transport facilities and of manpower. The first-mentioned deficiency requires a more detailed explanation, as the problem is of considerable importance to the timber supply.

The River Pechora can be divided into three sections:

1. The upper Pechora, from the source to Troitsko-Pechorsk;
2. The middle Pechora, from Troitsko-Pechorsk to the town of Pechora;
3. The lower Pechora, from the town of Pechora to Naryan-Mar.

Timber from the upper and middle reaches of the river is collected at the railway (Konosha-Vorkuta) and transported by rail in both directions. Timber from the lower Pechora goes to Naryan-Mar, or is collected at Ust-Ussa, which is accessible to ocean-going vessels and could therefore serve as an export harbour.

The upper Pechora abounds with sandbanks and cataracts. A 640 kilometre stretch of the river (between Yaksha and Kanin) contains

118 sandbanks and 43 cataracts. The river is only 0.96 metres deep at the Konosh-Porog cataract, 1,376 kilometres from its mouth; this circumstance prevents floating or navigation. The upper Pechora is navigable only after the spring thaw (20—60 days)—in the summer the water is so low that free passage over the sandbanks is impossible. But the areas rich in forests are located on the upper Pechora, above Troitsko-Pechorsk.

To exploit the timber stock here effectively, the only solution seems to be to build a railway to Troitsko-Pechorsk. Such a plan is reported to exist, but it is still uncertain when it will be carried out. On the other hand, there are plans for changing the course of the River Pechora, and redirecting it to the south, by creating a huge lake or dam in the vicinity of the upper Pechora, and linking it with the River Kama. Timber felled in the Pechora basin could then be transported through this river system, and via the Kama and the Volga, to the timber-deficit areas in the southern parts of the U.S.S.R. This latter plan also exists so far on paper only.

It is also considered advisable to establish wood-manufacturing industries locally, and not to transport all unprocessed timber to remote factories. It has been suggested (Medvedev, 1962, pp. 106-109) that the long-term plan should provide for the construction of pulp and paper mills in the Pechora basin, whose annual pulpwood consumption would be about 5.5 million cubic metres, and also for the establishment of new sawmills whose annual consumption of sawlogs would be up to 2.5 million cubic metres. Under any circumstances these industries would be amply supplied with raw materials, if only the forests were made more easily accessible through the construction of the necessary roads.

4. Potentialities of the Urals

4.1 Introductory Remarks

The administrative border between Asia and Europe no longer exists in the U.S.S.R. The Ural Mountains and their environs, i.e. the vast plains adjoining them east and west, are regarded as a single economic region. The Tyumen district, which was formerly part of Western Siberia, has been merged with the Ural region, now the third largest region of the whole U.S.S.R. It follows that the Ural region, as an economic and administrative unit, does not coincide in any way with the Ural Mountains as understood in physical geography. The metal-working and mining industries of the Ural Mountains, however, give a

characteristic impress to the region and constitute its economic backbone.

The European part of the Ural region has been settled since ancient times. The colonisation of its Siberian part began in the 18th century, but was restricted to the southern parts of the region, in the belt between the forest and the steppe.

The region comprises a total of 2,115,700 square kilometres and has a population of 16.3 millions, 7.9 millions of whom live in the rural areas (*N.Kh. SSSR 1963, 1965*). Thus, the overall average density of population is eight per square kilometre; that of the rural population is four per square kilometre.

The mining industry of the Urals was already being developed on a large scale in the time of Peter the Great. Its mineral wealth was developed by means of the allotment of vast land areas, complete with population (peasant serfs), to industrially minded noblemen, on the condition that they exploited the mineral deposits.

As long as the technique of smelting pig-iron by using coke remained unknown, the Urals, with their high-grade ores, well-stocked forests as a source of charcoal, and free labour, played a very important role in the Russian economy. In the 18th century large quantities of metal manufactures from the Urals were exported. These exports ceased at the end of the 18th century with the arrival of new processes of metal smelting and the emancipation of the serfs in 1861, which deprived the metal-working industries of their free labour (*Baransky, 1956, p. 227*).

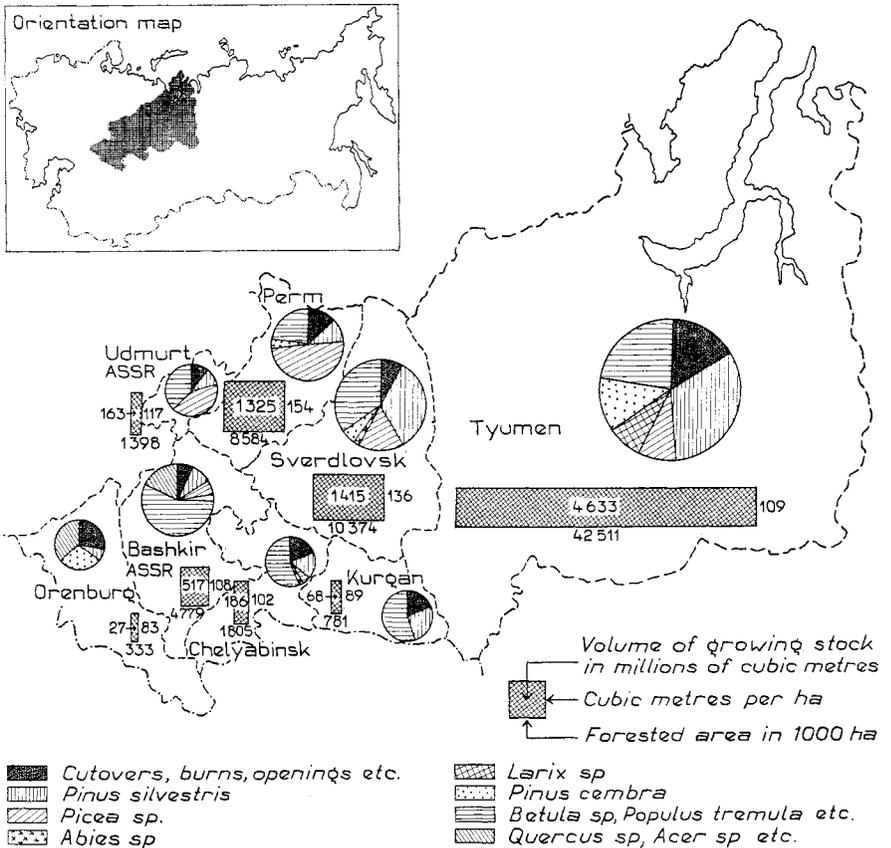
The Ural region is the second most important timber-producing region of the U.S.S.R. In 1963, some 19 per cent of the total U.S.S.R. output of timber and 14 per cent of its sawnwood came from the Urals.

4.2 Timber Stock

The total area of the forest land in the region was estimated (1 Jan. 1961) to be 81.6 million hectares, of which 70.6 million hectares or 86.5 per cent were forested. The total volume of growing stock amounted to 8,334 million cubic metres. Figure 3:6 shows the geographical location of the forest resources.

It reveals that most of the forest land is located in Siberia: the Tyumen district contains 62 per cent (50 million hectares), and the Sverdlovsk district 14 per cent (11 million hectares), of the total forest land in the region.

It should be noted that 11 million hectares or 13.5 per cent of the forest land of the region, is not forested. The percentage of forest land



Source: Lesnoy fond RSFSR, Statistichesky sbornik, 1962

Fig. 3: 6. Distribution of Forest Resources, by Provinces, in the Urals

not covered by timber stock is highest in the southern provinces: e.g. 28 per cent in Orenburg and 18 per cent in Kurgan. In absolute terms, however, these provinces contain a relatively small part of the forest land in non-productive condition, amounting to 7.8 million hectares in the Tyumen district.

However, the data presented do not include the non-forest area, a total of 53 million hectares, which in its turn includes 24 million hectares (45 %) of marshland, 15 million hectares (28 %) of mountain slopes and ravines, 11 million hectares of water surfaces and 2 million hectares (4 %) of arable land and meadows (*Lesnoy Fond RSFSR, 1962*).

About 21 million hectares of forest land are considered inaccessible, i.e. they are not being exploited at present and are not to be exploited

in the near future. No less than 98 per cent of the unexploited forest reserves lie in the Tyumen province, where about half of the total productive forest land is regarded as inaccessible at present.

Conifers cover 47 million hectares, or 66 per cent of the total forested area. About 23 million hectares, 34 per cent of the total, are covered by deciduous species, mainly birches and aspen. In addition, almost 0.6 million hectares are covered by shrubs and stunted trees (*talniki*) of no commercial value.

Almost 72 per cent of all the coniferous stands in the area are mature or over-mature. This figure, however, varies considerably from province to province, depending on the extent of forest exploitation in the past. In deciduous forests, younger age classes are predominant.

The average volume per hectare of forested area is estimated to be 118 cubic metres, and in mature stands to 137 cubic metres. The volume of mature timber per area unit is highest in the Udmurt Autonomous S.S.R. (207 m³/ha) and lowest in Tyumen province (118 m³/ha). The average volume of total forest-covered area is highest in Perm (154 m³/ha) and lowest in Orenburg province (83 m³/ha).

The forests of the Ural region generally have a higher productive capacity than is met with in the northern *taiga* zone. Since the Ural Mountains extend over 2,000 kilometres from north to south, and as the highest peaks (Narodnaya in the northern Urals) reach 1,800 metres above sea level, it is plain that growth conditions vary considerably over the area. The timber-line is 300—600 metres above sea level in the northern Urals and 700—1,000 metres above sea level in the central Urals. In the southern Urals (south of 55° latitude) only a few mountain peaks are unforested. As the terrain is high and rather hilly in the immediate vicinity of the mountain ridge, there are but few swampy forests, and peat bogs are much less extensive than elsewhere in the northern forest region. The slopes and mountain ridges of the Urals do not offer any particular obstacles to logging operations. It is relatively unusual to encounter mountain forests that are inaccessible for topographical reasons.

The area east of the Ural Mountains, including the West Siberian Lowlands, is quite different. Here swampy forests predominate, intermingled with extensive marshlands which account for 60 to 80 per cent of the total land area.

The forest zone proper (*lesnaya zona*) in Tyumen province may be divided into the following belts from north to south (Kerzhentsev, 1954, pp. 31-46):

1. *The Spruce-Larch Belt*, measuring 1,200 kilometres from east to west and 600 kilometres from north to south. The whole of the Yamalo-

Nenetsky national district falls within this region. However, forest land constitutes only seven per cent of the total on average. The forests are scattered and form narrow belts along the Polmy, the Nadym, the Pur and the Taz rivers.

River drainage is of particular importance here. All these rivers flow basically from south to north-east. They carry much water warmed at source. This is why the climate of the river valleys differs from that of the surrounding forest tundra. Permanently frozen subsoil extends over the entire region. The influence of the rivers on the growth of trees is considerable.

Trees grow but slowly in this region. Most forest stands are 180-220 years old, and the trees in them average 12-16 metres in height. The total timber stock of this belt is estimated at 248 million cubic metres.

2. *The Pine Belt.* Pine stands are located mainly along the big rivers (the Ob and the Irtysh) and their tributaries (the Severnaya Sosva, the Konda, the Vakh, etc.). The Okhlymsky Forests along the right bank of the Ob and of the Nazym are particularly valuable.

The region is called the pine belt because pine forests dominate there: pine covers 59 per cent of the forested area. *Pinus cembra* takes second place (14 %) and spruce comes third (10 %).

Only about 30 per cent of the total acreage of the region is forested; the remaining 70 per cent is marsh.

The average volume of pine stands, which fall within the lowest categories of site quality classes (V or V-) and are chiefly of moist type, is estimated at 110 cubic metres per hectare, which is the same as the overall average of the forests of the Tyumen district.

3. *The Birch-Conifer Belt* lies south of Khanty-Mansiisk. Its total area is 93,100 square kilometres. Here, too, the marshes are extensive, and only 27 per cent of the total area is forested. The forests are located mainly along river banks. Birch is the predominant tree species (52 %) and occurs in practically all mixed stands. Pine takes second place (16 %), while spruce comes third (11 %). Growth conditions in the birch-conifer belt are somewhat better than in the pine belt, but the soil is too wet and swampy here as well.

4.3 Transport Network

4.3.1 River Systems

The western slopes of the Urals are drained by the Kama and its numerous tributaries; their eastern slopes belong to the Ob and Irtysh river basin.

The **Kama** plays an important role in the transporting of timber from the Perm district, a most important forest area to the west. The Kama, a tributary of the Volga, offers an excellent transport link to the southern regions of the country; in addition, the Volga-Don Canal gives access to the open sea. About 16 million cubic metres of timber are floated annually on the Kama. Its most important tributaries, on the banks of which logging is now carried on, are the Obva, the Inva, the Kosa, the Kolva, the Vishera, the Kosva, the Chusovaya, etc.

The eastern slopes of the Urals are drained by the **Ob-Irtysh** river system. The Ob is about 5,600 kilometres long, measured from the sources of the Irtysh to the Ob estuary in the Kara Sea. However, only its lower reaches, including such large tributaries as the Tavda, the Tura and the Tobol, fall within the Ural region.

The terrain in the middle and lower reaches of the Ob and the Irtysh is low and flat; therefore these rivers flow very slowly and flood immense areas in the spring. The Ob delta, known as Obskaya Guba, is full of sandbanks. At one spot the navigable channel is only 2.5 metres deep, which greatly hampers shipping. Ocean-going vessels cannot, therefore, pass through the mouth of the Ob (Armstrong, 1952, p. 20). This explains the failure of the countless efforts to link the Ob river system with the Northern Sea Route and thus with the ocean.

4.3.2 Railways

Rail transport is much used in the Ural region proper, and there is an elaborate railway network connecting the industrial centres of the area.

The first railway in the Urals, constructed by the mining industry for its own use, was built in 1866-1867. It is probably one of the oldest in Russia. The Samaro-Zlatoust Railway was built in 1892, the Chelyabinsk-Ekaterinburg (Sverdlovsk) Railway in 1896, the Trans-Siberian Railway in 1900, the Perm-Vyatka (Kirov) Railway in 1906, the Sverdlovsk-Tavda Railway in 1916. The railway lines between Chusovaya-Berezniki and Alapayevsk-Sosva—especially the latter, which was completed after World War II—have given access to the large untouched virgin forests.

Until World War I, the Trans-Siberian Railway was the only transport route east of the Ural Mountains. At present there are two east-west railway lines in the southern parts of the region. The Serov-Ivdel Railway is an important timber transport route from the northern Urals.

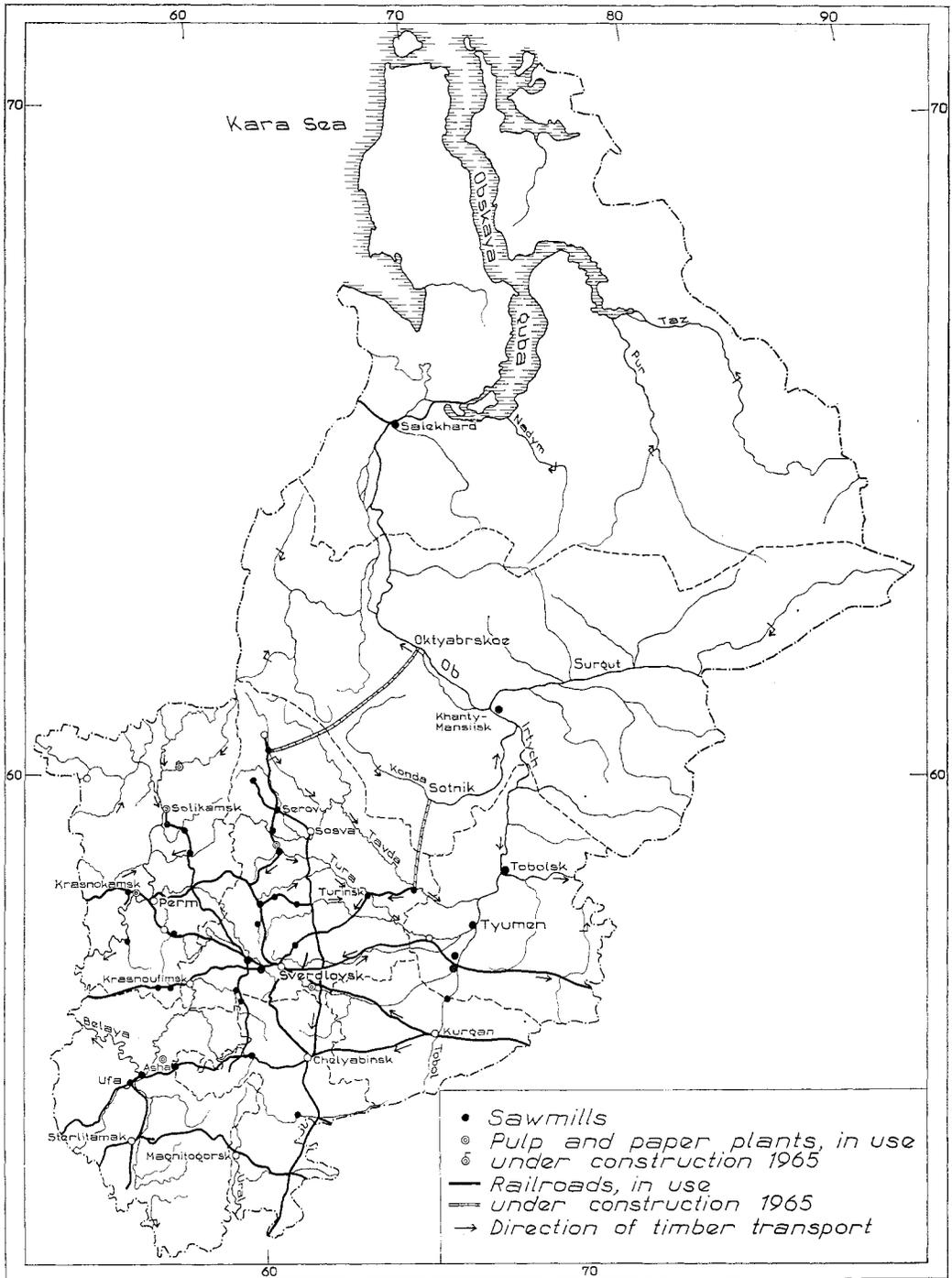


Fig. 3: 7. Geographical Map of the Urals

The existing railway network, however, is inadequate to meet the transport needs of the forests east of the Urals, which incline naturally towards the Ob. Timber from this area is at present floated down the tributaries of the Ob and then towed against the current for about 500-1,000 kilometres before it can be loaded on to railway waggons. It is not considered feasible to conduct large-scale floating operations down the Ob to Labytnangi, at the mouth of the river, although this town has a line linking it with the Pechora Railway (which connects Konosha-Kotlas-Vorkuta). This route is only practicable for supplying the Vorkuta coal mines with timber.

To solve the transport problems of the area it has been suggested that a new railway should be constructed north of the present Trans-Siberian Railway. The new line would be an extension of the Sverdlovsk-Tavda Railway, continuing east via Tobolsk and Kolpashevo (on the Ob) and thence to Abalakovo on the Yenisey (Dostal, 1961, p. 46). So far, however, this proposal has not taken any concrete shape.

Nevertheless, a decision has been made to construct two new railway lines in the Ural region, with the specific aim of facilitating the transport of timber:

1. A line connecting Ivdel and Oktyabrskoe on the Ob. The total length of this line is estimated at 380 kilometres. About 220 kilometres of the line, reaching as far as the River Konda, is reported to have been completed (*L.P.* 20 Nov. 1965). The map in Figure 3: 7 depicts schematically the location of this railway.

2. A line about 200 kilometres long, connecting Tavda and Sotnik, is to link the River Konda with the main railway network while avoiding placing further burdens upon the Trans-Siberian Railway. No data are available, however, to indicate how far construction has progressed or indeed whether work has started on the line at all.

4.4 The Development of the Wood-Processing Industries

The Ural Mountains are an ancient industrial centre. Mining began there as early as the time of Peter the Great, and since then it has steadily expanded. Under the Soviets it has become a large-scale industry. The exploitation of the forests, too, has developed parallel with the growth of the mining industry. In fact, for a long time the main function of the forests was to subservise the interests of the mining industry by supplying charcoal for the extraction of iron ore.

The first sawmills in the area were established at a relatively early stage. To begin with they worked for the mining industry. After the

building of the first railways, and more particularly after the Ural forests were released for general exploitation (previously most of them had been reserved for the mining industry), production of sawnwood was increased and several new sawmills were established.

In 1927-1928 there were 77 sawmills in the Urals with a total of 112 frame-saws (Petrov, 1952, p. 64). Under Stalin's first three Five-Year Plans (1929-1940) a total of 165 new sawmills were built and old ones restored. At that time the general trend was to establish large enterprises (e.g. the Tavda combine with 12 frame-saws, the Lobva combine with eight frame-saws, Novo-Lyalinsky, etc.). Later, however, it was mostly smaller sawmills with one or two frame-saws that were built.

The most important sawmilling centres are Tavda, Sverdlovsk, Novaya-Lyalya with Lobva, and Nizhny-Tagil. Most of the sawmills are located in the immediate vicinity of other wood-processing plants and work for them.

There are also sawmills at Salekhard, Khanty-Mansiisk, Tobolsk, Tyumen and elsewhere.

According to the available data no new large sawmills have been built in the Ural region since World War II.

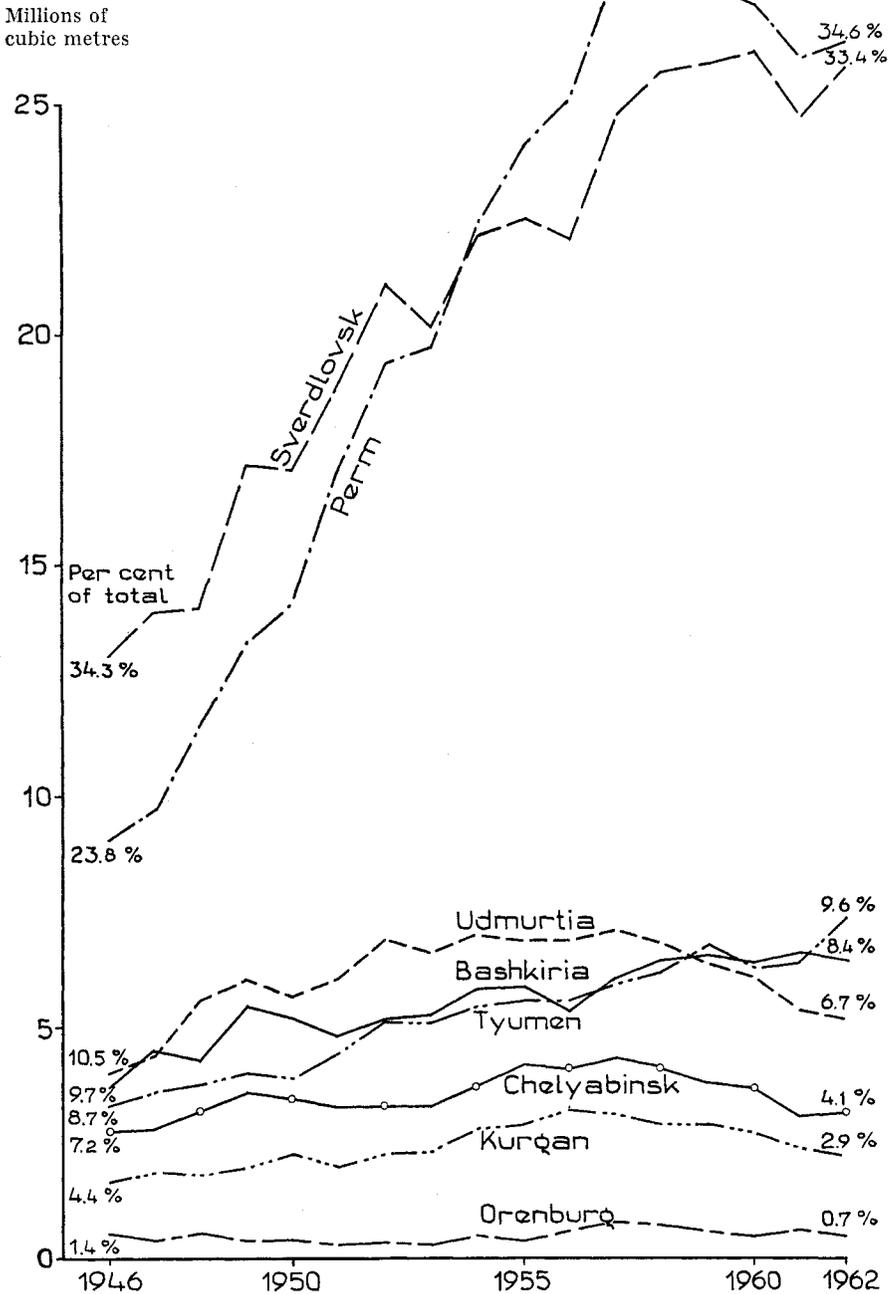
The woodpulp and paper industry is also well developed in the region. Before World War II, 30 per cent of the total Soviet output of woodpulp came from the Ural region; in 1944 the share of the region was 50 per cent. Before the war five per cent, and during the war 25 per cent, of the total Soviet output of paperboard came from the Ural region (Petrov, 1952, pp. 94-98).

Nine pulp and papermills are located in the Ural region.

Other wood-processing enterprises include furniture factories, 78 of which are reported to be functioning in the Ural region proper. Most of them are only small workshops.

The town of Tyumen is probably the biggest wood-processing centre east of the Urals; apart from sawmills, a plywood factory and a match factory are located here.

During the war, machinery from war-ravaged districts was evacuated to the Urals and regions further east. Among it was a certain amount of wood-processing machinery which remained working there after the war. The progress of forest industries in the region has slowed down since the war because other regions have been given priority by the authorities. However, a variety of wood-processing industries are to be established there in the future, mainly in areas where new railways are now under construction.



Source: Perepechin-Filinov, *Lesepolzovanie v SSSR, 1946—1962 gg.*, 1964

Fig. 3: 8. Dynamics of Annual Cut, by Provinces, in the Urals, 1946—1962

4.5 An Appraisal of Potentialities of Timber Production

In the past 35 years, i.e. since the launching of Stalin's first Five-Year Plan, timber removals in the Urals have increased steadily. The increase was particularly steep during World War II when the Ural region was turned into an "armoury for the war". For example, the share of the Ural region in total Soviet timber output rose from 13.5 per cent in 1940 to 19.5 per cent in 1944 (Petrov, 1952, p. 97). Nor has the pace of expansion slowed down since the war, as can be seen from the graphical representation in Figure 3: 8. This shows that the biggest increase of timber removals has been in the Sverdlovsk and Perm provinces. The share of the latter in the total timber output of the region has grown from 24 per cent in 1946 to 35 per cent in 1962. The two districts combined account for two-thirds of the total removals of the region.

Timber removals in the Tyumen province, the forest resources of which constitute more than half the total timber stock of the region, amount to barely 10 per cent of the annual cut in the region. Thus, the relocation of logging operations to this district has failed so far, despite considerable efforts.

Most of the Kama basin falls within the province of Perm, where unexploited forests, considered inaccessible at present, amount to 0.5 million hectares. The commercial timber stock in forests currently under exploitation is no more than 1,000 million cubic metres.

However, if removals of the order of 25-30 million cubic metres a year—the figure of recent years—were to continue, the balance between consumption and replenishment of timber could not be maintained for any appreciable time. At present there are no plans for increasing the rate of timber removals from this area (Lobovnikov, *L.P.*, 1964, 3), at least in the near future. Nor are there plans for any appreciable expansion of the capacity of wood-processing industries, since roundwood transport down the River Kama to the timber-deficit areas of the south provides a natural outlet.

In the province of Sverdlovsk, the most important logging area lies in the Tavda river basin, where the conifer stock is estimated at 300 million cubic metres. Annual removals in this river basin are estimated at about eight million cubic metres. The most important wood-processing centres are Ivdel, Sosva, Tavda and Novaya Lyalya.

Another important logging area lies on the Tura river, where the timber stock is estimated at 145 million cubic metres. A narrow-gauge railway to Verkhneturinsk is the principal means of timber transport.

Annual removals at present total 26 million cubic metres, and any major rise in production must be deemed unlikely.

In Tyumen province, the most valuable forests are to be found in the basin of the Konda river, which is the biggest tributary of the Irtysh. Commercial timber stock in the area is estimated at 500 million cubic metres. The projected Ivdel-Ob and Tavda-Sotnik railway lines are intended to make these forests accessible. The Ivdel-Ob Railway is expected to bring to the consumer some 2,000 million cubic metres of timber (Krylov, *L.P.*, 1965, 1, p. 21) from the forests of the Ob river basin, including the Tomsk district.

The volume of removals in the district cannot be expected to rise until the railways have been constructed and other capital projects entailed in the relocation of logging enterprises in the area have been undertaken. It is calculated that removals from the Konda river basin will then be three million cubic metres annually (Dostal, 1961, p. 79).

Total removals in Tyumen province, at present amounting to over seven million cubic metres, can certainly be increased eventually. However, the state of most forests in the area is such that it would be quite unrealistic to look for anything like a doubling or trebling of the volume of the cut in the immediate future.

5. Potentialities of Western Siberia

5.1 *Introductory Remarks*

The area of the Western Siberian economic region was reduced considerably when the Tyumen district was transferred to the Ural region. Only the southern part of the West Siberian Lowlands (which is a vast flat plain without any appreciable elevations) now falls within this region. The south-eastern portion of Western Siberia, bordering on Mongolia, is mountainous. Large areas of the region consist of steppe and forest steppe. Administratively the region comprises the provinces of Omsk, Novosibirsk, Tomsk, Kemerovo and Altay.

The total area of the region is 991,800 square kilometres. The population is 10.8 million, of whom 4.6 million live in rural districts. The overall average density of population is 11 inhabitants per square kilometre, but in rural districts it is only five. This average density, however, is by no means representative of the whole region. The northern *taiga* zone and the mountains of the south-east are still sparsely populated. The population is concentrated mainly in the forest-steppe zone, along the Trans-Siberian Railway where the soil is

most suitable for farming, and in the Kuznetsk Basin, an important mining area.

The region contains within its boundaries not only the sort of rich deposits of coal and metalliferous ores that are needed for the development of industry, but also vast tracts of land that are eminently suitable for agriculture. Large-scale utilisation of these mineral resources only began under the Soviets. Gigantic new power plants are being constructed on the rivers Irtysh and Ob so as to increase power supplies and thus make possible the further industrialisation of the region.

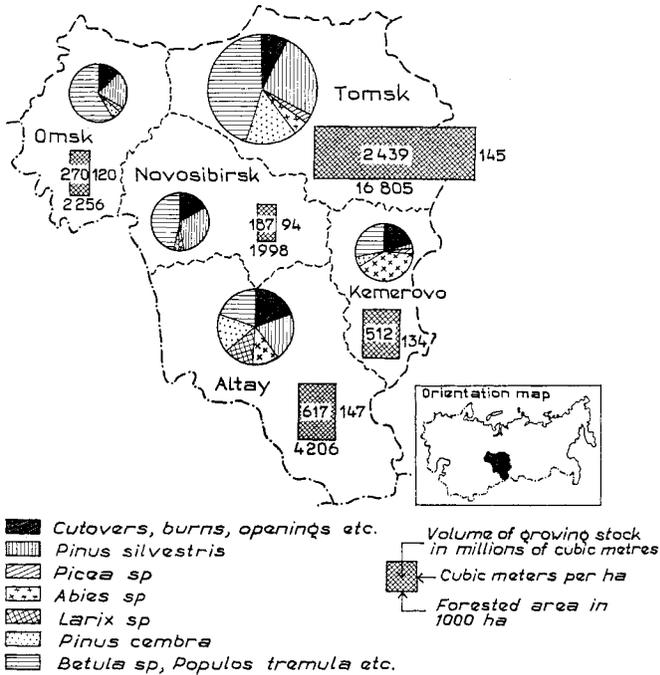
Apart from a few sawmills and wood-working factories, there are no wood-processing industries in the region. An important place in the economy of the region, however, is occupied by the extraction of roundwood, which may be used locally or transported outside the territory.

5.2 *Timber Stock*

The forest census of 1961 estimated the total area of forest land at 33.2 million hectares, of which 29.1 million hectares were forested and 4.1 million devoid of forest (cut-over and burned areas, and semi-permanent openings). The area of unexploited forests, i.e. of forests impracticable of access at present, is estimated at 7.6 million hectares. Over and above all this, there are a further 14.5 million hectares of non-forest land (water surfaces, marshes, etc.) falling within the administrative ambit of the forest authorities. The volume of timber stock totals 4,025 million cubic metres.

Figure 3: 9 shows the geographical distribution of forest resources and their composition by dominant tree species. Birches and aspen predominate in the important agricultural provinces (67 % in Omsk and 56 % in Novosibirsk); these species of deciduous trees are remarkable for their abundance in other districts as well. It is worthy of note that while fir is predominant (55 %) in Kemerovo province, the incidence of other conifers is but limited. In the province of Tomsk, the most important forest district of Western Siberia, pines predominate over 46 per cent of the total forested area. Mature and over-mature timber predominates in all provinces.

It should be observed that a large part of the timber stock consists of *Pinus cembra* and *Abies sp.* These species are considered to be not particularly suitable as lumber: ordinary pine is preferred for this purpose. Pulp manufacture, on the other hand, has hardly started because there are no pulpmills in the area.



Source: Lesnoy fond RSFSR, Statistichesky sbornik, 1962
 Fig. 3:9. Distribution of Forest Resources, by Provinces, in Western Siberia

In the northernmost forest belt, swampy stands predominate, chiefly because the landscape is low and flat and includes many marshes and bogs. The Vasyugan Marshes ought to be specially mentioned: they lie along a watershed between the Ob and the Irtysh, measuring about 400-500 kilometres long and up to 40-50 kilometres wide.

Such productive forest land as exists here is found, for the most part, in a 10-15 kilometre-wide belt along riverbanks and on morainic ridges and drumlins (*griva* in Russian) rising somewhat above the general flatness of the terrain.

South of the steppe zone, in the mountainous areas bordering Mongolia (the Altay Mountains), growth conditions are quite different. Here, however, logging is hampered by difficult and inaccessible terrain.

5.3 Transport Network

The Ob and its innumerable tributaries, such as the Tym, the Ket, the Chulyum, the Tom, the Baksa, the Inya, the Chumysh, the Biya and

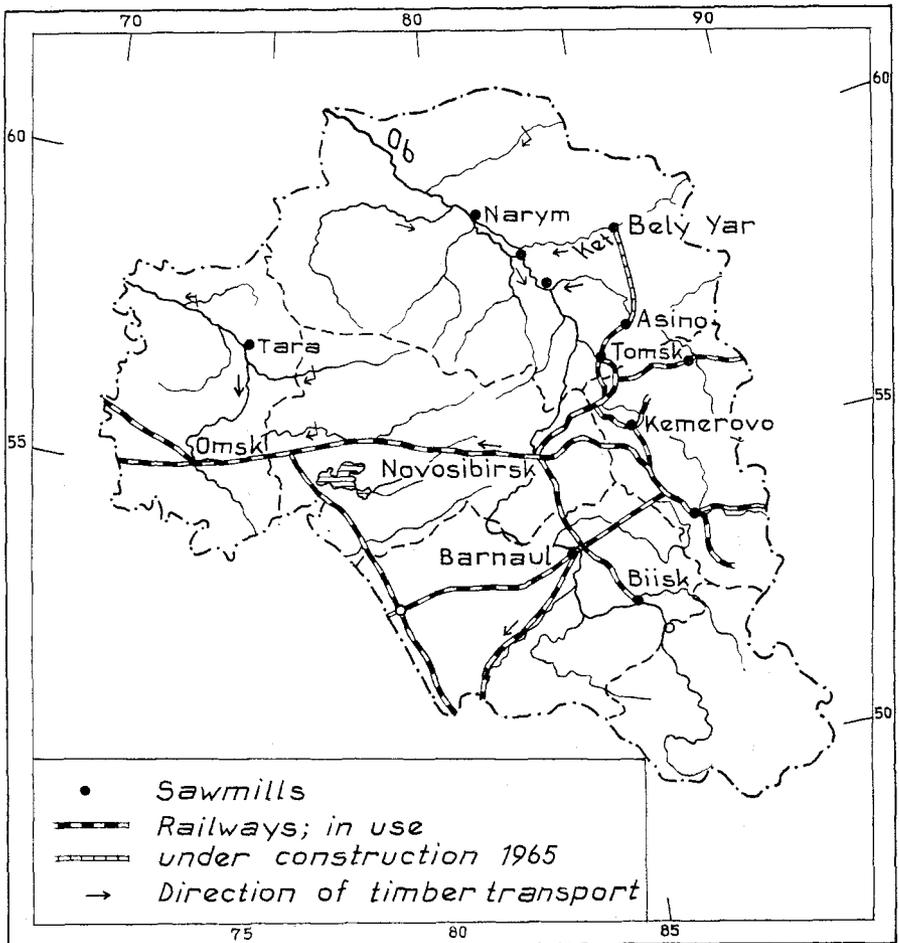


Fig. 3: 10. Geographical Map of Western Siberia

the Katun, have an important role in timber haulage. In the Tomsk district alone, floatable waterways are estimated at 6,794 kilometres (Dostal, 1961, p. 88). The Irtysh, and its tributaries the Tara, the Tartas and the Om, are of great importance in the western part of the region.

Railways form the main communication links with other regions. The most important railway line is the Trans-Siberian Railway, which crosses the middle sections of the two principal rivers, the Ob and the Irtysh, just south of the forest belt proper. Settlements have become established wherever the railway crosses a river; where it is an important river that is crossed, there will be a large city like Omsk or

Novosibirsk. These nodal points usually have sawmills and also act as collecting centres at which roundwood felled on the river-banks is loaded on to trains and dispatched to its ultimate destination.

In addition to the main Trans-Siberian Railway running from east to west, there are other railway lines: Tatarsk-Slavgorod-Mikhaylovka; Novosibirsk-Barnaul-Semipalatinsk; Taiga-Tomsk-Asino; and a number of branch lines connecting the Kuznetsk Basin with the main railway network.

The construction of the Tomsk-Asino railway, which made the exploitation of the large timber resources in the Chulyum river basin possible, played an important part in the development of forest industry in the area. It is planned to extend the railway from Asino to Bely-Yar on the River Ket (cf. the map in Fig. 3: 10), a distance of 190 kilometres; this would enable removals in this river basin to be increased (Dostal, 1961, p. 51). It is not known, however, whether construction has started or whether the project has been postponed.

5.4 An Appraisal of Potentialities of Timber Production

5.4.1 Past Removals

Thirty-five years ago the Ob *taiga* was practically virgin land, except for the forests in the vicinity of the Trans-Siberian Railway and in the Chulyum river basin. During the industrialisation drive of the Thirties, while giant wood-processing industries were being established and timber removals increased elsewhere in the U.S.S.R., Western Siberia remained virtually at a standstill, even though it had been planned to construct a number of new sawmills and pulp and paper plants in the area.

The development of timber production in different provinces since World War II is shown in Figure 3: 11. The graph shows that the most notable increase in output has occurred in the province of Tomsk which in 1962 accounted for 41 per cent of the total production of the region. This means that the share of this province has doubled compared with 1946, while in absolute terms output has grown almost fourfold. The widely fluctuating output of Altay province, testifying to the difficulties of logging in mountainous areas, is also worth noticing.

5.4.2 The Middle Ob Basin

The province of Tomsk contains most of the forest resources. It has been calculated (Dostal, 1961, pp. 90-96) that the commercial timber

Millions of cubic metres

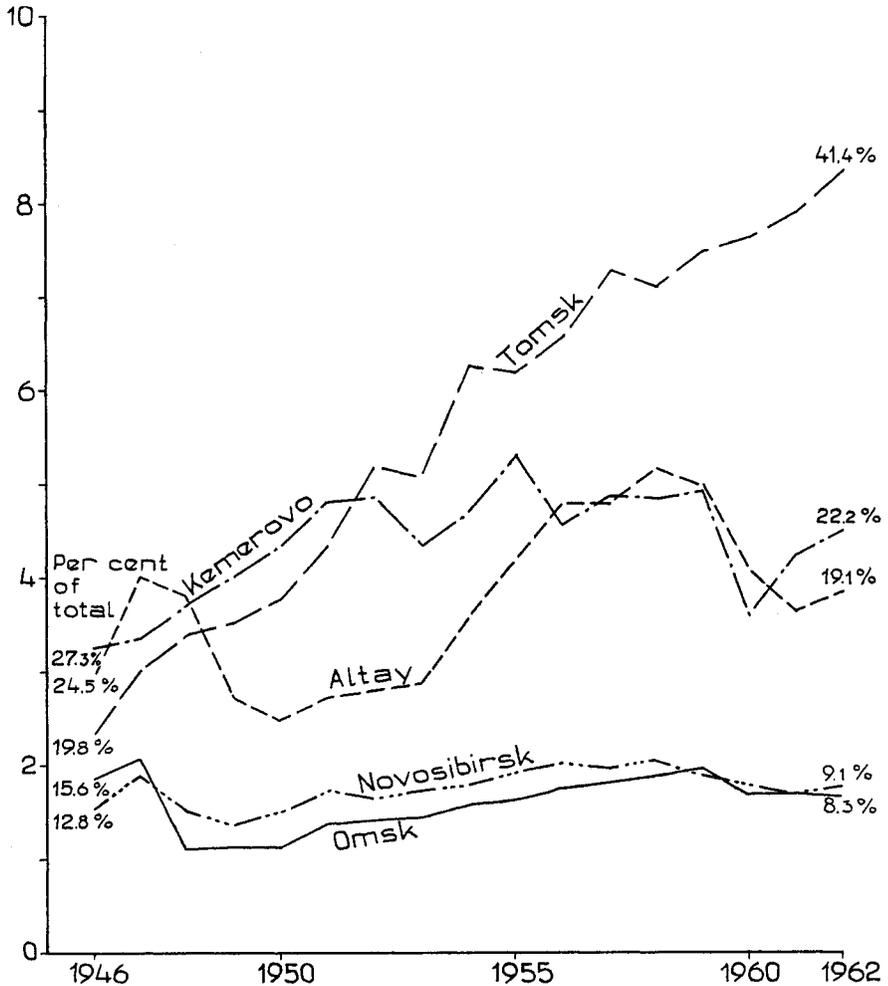
Source: Perepechin-Filinov, *Lesepolzovanie v SSSR 1946—1962 gg.*, 1964

Fig. 3: 11. Dynamics of Annual Cut, by Provinces, in Western Siberia, 1946—1962

stock of the entire province, (i. e. the stock accessible under present conditions) does not exceed 573 million cubic metres. This stock is located in the river basins which are briefly described below.

The **Chulym** river basin is the most important, with an estimated merchantable timber stock (*likvidny zapas drevesiny*) of 142 million cubic metres. The Chulym, which is the biggest of the right-hand tributaries of the Ob, is about 2,000 kilometres long, rising in the mountainous district of Kuznetsk-Alatau. The lower Chulym is

reckoned to be capable of floating 3—4 million cubic metres of timber annually. In 1961, the rate of removals was about 2 million cubic metres a year, but this can be increased to 4.5 million cubic metres, which ought to be applicable for a long time to come. Removals will be concentrated principally on the tributaries such as the Ulu-Yul, the Chichka-Yul and the Yuksa. The wood-processing centre will be at Asino.

The **Ket** river basin possesses, according to official estimates, a timber stock of about 350 million cubic metres. The river is 1,400 kilometres long. The Ob is some 20 kilometres wide and its navigation presents difficulty, particularly in the Narym district (*narym* means swamp in the local dialect) where the Ket joins the Ob. Ket basin timber is to be assembled at Bely-Yar, a settlement lying a considerable distance from the mouth of the Ket, and loaded there on a new railway which is planned to construct so as to avoid having to float timber via the Ket-Ob confluence and down the Ob. When this projected new railway, which is to link Asino with Bely-Yar, is completed, it is estimated that the timber output of the Ket river basin will increase to 4 million cubic metres a year. At present, the annual removals of the area, consisting mainly of logs for the Ket sawmill (at Togur), are estimated at about 300,000 cubic metres.

The **Tym** river, another large tributary of the Ob, is 650 kilometres long. Its river basin possesses a timber stock of about 260 million cubic metres, of which 57 per cent are conifers. However, the stands are situated in inaccessible areas, mainly on the rivers Bolshaya Kositsa and Sangilka. Current removals are only 120,000 cubic metres, but it is estimated that these can be increased to two million cubic metres a year. The timber must, however, be transported to the Ob; this means that the Ivdel-Ob railway (cf. the Ural region) must be completed before large-scale operations can start.

The **Vasyugan** river basin includes a forested area of almost four million hectares, with a timber stock of 500 million cubic metres. The Vasyugan itself, one of the left-hand tributaries of the Ob, is 830 kilometres long. It rises in the Vasyugan-Abinsky Marshes (*Vasyugansko-Abinskie bolota*) which extend over an immense area on the watershed between the Irtysh and the Ob. The higher levels of these marshes, however, are forest-covered and are capable of being exploited.

The present annual removals in the Vasyugan river basin are about 250,000 cubic metres, but this figure could be gradually increased to one million cubic metres. An essential condition for this, however, is that transport facilities for timber should be provided on the lower Ob.

5.4.3 *The Altay Mountains*

Most of this area comes under Altay province for administrative purposes. It is one of those Siberian areas possessing high-quality coniferous stands and belonging to a comparatively high category of site quality class. The yield in the Biya river basin is 150-250 cubic metres per hectare, and in the vicinity of of the Ob (Priobye, the so-called *potnoye bory*) it is no less than 450-500 cubic metres per hectare (Shimanyuk, 1962, p. 50). In this last-mentioned area, logging on a large scale is currently going on, and it would scarcely be possible to achieve a further increase in removals.

On the other hand, there is every opportunity to increase the output of timber from the mountain forests of the Biya and Katun river basins, though this would require that these rivers should be adapted for floating. The Katun, which is 730 kilometres long, rises from the Katun Glacier and flows through narrow mountain passes. It grows wider and flows more slowly after it has been joined by its tributaries, the Argut and the Chuya.

Conditions for floating are a little better on the Biya, which rises at Lake Teletsk and is 700 kilometres long.

It is planned to increase the output of timber in Altay province to five million cubic metres a year (Dostal, 1961, p. 81). The wood-processing centres are to be at Biisk and Gorno-Altaysk, where new factories with an annual consumption of 700,000 cubic metres of roundwood are to be built. The emphasis will be upon the sawmilling and particle-board industries.

6. Potentialities of Eastern Siberia

6.1 *Introductory Remarks*

The River Yenisey divides Western from Eastern Siberia. The lower and middle Yenisey basin fall under the administrative province of Krasnoyarsk, the western boundary of which runs about two hundred kilometres from the river. It is therefore convenient to classify the whole of the river basin—i.e. both banks—as Eastern Siberia and to go by the administrative boundaries. The total area involved is almost double that of Western Europe, but the population is only a fraction of that of Europe.

The region includes two vast river systems—the Yenisey and the Lena, which both debouch into the Arctic Ocean—more precisely, the

Kara and Laptev Seas—so that their value as waterways is strictly limited.

However, these two river basins boast the richest timber resources of the U.S.S.R., the exploitation of which has up to now been extremely limited.

Eastern Siberia is in the main a country of high relief. East of the Yenisey the terrain is hilly and on average higher above sea level than Western Siberia. It is known geologically as the Central Siberian Uplands. The areas to the east and south contain several mountain chains, such as the Chersky, the Verkhoyansky, the Stanovoy, the Yablonovy, the Western and the Eastern Sayan. The largest tract of lowland is situated at the confluence of the Vilyuy and Lena rivers.

As a rule the rivers are rapid and the cataracts numerous. Marshes are less extensive than in Western Siberia, but permanently frozen subsoil is general, except for certain southern areas. Seasonal variations of temperature are wide in Eastern Siberia: winters are cold and summers hot. The coldest places in the world are found here. In Verkhoyansk and Oimekon, for example, the temperature can fall to -70° C during the winter.

The vast territory of Eastern Siberia is very sparsely populated. The land area totals 7,226,000 square kilometres while the population is 7.7 million, of whom 3.6 million are classed as rural dwellers (*N. Kh. SSSR, 1965*). Thus the average population density is only one inhabitant per square kilometre, the lowest in the whole of the U.S.S.R.

6.2 Timber Stock

The total forest area of Eastern Siberia is estimated according to 1961 inventory at 417.9 million hectares, of which 335.7 million hectares are forested and 82.2 million hectares unforested. A further 124.7 million hectares of non-forest land, e.g., marshlands (53 million ha), mountain slopes (56 million ha), are under the administration of forest authorities. The total volume of timber stock is estimated at 38,783 million cubic metres, of which 36,127 million are conifers, mostly larch. The volume of mature coniferous timber totals 28,528 million cubic metres. This in fact is the most extensive stand of coniferous forests in the world. However, less than half can be exploited under present conditions; the rest must be considered inaccessible.

The most valuable tree species in Eastern Siberia, however, is still the common pine, which covers 42 million hectares, or 13 per cent of

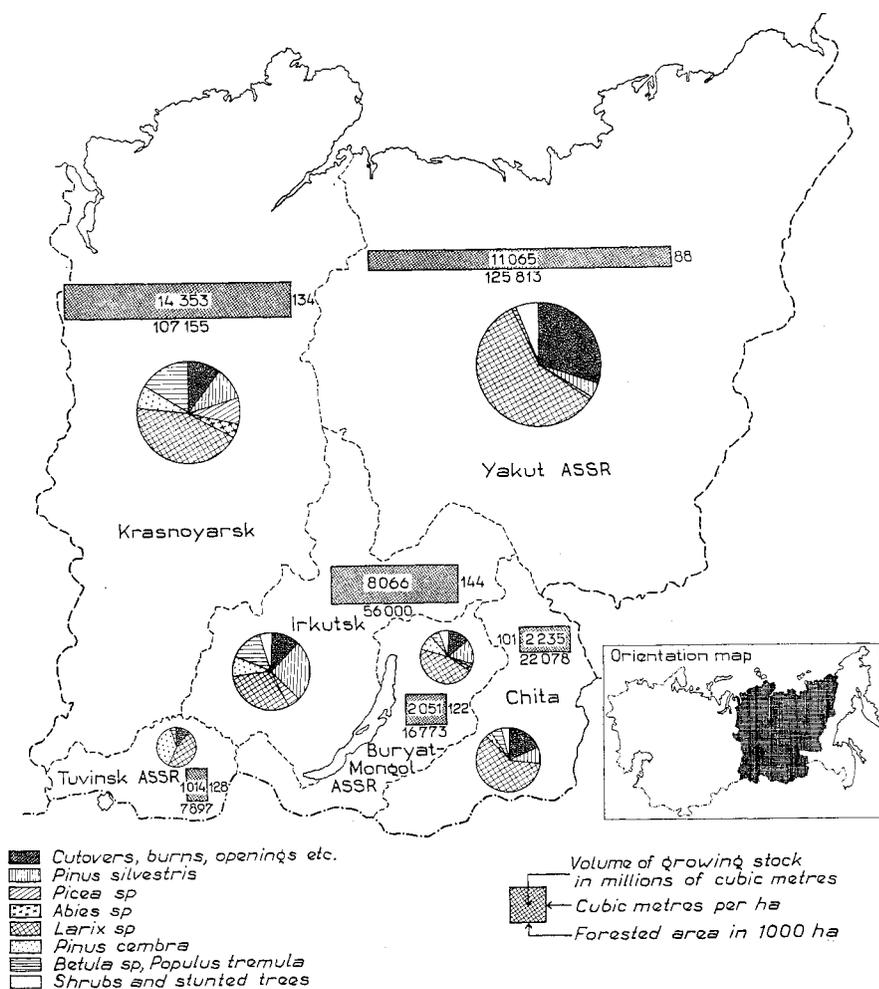


Fig. 3: 12. Distribution of Forest Resources, by Provinces, in Eastern Siberia

the total forested area. The large-dimensioned stems are alleged to be of high quality, particularly in the southern parts of the region. The specific weight of pine timber from the Krasnoyarsk province, however, has proved to be lower than that of the pine from north European Russia (Shimanyuk, 1962, p. 47).

Figure 3: 12 shows the distribution of the forest resources and their composition by provinces. The diagram indicates also the average cubic

volume per hectare in the various provinces. It will be seen that the average timber volume per area unit is highest in Irkutsk province (144 m³/ha) and lowest in the Yakut ASSR (88 m³/ha). The corresponding figures in the mature stands with old growth timber is 169 cubic metres per hectare in Irkutsk and 99 cubic metres per hectare in the Yakut ASSR. The average volume of the timber stock in the whole region is 116 cubic metres per hectare. There are wide local variations in the productive capacity of the forests, but it can be stated generally that it improves as one travels south. It should not be forgotten, however, that almost the entire region has permanently frozen subsoil extending as far as Lake Baikal.

6.3 Transport Network

6.3.1 River Systems

Eastern Siberia is a country of big rivers. The Yenisey and the Lena are among the largest rivers in the world. The Yenisey, however, is much more important than the Lena as a line of communication with the rest of the world, particularly by way of the Northern Sea Route.

The great natural resources of Siberia were the reason why by the middle of the 19th century attempts were already being made to reach the **Yenisey** by sea and establish regular shipping routes between that river and the oceans.

The construction of a transshipment port on the Yenisey signalled the start of large-scale timber exports by sea from Siberia. In 1927 the first ocean-going vessel anchored at Igarskoye, a small fishing village about 750 kilometres upstream on the Yenisey. Igarskoye was protected from the main channel by an island, and the channel between the island and the mainland was sufficiently wide and deep for ocean-going vessels. The location seemed ideal for a port and construction started the following year. At the same time a sawmill was established there, and in 1929 the first cargo of sawnwood was shipped from the new port, called Igarka, northwards to the Kara Sea. Since then almost all ships sailing through the Kara Sea have called in at Igarka, which grew in 10 years into a town of more than 20,000 inhabitants.

An important factor here has been that the Northern Sea Route has been developed into a navigable shipping route, thanks chiefly to the general progress of technology which we have discussed earlier (cf. Part I, p. 104). The Northern Sea Route, however, does not extend to the Lena, which flows into the Laptev Sea.



Fig. 3: 13. Geographical Map of Eastern Siberia

The River Lena, or Ulakhan-Yuryakh, as the Yakuts call it, is more than 4,000 kilometres long, measured from its source near Lake Baikal. It is navigable from its mouth as far as Ust-Kut, but not by ocean-going vessels, which must tranship their cargoes at sea at Tiksi. Cargoes coming down-river to the Laptev Sea must also be transhipped. Under current circumstances, therefore, the transport of Lena basin timber to the European market in the west via the Arctic Ocean seems to be impracticable because of the loading difficulties and because the sea route along the Siberian coast is too long.

There are a number of other big rivers flowing into the northern seas. These include the Khatanga, the Anabar and the Olenek, which empty themselves into the Laptev Sea west of the Lena; the Yana

east of it; and the Indigirka and the Kolyma which flow into the East Siberian Sea (cf. the map of Fig. 3: 13). These rivers, however, are of no practical consequence in the transport of timber.

The most important waterway in the area for the transport of timber is the **Yenisey-Angara** system, including innumerable tributaries, such as the Ona, the Chuna, the Taseyeva, and so on. Certain rivers which flow into Lake Baikal, such as the Barguzin and the Selenga, and into the Amur River, such as the Shilka, are also used for timber floating. Two tributaries of the Shilka, the Ingoda and the Olenguy, are particularly important in this respect.

6.3.2 Railways and Highways

The communications network of Eastern Siberia is inadequate. The Trans-Siberian Railway, which crosses the southern parts of Eastern Siberia, is still practically the only east-west transport link. Timber destined for European districts of the U.S.S.R. is carried exclusively by this railway, which is considerably overloaded.

The Achinsk-Abakan railway line, a southern branch of the Trans-Siberian Railway, provides a direct outlet for the products of the Minusinsk mining area. The extension of the railway to Taishet, which began quite a long time ago, now seems to have been completed (cf. the map in *L.P.*, 1966, 3).

The recently built Taishet-Bratsk Ust-Kut railway line, which links the Trans-Siberian Railway with the Lena, is of great importance for the transport of timber.

The railway between Ulan-Ude and Naushki provides a link southward to China.

The railway linking Dudinka, on the mouth of the Yenisey, with the Norilsk mining area, is of local importance only.

The new Achinsk-Abalakovo railway line, now under construction and scheduled to open for traffic in 1966, will have an immense effect on the nation's supply of wood products. It will link the Trans-Siberian Railway with the Yenisey below the confluence of the Yenisey and the Angara, thus opening up the vast timber resources of the Angara river basin for exploitation.

Plans also exist to construct a railway from Reshety (on the Trans-Siberian Railway) to Boguchany on the River Angara, but they seem as yet to be only on paper.

There are only a few highways in the whole region. These include

the Usinsk Highway, linking the Minusinsk area with the Tuvinsk ASSR, and the Aldan Highway which runs from Bolshoy Never station on the Trans-Siberian Railway, to Aldan, Tommet and Yakutsk.

6.4 Wood-Processing Industries

The development of the East Siberian wood-processing industry has lagged badly in the past. In very recent years, however, the capacity of the wood-processing industry has expanded fairly rapidly, especially on the sawmilling side, so that in 1963 the output of the sawmilling industry in the region was 13.6 million cubic metres (Petrovskaya, *L.P.*, 1965, 8), which must be considered a respectable figure. Furthermore, large-scale industrial projects are now under way and a number of large wood-based enterprises will come into production in the near future. It is planned to transform Eastern Siberia into one of the most important wood-processing areas in the whole of the U.S.S.R. The following centres, either projected or already in existence, may be mentioned.

Igarka, as already stated, is an important port for the export of sawnwood from Eastern Siberia. At present it possesses a large sawmilling plant which uses sawlogs from the middle Yenisey and from the Angara river basin. But the sawnwood consigned from Igarka is not just the locally manufactured product; most of it comes from sawmills higher up on the Yenisey.

Yeniseisk-Maklakovo, on the confluence of the Yenisey and Angara rivers, 350 kilometres north of the town of Krasnoyarsk, will be one of the main wood-processing centres. According to plans which have already been partly implemented, four large sawmills and a pulp and paper plant are to be constructed here. The Novo-Maklakovsky combine will be equipped with 16 frame-saws and will consume 1.1 million cubic metres of sawlogs annually, producing 680,000 cubic metres of sawnwood. Another sawmill in Maklakovo may have the same capacity as the Novo-Maklakovsky combine. The plans provide for a total of 39 frame-saws to be working in the area by 1965 (Nevzorov, *L.P.*, 1958, 5, p. 4).

A characteristic of these sawmills is that they are to be integrated with other wood-processing industries so that the sawmill residues can be used as raw material for other products, primarily pulp and building-boards. The main emphasis, however, will be on the sawmilling industry. The future total consumption of industrial roundwood is estimated at 12 million cubic metres (*L.P.* 7 Nov. 1964).

The timber products of the Yeniseisk-Maklakovo industrial district are to be transported in two different directions in the future: northward along the Yenisey to Igarka, and southward along the projected railway line from Abalakovo to Achinsk on the Trans-Siberian Railway.

A large industrial centre will be built on the River Angara, seven kilometres from **Boguchany**. It will include a pulp and paper mill, a sawmill, a plywood factory, and so on, and will consume more than eight million cubic metres of industrial roundwood annually (*L.P.* 7 Nov. 1964). By the projected Reshety-Boguchany railway, it will become possible to transport the processed forest products to consumers in other parts of the country. No information is available on how far this project has progressed.

The town of **Krasnoyarsk** was a wood-processing centre even before the construction of the new pulp and paper combine which came into partial production in 1964. The raw material needs of the wood-using industries situated here are partly met by supplies from the upper reaches of the River Yenisey.

Bratsk will also become one of the biggest wood-processing centres of the U.S.S.R., converting about 4 million cubic metres of industrial roundwood into a variety of manufactured forest products. The annual output of sulphate pulp will be 500,000 tons (of a total pulp production of 590,000 tons) and that of paperboard 280,000 tons (Arkhipov, *B.P.*, 1964, p. 4). The production of sulphate pulp started towards the end of 1965, when a pulpmill was completed with an annual rate of production of 250,000 tons, or half of the planned total rate of output (*L.P.* 6 Nov. 1965). It is additionally intended to construct here a large sawmill, a particle-board factory, another factory manufacturing wood-chemical products, and a furniture factory. Their products will be shipped by rail to Taishet on the Trans-Siberian Railway and thence to other parts of the U.S.S.R.

A pulpmill in **Baikal** which has reached an advanced stage of construction will produce 250,000 tons of pulp, comprising 200,000 tons of viscose cellulose, 10,000 tons of paper and a number of other products (*L.P.* 15 June 1965).

Another new factory to be constructed in the near future is a pulp-paperboard combine at **Selenga**, east of Lake Baikal. However, work has probably not started on it yet (*L.P.* 9 Jan. 1964).

A number of fairly large sawmills lie along the Trans-Siberian Railway, at places like Kansk, Taishet, Tulun, Zima and Chita. It is not intended, however, to increase sawmilling capacity by establishing

Millions of cubic metres

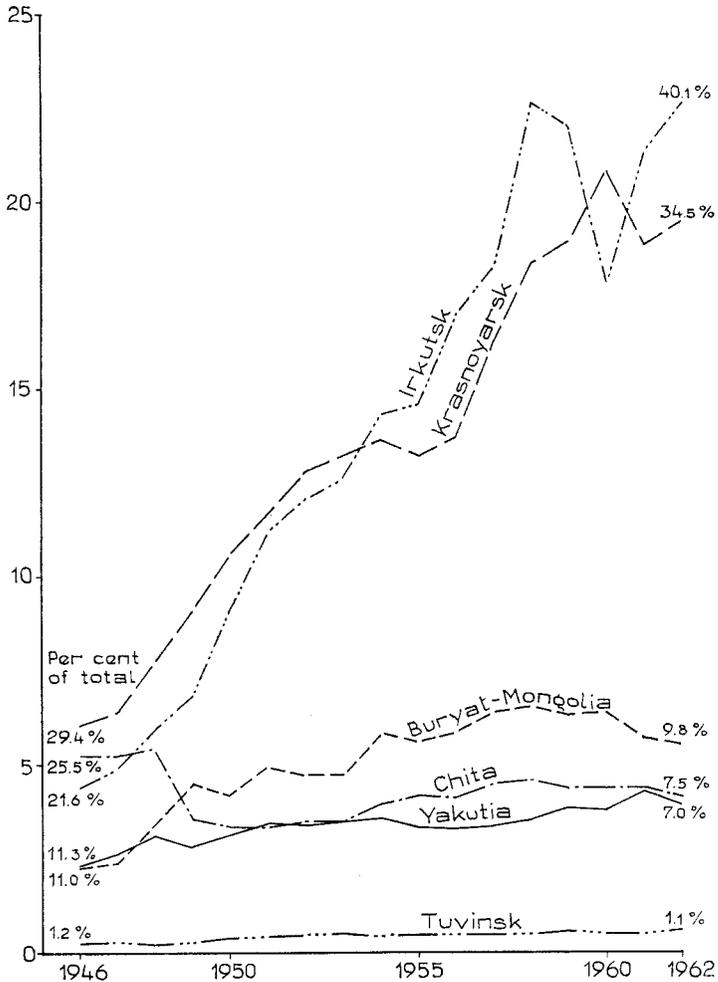
Source: Perepechin-Filinov, *Lesepolzovanie v SSSR 1946—1962 gg.*, 1964

Fig. 3: 14. Dynamics of Annual Cut, by Provinces, in Eastern Siberia, 1946—1962

small new sawmills. Capacity will be increased mainly by constructing big integrated industrial centres.

6.5 An Appraisal of Potentialities of Timber Production

6.5.1 Past Removals

Considerable efforts have been made for a long time to increase timber output in Eastern Siberia. As shown in Figure 3: 14, the annual

cut has increased in two districts particularly, Irkutsk and Krasnoyarsk, since World War II. Removals increased somewhat in the Buryat-Mongol and Yakut ASSRs, too, but declined in the province of Chita, between 1946 and 1962.

The point that seems most worthy of remark is that in Yakutia, which has 126 million hectares of forested land with a timber stock of about 11,000 million cubic metres, the annual cut is only 3—4 million cubic metres.

We now, therefore, proceed to a detailed consideration of the opportunities that present themselves for increasing removals from the various tracts of this vast region.

6.5.2 *The Yenisey-Angara Basin*

Most of this river basin is embraced within the administrative province of Krasnoyarsk. It contains the most valuable timber resources in Eastern Siberia. The total area of forest land is estimated at 117.6 million hectares, of which 107.2 million hectares are forested and 10.5 million hectares unforested. More than half, or 60.5 million hectares of the forested area, is classified in the official statistics as a forest reserve, which is inaccessible under current conditions. Forests situated in the northern part of the river basin are as yet practically untouched by the axe. The total volume of timber stock is estimated at 14,352 million cubic metres, the largest in any province of the U.S.S.R.

The most valuable forests are located in the Angara river basin (the so-called Priangarye) on the Taseyeva, Ona and Chuna tributaries. The total forested area in the Priangarye is estimated at 11.8 million hectares and the total timber stock at about 2,000 million cubic metres. Pine is the predominant tree species here. The productive capacity of these forest stands is relatively high. The average volume of growing stock amounts to 150—200 cubic metres per hectare and that of a single tree to 0.8—1.0 cubic metres (Reshetov, *L.P.*, 1957, 2, p. 23).

The removals in the area have increased considerably in recent years, and a further increase in the future is quite feasible. To quote one example, on the Taseyeva, which is located 68 kilometres above the confluence of the Angara and the Yenisey, about 2.5 million cubic metres of timber are now cut annually, but the removals from there are to be raised to 3.5 million cubic metres (Milovantsev, *L.P.*, 1963, 5, p. 9). The timber is floated along the Angara to Strelki, where it is sorted and then floated to the sawmills at Maklakovo, Yeniseisk and Igarka.

Some timber, too, has been towed in the past up-river to the town of Krasnoyarsk.

Another forest area lying west of the Yenisey and east of the Chulym, where the new Achinsk-Abalakovo railway line is now being constructed, is to be an important centre of the logging industry in the future. It is estimated that a 90-kilometre belt along the new railway contains 1.06 million hectares of mature stands, amounting to 223 million cubic metres, 71 per cent of which are conifers. The productive capacity of the forest land is relatively high, the average volume in mature stands being 210 cubic metres per hectare (Tverskoy, *L.P.*, 1958, 5, p. 5)—an important factor in forest exploitation.

Altogether ten logging enterprises, some of which are already in operation, are to function in the area. It is estimated that the timber stock is sufficient to keep them employed for the next 40-45 years.

Logging operations are also planned for the future in the area north of the Angara and south of the Podkamennaya Tunguska. Preparations are now in hand for the establishment there of 21 *lespromkhoz*y to conduct logging (*L.P.* 7 Nov. 1964). However, conditions here are less favourable than in the Priangarye to the south.

The forests on the upper Yenisey, and especially those on its tributary, the Abakan, have up to now chiefly supplied timber to the Kuznetsk coal-mining area. The wood-processing combine at Ust-Abakan plays an important part in this. The new Abakan-Stalinsk railway will make it possible to transport forest products westward, primarily to Soviet Central Asia.

However, it ought to be stressed that according to the new Five-Year Plan for 1966—1970 total timber removals in Krasnoyarsk province are to be 14.5 million cubic metres annually (*L.P.* 3 March 1966). This means that in the immediate future the level of activity will remain about the same. It would appear that the projected wood-consuming industries will not be coming into operation within the next five years.

The second most important area for forest industry after Krasnoyarsk is the province of Irkutsk. One of the biggest wood-processing centres is Bratsk, which receives most of its supplies of roundwood from the Iya and Oka river basins. It is possible that in time to come the railway between Bratsk and Ust-Kut on the Lena will carry industrial roundwood for processing in Bratsk. At the present time, at any rate, this seems to be the likeliest solution to the problem of exploiting the immense timber resources of the upper Lena.

The forest land area in the province of Irkutsk totals 63.2 million hectares, of which 56.0 million hectares are forested. The growing

stock is estimated at 8,065 million cubic metres of which about 70 per cent is mature timber.

The productive capacity of the forest land in Irkutsk province is relatively high. The average volume of mature timber is estimated at 169 cubic metres per hectare and the average of the total growing stock at 144 cubic metres per hectare. This means that conditions are favourable for mechanised logging operations, provided there are access roads to these enormous forest resources.

6.5.3 The Lena Basin

Most of the Lena basin lies within the Yakut ASSR. The total area of forest land is estimated at 182.1 million hectares, of which 125.8 million hectares are forested. It is officially estimated that there are 80.6 million hectares of unexploited forests at present classified as inaccessible. This estimate, however, seems to be too optimistic because it would mean that 45.2 million hectares of forested land were in use at present, i.e., that this acreage was being exploited in Yakutia, which seems unrealistic.

Soviet statistics relating to annual cut, presented in Figure 3:14, indicate that removals in Yakutia are not much more than 4 million cubic metres. It has also been stated that the permitted annual cut in the forests in use is 32 million cubic metres (*L.P.* 3 March 1965). Thus, approximately one-tenth of the allowable annual cut is actually used.

Timber removals take place chiefly on the Lena south of Yakutsk. In the Vilyuy and Aldan river basins, which contain most of the timber resources, there is practically no logging at the present time apart from local needs, which are of course negligible because the area is very thinly populated. It is interesting to note that the annual cut has even decreased recently. In 1964, the State logging enterprises cut only a total of 3.5 million cubic metres, because timber consumption in the Yakut ASSR had declined (*L.P.* 16 March 1965), and, as has been said before, there are no facilities for transporting the timber to markets outside the Republic.

The predominant tree species in Yakutia by area is *Larix dahurica*, 84 per cent, which is well adapted to the prevailing site conditions, especially the permanently frozen subsoil. In the southern zones, on dry sandsoils and more particularly in the upper terraces of the river valleys with their better drainage, the common pine is found. It covers six per cent of the total forested area. It must be stressed that pine is

regarded as the most valuable tree species in the area and for most purposes it is preferred to larch. The total growing stock of pine amounts to more than 1,000 million cubic metres (Shimanyuk, 1962, p. 133).

Forest fires devastate immense areas. It is stated that areas burnt over and not regenerated later are much more extensive in the north than in the south, partly because forest renewal proceeds much more slowly in areas near to the timber line.

Much forest land has also become swampy, although to a lesser extent than in Western Siberia. In Yakutia the swamp forests are most extensive in the Vilyuy *taiga*, the flat landscape drained by the Vilyuy river system. The terrain is for the most part mountainous and hilly. The getting of timber in the mountains is fraught with special difficulties, which should be taken into account when evaluating opportunities for forest exploitation in the area.

7. Potentialities of the Far East

7.1 *Introductory Remarks*

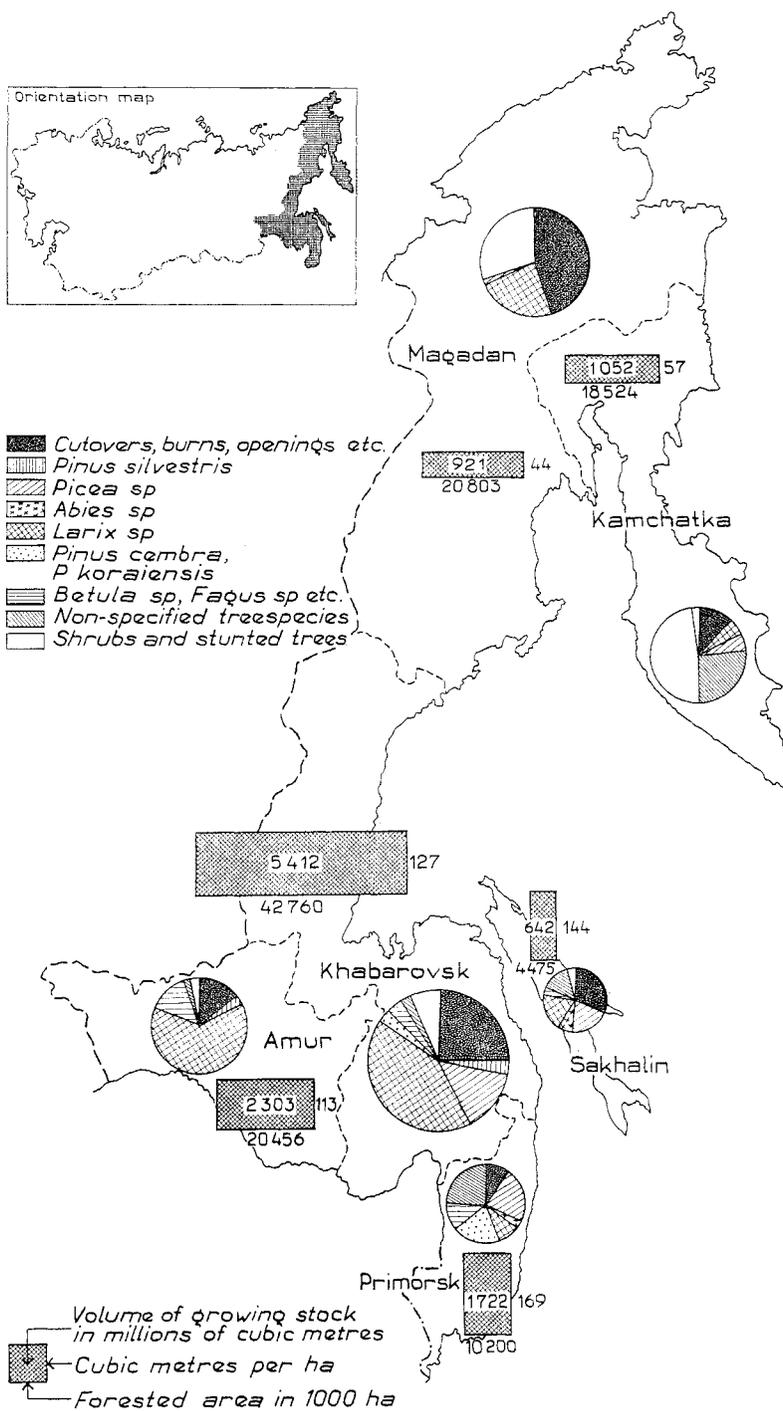
This region is one of the Soviet possessions in Asia most favoured by nature. Its great north-to-south sweep embraces wide variations of climate from arctic conditions in the north to nearly sub-tropical in the south.

The Far East lies within the monsoon belt. Winter monsoons, blowing from the Eastern Siberian land mass, bring dry cold to the coastal area, while the summer monsoons, blowing from the sea, bring rain and fogs.

As the warm Kuro-Shiva Stream of the Pacific (corresponding to the Gulf Stream of the Atlantic) turns east towards America at the northern extremity of the Japanese Archipelago, temperatures in the Far East are as a rule lower than at the same latitudes in Europe. Thus, for example, certain parts of the Sea of Okhotsk are ice-covered for eight to nine months annually.

The climate is warmer at Vladivostok and in the Ussuri river basin, where broad-leaved forests occur. Even so, Vladivostok has an average winter temperature of -13°C , compared with $+5^{\circ}\text{C}$ at Sukhum, at the same latitude (43°) on the Black Sea coast.

The total land area of the Far East region is 3,112,700 square kilometres and the total population about 4.7 million, of whom 0.9 million



Source: Lesnoy fond RSFSR, Statistichesky sbornik, 1962

Fig. 3: 15. Distribution of Forest Resources, by Provinces, in the Far East

are rural dwellers. Thus, the average density of population is between one and two inhabitants per square kilometre.

The landscape is predominantly mountainous. The mountains reach 1,500-2,000 metres above sea level as a rule, and their slopes are generally forested. The most important mountain ranges in the area are the Stanovoy, Kolyma, Sikhote-Alin, Kamchatka and Sakhalin. Eighty per cent of the forests in the area are found in these mountainous districts. The principal lowlands are situated on the River Amur and its tributaries, the Zeya and the Ussuri; in the Tym and Poronay river basins on the island of Sakhalin; on the Kamchatka river; and in the Arctic region, which includes the large Anadyr Lowland.

7.2 Timber Stock

The total area of forest land in the Far East is estimated at 157.4 million hectares, of which 117.2 million hectares are forested and 40.2 million hectares unforested (cut-overs, burned areas, semi-permanent openings, etc.). The total volume of growing stock is estimated at 12,052 million cubic metres. The forest authorities also administer 88.4 million hectares of non-forest land, including 20.0 million hectares of bogs and marshlands and 44.4 million hectares of mountain slopes. Almost half of the forest-covered area in the Far East is considered inaccessible at present.

The distribution of forest resources by provinces and by dominant tree species is shown in Figure 3: 15. The predominant species is larch, and coniferous forests cover some 80-90 per cent of the productive forest area. However, the diagram does not offer a sufficiently detailed picture of the composition by tree species, since about 15 different conifers and more than 150 deciduous species are represented in the region. The greatest variety of tree species is to be found in the southern portion of the region. The coniferous stands north of the River Amur consist mainly of *Larix dahurica*, *Picea ajanensis*, *Picea obovata*, *Abies nephrolepis* and *Pinus silvestris* (Orlov, 1955, pp. 26-48). South of the Amur, *Pinus koraiensis* is also to be found; it can attain a height of 40 metres and a diameter of more than a metre. Timber of this species is of high quality and widely used. Spruces (*Picea ajanensis* and *Picea obovata*), too, can on the better soils reach a height of more than 38 metres and a diameter of more than a metre.

The deciduous species of commercial value found in the southern parts of the region include *Juglans manshurica*, *Phellodendron amurense*, *Quercus mongolica*, *Fraxinus manshurica*, *Acer mono*, *Kalopa-*

nax recinifolium, *Tilia amurensis* and *Tilia manshurica* (Tsymek, 1956).

Over 70 per cent of the conifers are mature and over-mature old-growth timber. The average volume for total forest covered area is 103 cubic metres per hectare and that for the mature timber 111 cubic metres per hectare. The average volume per hectare is highest in the province of Primorsk (169 m³/ha) and lowest in Magadan (44 m³/ha). The volume of mature timber stock in Primorsk averages 206 cubic metres per hectare, which indicates the productivity of the forests to be relatively high. The productive capacity of the forest land on Sakhalin island is also fairly high: in mature stands the timber volume averages 191 cubic metres per hectare.

As the terrain is mountainous, timber extraction is generally to be accomplished only with great difficulty and not always even then. Nor are all tree species exploited. It is a curious fact that the commonest species in Eastern Siberia and the Far East, *Larix dahurica*, is scarcely used at all and indeed is left standing when other species are being cut (Vasiliev, 1955, p. 12). And of the deciduous species abounding in the most productive southern parts of the region, little is removed by logging.

7.3 Transport Network

7.3.1 River Systems and Ports

The forests of the region reach down to the coastline, which is about 14,000 kilometres long. However, because of the adverse climatic conditions the coastal area is very sparsely populated, except in the southern part of the region; moreover, there are extremely few links between the coastal area and the interior, which is almost devoid of inhabitants. The only natural east-west line of communication of any significance is the River Amur, which is 2,900 kilometres long and drains an area of more than two million square kilometres, almost half of which lies outside the U.S.S.R.

The Amur system, with its source-rivers, the Shilka and the Argun, and its large tributaries (including the Ussuri, which plays a major part in the transport of timber), provides a navigable river network of about 14,000 kilometres. About 30,000 kilometres of the Amur system are floatable. The total number of floatable rivers in the system is 126 (Viryasov, 1933, pp. 16-19).

The fact that the Amur empties into the shallow Sea of Okhotsk or, to more precise, into the shallow 'Amur Liman' in the northern

part of the Tartar Sound linking the Sea of Okhotsk with the Sea of Japan—is a great obstacle to navigation. What is more, the lower Amur (from Khabarovsk to the river mouth) is frozen on average for 215 days a year. The middle Amur (from Blagoveshchensk to Khabarovsk) is frozen for 185 days and the upper Amur for 200 days. The navigation season is longest and conditions generally are most favourable in the middle Amur.

Thus, the town of Nikolayevsk, on the mouth of the Amur, is negligible as a port, despite the apparent advantages of its geographical position.

The principal ocean port of the Amur river system is the town of **Sovetskaya Gavan**, on the Tartar Sound, in the northern part of the Sea of Japan. This port was established at the beginning of the Thirties. It is linked by railway to Komsomolsk, another new town on the River Amur, and with the Trans-Siberian Railway in the vicinity of Khabarovsk. **Sovetskaya Gavan** ('Soviet Port') has an excellent natural harbour accessible to ocean-going vessels. It is the point of shipment for much of the seaborne traffic from the mainland to Sakhalin.

About 40 smaller rivers rising in the eastern ranges of the Sikhotealin Mountains, also empty into the Sea of Japan and the Tartar Sound. The fall of these rivers is very steep, so that their flow is very rapid. None of them are navigable. Timber can be floated in rafts in the lower reaches of some of these mountain rivers (e.g. the Suifon and the Tumnin). The floating of single logs is also rather difficult and must be done during the spring flood or immediately after rainy periods, because the water level falls very rapidly. On the other hand, floods are frequent and often carry floating timber to the open sea.

The biggest port on the coast of the Sea of Japan in the whole of the Far East region is **Vladivostok** ('Ruler of the East'), founded in 1860. It is very advantageously situated on a protected bay, **Zolotoy Rog** ('Golden Horn'). The harbour is ice-free for nine months of the year and can be kept open all the year round with icebreaker assistance. **Vladivostok** was formerly the biggest timber exporting port in the Far East, but after World War II its timber exports fell almost to zero. This is mainly attributable to a change of trade policies, but shortage of raw material in the natural hinterland of the harbour has been partly responsible, too.

Other timber-loading ports along the coast, in addition to those mentioned above, include **Ambabaza** (on the Bay of Peter the Great), **Nakhodka**, **Olga**, **De-Kastri** and **Lazarev**. A number of rivers also flow into the Sea of Okhotsk, north of the estuary of the Amur; timber

floating would be possible on the larger of these. Such rivers include the Tugur, the Torom, the Uda, the Maya (a tributary of the Uda), the Tyl, the Ulya, the Urak, the Okhota, the Kukhtuy, the Inya, the Kova, the Ola, and the Yama. The only one of these said to be navigable is the Ulya, which can be sailed by small ships a distance of 200 kilometres up-river (Viryasov, 1933, p. 21). All these rivers are usually frozen for eight to nine months of the year.

Thirty years or so ago there was no port on the Sea of Okhotsk accessible to ocean-going vessels. In the early Thirties the town of Magadan was founded on Nagayevo Bay to promote gold-mining in Kolyma; it is about 2,700 kilometres north of Vladivostok by sea, and its harbour, known as the "harbour for Kolyma", is said to be accessible to ocean-going vessels.

The largest rivers on the island of Sakhalin are the Tym and the Poronay. Their sources are fairly close to each other in the eastern mountain range but they flow in diametrically opposite directions. The Tym flows north-eastwards and empties into Nyisky Bay in the Sea of Okhotsk, the Poronay southward into Terpeniya Bay ('Bay of Patience'). The Tym is about 350 kilometres long and has numerous tributaries, most of them floatable.

The biggest river on the Kamchatka Peninsula is the Kamchatka, which flows into the Pacific. It is about 1,000 kilometres long, and its upper course is very rapid. Floating is possible from about 600 kilometres up-river. The navigation season lasts from May to October. Ust-Kamchatsk, a small port at its mouth, handles a certain amount of timber. Petropavlovsk is the biggest town and port on the Kamchatka Peninsula, but it has no natural links with the forested interior.

Proposals have been made for the construction and expansion of port facilities during the next few years. The first step would be to build modern ports, specially designed to handle timber, on Nakhodka Bay, at the mouth of the Amur and on Tartar Sound (Kanevsky, *L.P.* 1964, 4, p. 28). This is considered necessary because timber shipments from these regions are to be increased during the next few years. There is information (*L.P.* 11 Feb. 1965) to suggest that the export of timber products, primarily roundwood, is to amount to 4 million cubic metres by 1970.

7.3.2 Railways

The railway network in the Far East is somewhat meagre: the only lines are in the southern parts of the region. They are:

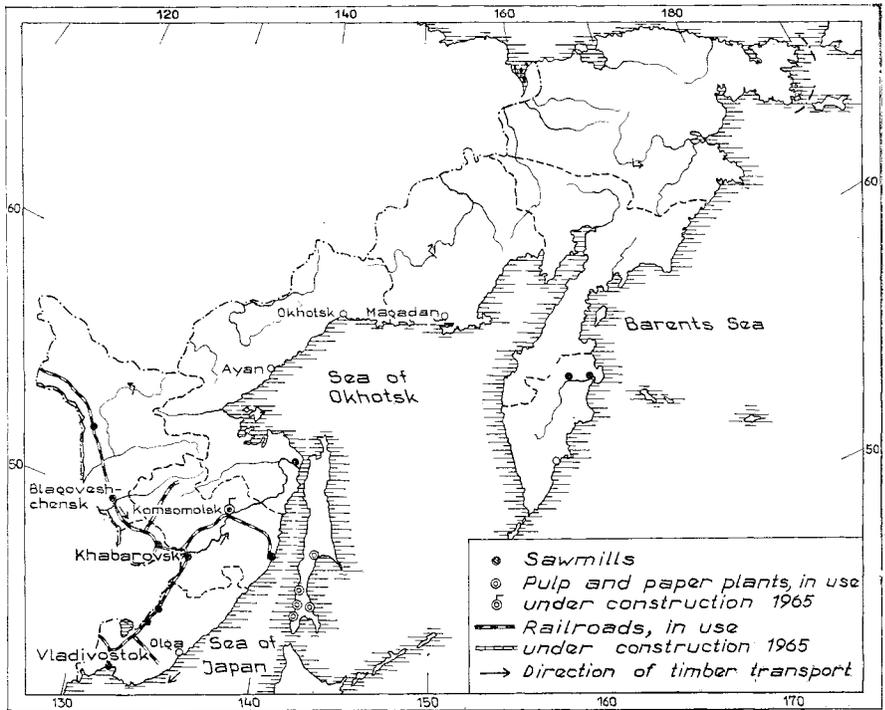


Fig. 3: 16. Geographical Map of the Far East

The Amur Railway, which is an extension of the Trans-Siberian Railway north of the Amur to Khabarovsk, where it bridges the river and continues south to Vladivostok under the name of the Ussuri Railway. This railway line, 2,362 kilometres of which lie within the region, was opened for traffic in 1916 when the railway bridge 2.6 kilometres long was completed across the River Amur at Khabarovsk.

The railway from Volochayevka (near Khabarovsk) via Komsomolsk to Sovetskaya Gavan, another extension of the Amur Railway, was completed after World War II. The Komsomolsk-Sovetskaya Gavan line was originally designed to be the final stretch of a second Trans-Siberian Railway which was to have started at Taishet and proceeded north of Lake Baikal via Bodaibo to the Sea of Japan.

Railways branching off from the main Trans-Siberian Railway have role in the transport of timber.

The railways of Sakhalin are located in the south and are used fairly extensively for transporting pulpwood to the island's pulpmills. They are of only local importance, however.

The existing railway network is thought to be inadequate, and this is evidenced too, by the map in Figure 3: 16. It is proposed that the network ought to be extended in the districts of Komsomolsk, Selikhinsk and Oborsk (Kanevsky, *L.P.*, 1964, 4, p. 28) with the needs of timber transport particularly in mind; but the construction of forest railways should nonetheless be suitably combined with the extension of the general communications network.

The question of an overland link between Sakhalin and the mainland has again become topical in connection with ambitious plans for establishing a uniform deepwater communications network throughout the whole of the U.S.S.R. by artificial floodings and new canals. The main function of an overland link between Sakhalin and the mainland would be to improve the climate on Tartar Sound by excluding the cold streams from the Sea of Okhotsk; but in addition it would enable a direct railway connection to be established between Sakhalin and the Trans-Siberian Railway, which would considerably improve transport facilities in the Far East.

Railways have a much more important role than waterways in long-distance timber transport in the Far East. With but few exceptions, water is used only for short-distance movements, e.g. from the logging site in the forest to a loading point or sawmill on the nearest railway. As most of the railways in the area run parallel to the main rivers, the Amur and the Ussuri, nearly all the tributaries on the Russian side of these two main rivers are crossed by the railway.

At the junctions of the railway and the more important rivers there are usually wood-processing plants, or at least collecting points at which floated timber is loaded into railway waggons.

7.4 Wood-Processing Industries

Sawmills predominated among the forest industries which processed wood within the old Soviet frontiers in the Far East before World War II. In the whole of the region there was but a single plywood factory and no pulp or paper mills at all, even though the industrialisation plans of the Thirties had provided for the expansion of the wood-processing industry (Viryasov, 1933, p. 107). However, when the U.S.S.R. gained southern Sakhalin from the Japanese after World War II, it also obtained certain modern pulp and paper mills which were there, so that the Far East became the second or third largest pulp and paper producer among the economic regions of the U.S.S.R.

In 1913, according to Viryasov (1933, pp. 101—105) there were 56

sawmills in the Far East with a total of 98 frame-saws. The annual output of sawnwood was estimated at about 300,000 cubic metres. Movement of timber from this region was almost negligible, but immediately before World War I great efforts were made to increase the volume of timber exports. Vladivostok was the only port shipping timber in the whole of the region. The largest and best equipped sawmills were located along the Ussuri Railway, and Vladivostok, at the terminus of this railway line, was the natural and nearest port of shipment for their products.

During World War I and the Civil War, most of these sawmills deteriorated, and in the early years of the Soviet regime little was done to restore them. Restoration only began in earnest when it became necessary to increase timber exports so as to finance the industrialisation of the country, and at the same time a few new establishments were set up as well (e.g. in Oborsk).

The most important sawmills in the region are located as follows: along the Ussuri Railway at its junctions with the Ussuri, the Iman, the Bikin and the Khor rivers and at its two termini, Vladivostok and Khabarovsk (on the Amur);

along the Amur Railway at Sivaki and Blagoveshchensk;

in Sovetskaya Gavan;

in Nikolayevsk at the mouth of the Amur;

at Kluchi and Ust-Kamchatka on the River Kamchatka, in the Kamchatka Peninsula;

on Sakhalin and in the Kurile Islands.

The biggest sawmilling centre in the Far East is probably Lesozavodsk, at the junction of the River Ussuri and the railway, a town founded immediately before World War II. Here are two fairly big sawmills and a furniture factory.

The total output of sawnwood in the Far East in 1963 was 5,912,000 cubic metres (Petrovskaya, *L.P.*, 1965, 8, p. 25). Considering that the annual regional production of sawnwood in the Thirties was about one million cubic metres (Viryasov, 1933, p. 108), it cannot be denied that the rise in output has been impressive. However, the future rate of increase will be slower. It is proposed that the output of sawnwood should rise by at most 15—20 per cent by 1970 (Kanevsky, *L.P.*, 1964, 4, p. 27).

On the other hand, it is planned to expand the plywood industry considerably, since suitable supplies of raw materials for this form of industry are available: three-quarters of the total high-quality hardwood timber stock (oak, ash, maple, elm, etc.) of the U.S.S.R. grows

in the Far East. Until a few years ago there was only one plywood and veneer factory (at Okeansk on the Ussuri Railway, 22 km from Vladivostok) in the area; since then new factories have been constructed at Litovsk and Birobidzhan. It is proposed that new plywood factories should be built at Iman (district of Primorsk), Mukhensk (district of Khabarovsk) and Svobodnenskoye (district of Amur), to start operations before 1970. The capacity of the existing factories is to be increased considerably at the same time.

The pulp and paper industry of the Far East is to receive special attention. Most of the existing pulpmills are in southern Sakhalin (Karafuto); they were, as previously stated, originally Japanese, and are situated at Uglegorsk, Poronaisk, Makarov, Tomari and Kholmsk. They consume large quantities of pulpwood from the mainland in addition to the pulpwood produced on Sakhalin itself.

A large pulp and paper combine is under construction on the River Amur, about 60 kilometres above the town of Komsomolsk, on the mainland. It is planned to produce about 110,000 tons of viscose pulp and 280,000 tons of paperboard and to consume about 2.2 million cubic metres of pulpwood annually when it reaches full capacity. It is expected to come into partial production in 1966 (*L.P.* 3 March 1966).

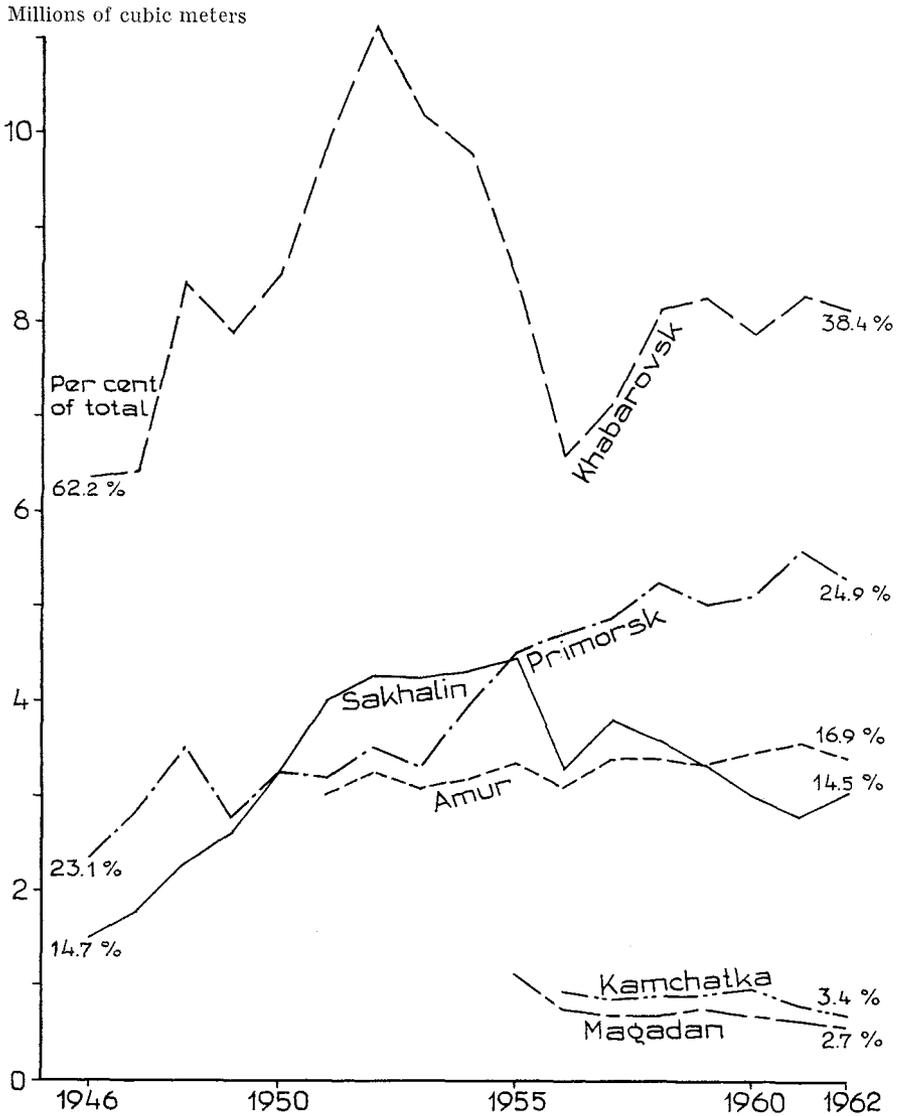
The long-term overall plan for industrial construction, which should be regarded as only tentative, provides for the following pulp and paper mills to be built in addition to the one near Komsomolsk: (1) at Khabarovsk, down-river from the town itself; (2) at Sovetskaya Gavan, near the port of Vanino on the mouth of the Tumnin; (3) at Nizhne-Amur, on Lake Kizi, in the vicinity of De-Kastri, and (4) at Urgal, where the Izvestkovaya-Urgal Railway crosses the River Bureya (Polyakov, *L.P.*, 1963, 3, p. 30). No information is available on how far these projects have actually progressed.

7.5 An Appraisal of Potentialities of Timber Production

7.5.1 Past Removals

In the Czarist era, logging was concentrated mainly in areas which were being settled. These lay along the Ussuri Railway, especially near Vladivostok. Just before World War I, the most important logging centres were situated along the main rivers in the Ussuri region and on the middle reaches of the Amur; the principal centre was the town of Blagoveshchensk. Virtually no timber was cut on the lower Amur, in northern Sakhalin or in the Kamchatka Peninsula.

The volume of the annual cut in the Far East before World War I



Source: Perepechin-Filnov, *Lesopolzovanie v SSSR 1946—1962 gg.*, 1964

Fig. 3: 17. Dynamics of Annual Cut, by Provinces, in the Far East, 1946—1962

was about six million cubic metres; this figure dropped considerably after the war and was about four million cubic metres by the end of the Twenties (Viryasov, 1933, p. 100). Removals began increasing again gradually in the Thirties and continued doing so after World War II.

The fluctuations in the volumes of the annual cut in different provinces are shown in Figure 3:17. It will be seen that the volume of the cut fluctuates widely in the individual provinces. This seems to be largely ascribable to changes made in the boundaries of provinces for administrative purposes and to relocations of logging operations. The relatively high timber output of the province of Khabarovsk in the early Fifties seems to arise from the circumstance that the boundaries of this administrative district were different then from what they are now and that it was not possible to take the change into account by later statistical adjustments (cf. Perepechin—Filinov, 1964). For example, the present district of Magadan was formerly part of the district of Khabarovsk.

As is shown in the diagrammatic presentation in Figure 3:17, removals in the district of Magadan have been less than one million cubic metres in the past few years, but they were much greater in former years. When the town of Magadan was being built between 1932 and 1956, a total of 46.5 million cubic metres of timber was used in the construction work, i.e. about two million cubic metres a year. However, removals have fluctuated considerably. Immediately after World War II, when plenty of labour was available in the shape of prisoners of war, the volume of removals was very high, reaching a peak in the early Fifties. It is reasonable to suppose that the timber consumed in Magadan was produced in the immediate vicinity of the town itself, i.e. in the administrative district of Magadan in Kolyma and on the Sea of Okhotsk. To obtain the timber required, 1.7 million hectares in the area were clear-cut (Starikov, *L. Kh.*, 1962, 2, p. 20). Shortage of timber stock has caused the recent fall in the volume of the cut in the area.

7.5.2 *The Ussuri Basin*

The more easily accessible forests in the area have been under exploitation for a considerable time and the available timber stock is probably not great close to the railways and to waterways offering favourable conditions for floating.

The whole of the province of Primorsk, (comprising the Ussuri Basin, and the coastal areas on the Sea of Japan) contains 11.1 million hectares of forest land, 10.2 million of which are forested. Forests unexploited or present inaccessible cover 3.1 million hectares, mostly outside the Ussuri basin proper, in the mountains of Sikhote-Alin and on their eastern slopes towards the coast.

Logging is concentrated mainly on the Bikin, the Iman, the Daubikhe

and other tributaries of the River Ussuri. A number of logging enterprises operate on the banks of these rivers, all of which are crossed by the railway before their confluence with the Ussuri. Timber from the upper Daubikhe is loaded on to railway waggons at the town of Arsenyev.

Timber extraction is considered to be very difficult in the mountains and becomes more so in proportion to distance from the main waterways.

It should be added that wood for fuel constitutes on average 40 per cent of the total timber output in the Ussuri basin whenever clear-cutting is conducted (*L.P.*, 15 Jan. 1955). This is because of the large percentage of hardwood in the stands. However, logging operations here are reportedly concentrated mainly on removing conifers, as the demand for high-quality hardwoods has been very limited in the region (Vasiliev, 1955, pp. 12—13).

It follows that the volume of cutting could easily be increased if a demand for the hardwoods arose. It has been suggested that a large sawmill at Novo-Mikhailovka, where a plywood, particle board and fibreboard factory is to be built, could make use of the large timber resources which are still unexploited in the area between the River Ussuri and the timber-loading port Olga (Kanevsky, *L.P.*, 1964, 4, p. 27). Thus, the greatest obstacle to rational exploitation of the forests here is that there is no industry consuming industrial roundwood.

7.5.3 *The Amur Basin*

The provinces of Amur (Blagoveshchensk) and Khabarovsk embrace most of that part of this river basin which lies within the U.S.S.R. The northern part of Khabarovsk province is of course also drained by rivers which empty directly into the Sea of Okhotsk (e.g. the Uda) or the Lena river system (e.g. the Vatanga, the Maimakan, the Maya). However, the forests in these areas can be regarded as inaccessible at present.

The total forest area of the provinces of Amur and Khabarovsk is 80.8 million hectares, of which 63.2 million hectares are forested and 17.6 million hectares unforested (burned areas, openings, etc.). The total area of forest unexploited or at present inaccessible is 30.7 million hectares.

The accessible forests in the immediate vicinity of the main rivers, especially on the upper and middle Amur, have been exploited fairly considerably. Virgin forests are located either in marshes, particularly

in the basins of the Kur and Urmi rivers (tributaries of the Tunguska), or on the less accessible mountain slopes.

However, resources of timber are considered sufficient to supply the proposed pulp and paper mill at Khabarovsk. Even so, much of the pulpwood for this mill will come from the upper reaches of the River Khor, a tributary of the Ussuri.

No data are available on the progress of removals in the basins of the Seya-Selemdzha and Bureya rivers, two large tributaries which join the Amur in its middle course and are crossed by the Amur Railway near Blagoveshchensk.

Roundwood for the projected pulp and paper mill at Urgal will come mainly from the forests of the Bureya basin (Polyakov, *L.P.*, 1963, 3, p. 31).

Great efforts are currently being made to increase removals on the lower Amur, between Khabarovsk and Nikolayevsk. At Komsomolsk, where the railway joins the River Amur, a new pulp and paper combine will soon require large quantities of pulpwood, to be produced in the area itself. Much of the timber cut here was formerly exported to Japan.

Logging on a fairly large scale is also in progress on the shores of Lakes Innokentyevka, Khummi and Kizi, which are linked by waterways to the Amur.

Timber floating, and indeed navigation in general, is extremely difficult in the shallow 'Amur Liman' and in the northern parts of Tartar Sound, where there is permanent fog combined with frequent and protracted storms.

The projected pulp and paper combine at Nizhne Amur, on Lake Kizi, will consume much of the roundwood produced in the area. Forest resources in that part of the Amur basin, however, are far from exhausted, although it seems inevitable that logging operations will have to move further away from the main waterways. The new Five-Year Plan provides for removals in the province of Khabarovsk to be increased by 50 per cent by 1970 (*L.P.* 3 March 1966).

7.5.4 Sakhalin Island

The total forest area in the administrative district of Sakhalin, which includes the Kurile Islands, is estimated at 6.5 million hectares, of which 4.8 million hectares are forested with a growing stock of 672 million cubic metres. It is noteworthy that one third of the total forest land is non-productive. Furthermore, 0.9 million hectares of the forested land are inaccessible at present. The forest area in the part of

Sakhalin which was Japanese territory before World War II (Karafuto) is approximately 2.8 million hectares (Unasykva, 1949, Vol. III, 3, p. 127).

Logging operations on Sakhalin aim to satisfy the demand for roundwood of the wood-consuming industries established there. Pulpmills are the most prominent of these, taking 70 per cent of the island's total roundwood production. Other large consumers are the coal and oil industries.

The reason for the Japanese having established a pulp and paper industry on southern Sakhalin was the large stock of *Picea ajanensis* and *Abies sachalinensis* growing on the island; and it was probably they who cut over the virgin forests of these species. However, the second growth stands do not seem to supply sufficient timber for the pulp industry, so that pulpwood for the factories now has to come from more distant areas.

Most pulpwood is transported via the numerous natural floatways of the Tym, Poronay and other river systems. Timber is floated down the principal rivers to the Sea of Okhotsk in the east and the Tartar Sound in the west; thence it is towed in sea-floats or carried coastwise by boat to the wood-using factories of the island. According to report nothing has been done to improve the floatways, no dams having been constructed in the mountains to alleviate the water shortages which frequently hamper floating. Transport of timber in sea-floats along the coasts of Sakhalin is not easy, either, because of storms and the prevailing fogs, and most inadequate harbour and loading facilities.

Sakhalin and the Kurile Islands can be divided into four regions as follows (Pravdin, *L.Kh.*, 1965, 10, pp. 72—73):

1. The southern (*Yuzhny*) region, comprising 16 per cent of the territory and 15 per cent of the area covered by forest, and containing 51 per cent of the population. It is a timber-deficit area, and most of the raw materials for the wood-processing industries established there are imported either from northern Sakhalin or from the mainland. However, major wood-processing industries are located in this region, and 45 per cent of the paper produced on Sakhalin comes from there.

2. The central (*Tsentralny*) region, comprising 49 per cent of the territory and containing 38 per cent of the population. Almost 80 per cent of the roundwood, 55 per cent of the paper and 70 per cent of the sawnwood is produced in this region; thus, this is the most important wood-processing area of Sakhalin.

3. The northern (*Severny*) region comprises 20 per cent of the total territory and contains nine per cent of the population. There are no

wood-processing industries in the area and logging operations are negligible, a result of the low productive capacity of the forest land.

4. The Kurile Islands, comprising 16 per cent of the total area of the administrative district of Sakhalin and containing three per cent of its total population. Although a certain amount of roundwood is exported from the southernmost islands, the area is relatively unimportant as far as forest industries are concerned.

8. Summary of Conclusions from Part III

Soviet authorities in the forestry sector are pursuing an early formulated operational objective, namely, the transfer of logging and wood-processing from the timber-deficit regions of Central Russia to the timber-surplus regions of Northern Russia and Siberia. This has been a topical question for quite a long time and has appeared in the five-year plans and in particular in the recent Seven-Year Plan. Up to now this goal has been only partially attained. The relocation of logging operations has encountered great difficulties, but better results have been achieved in this field than with the establishment of new wood-processing installations. The greatest delay has been in the establishment of new pulpmills in the virgin forest areas. The new Five-Year Plan for the development of the Soviet economy for the period 1966—1970 sets production targets for the pulp industry, the fulfilment of which would almost treble the 1965 volume of production by 1970. This increase in capacity will take place almost entirely in the timber-surplus regions, which have been examined in this part of the thesis. The conditions for the utilisation of the forest resources and the expansion of the forest industries in each of these regions can be summarised as follows:

Throughout the last half-century the European North has been the most important area for the Soviet production and export of timber. The favourable geographical position and the easy accessibility of the forests have contributed considerably to the economic importance of this region. However, there can be no doubt that the annual removals have exceeded the annual growth and that the timber stock, particularly in the case of large dimensions suitable for sawlogs, has declined continuously. Nevertheless, there probably remains here a supply of timber which far exceeds the joint total stocks of merchantable timber of the Scandinavian countries and Finland.

The more easily accessible forests have already been utilised to their

full extent, and it is hardly likely that the timber output could be increased here. In many places it has been necessary even to reduce the timber cut. However, there are large areas of forest, particularly in the basins of the River Mezen and the Pechora, where it has not been possible up to now to utilise the timber owing to transport difficulties. The obstacles to transport are of such a nature that they can be overcome by building access roads to the resources. Railways between Archangel and Karpogory and between Mikun and Koslan, which are now under construction, will eventually open up the relatively large timber resources of the basin of the River Mezen.

There is reason to believe that the European North will maintain its position as the foremost region for forest industries of the U.S.S.R. Even in the future it can be expected that the largest part of the Soviet timber exports will come from the European North.

The western part of the Urals is of the greatest importance for the supply of timber to industrial areas in the southern and south-eastern parts of European Russia, as well as the Urals. The Kama-Volga river system facilitates relatively cheap transport of the timber to the wood-consuming centres on the Lower Volga and on the Caspian Sea. The building of the Volga-Don Canal has extended the water transport facilities for forest products from the north to the coal-mining areas of the Donbass and to the coastal areas of Asov and the Black Sea.

The forests in the eastern part of the Urals in the Ob and the Irtysh river basins have no direct natural communications to the large international wood-consuming centres as the Gulf of Ob is full of sandbanks making it impossible for ocean-going vessels to reach the mouth of the River Ob.

Provided that the railway now under construction between Ivdel and Ob is completed (and this is planned for 1966) it will be possible to exploit the valuable and vast forests between the Urals and the River Ob and to transport the timber to wood-consuming centres inland. This railway will be of great importance also in the exploitation of the forests in the Ob river basin beyond the Ural region, namely in the province of Tomsk in Western Siberia. The other railway under construction is between Tavda and Sotnik. However, it will be some years before this railway is completed, but then it will facilitate the exploitation of the vast forests in the Konda river basin.

The conditions for building large wood-processing centres in the vicinity of these railways are particularly good, and a number of building proposals have been made. However, there is no indication that the construction of large wood-processing industries has begun

in these areas. It seems that the intention for the present is to continue with the transport of roundwood to the existing wood-processing industries west of the Urals. Geographically this region is closer to the large consuming centres in European Russia and this is probably one of the reasons for the present decision.

Western Siberia is of importance only for the supply of timber to the home market. The rapidly expanding industries in southern portion of Siberia and Central Asia and also the expanding agriculture of these areas are directly dependent on timber supplies from Western Siberia.

There are great possibilities for increasing logging operations in the province of Tomsk, particularly in the Chulym river basin, provided that the planned access roads to the timber resources here will be realised. The conditions for building large wood-processing industries in this area are particularly good. However, there is no indication that the construction of such installations has begun.

Eastern Siberia will soon hold a leading position in both the production and export of forest products. The Northern Sea Route is the main means of communication from the Yenisey-Angara basin where the most valuable timber resources of Siberia are situated. The exploitation of the forests north of Krasnoyarsk has been made possible by the existence of transport facilities northwards along the River Yenisey, and the port of Igarka on this river plays a particularly important part for the export of the timber. Nevertheless, the importance of railways in the exploitation of the timber resources of Eastern Siberia cannot be underestimated.

The timber resources of this region amount to half the total timber stock of the U.S.S.R. and far exceed the entire total timber stock of Western Europe. One may work on the assumption—for the present, at least—that large parts of these forests are situated in areas, which geographically lack communications with outside parts; this means that forest products cannot be exported beyond the region on any large scale for the present. Practically the entire basin of the River Lena, with the exception of the upper loop of the river, can be regarded as inaccessible in this respect.

The plans for the expansion of the wood-processing industry in Eastern Siberia deserve special attention. Only a few years ago there was not a single pulpmill in the entire region; there were only sawmills which were mainly situated on the Trans-Siberian Railway, in Yeniseisk and Igarka, as well as in a few other places. With the development of this region a number of integrated wood-processing combines have been built and are in operation. The Bratsk industrial centre contains

a pulpmill with an annual production of 540,000 tons of pulp and 280,000 tons of paperboard.

The largest centre for the wood-processing industries in the Yeniseisk-Maklakovovo area will be situated near where the Angara tributary flows into the River Yenisey; this is also the terminus for the Achinsk-Abalakovo railway line. The site has been very well chosen from the geographical point of view as it will allow the forest products to be transported on the River Yenisey for export and by railway to inland markets.

Despite its vast timber resources and their close proximity to seas navigated by commercial shipping the development of forest industries in the Far East has not attained the proportions which might have been thought likely considering the favourable geographical situation. The greatest obstacle to the exploitation of the timber resources has proved to be the difficult access to the forests, owing to the topography of the region, plus the lack of access roads. Navigation is difficult at the mouth of Amur and in the Sea of Okhotsk. Furthermore, unfavourable climatic conditions have prevented the exploitation of the forests along the coast of the Sea of Okhotsk north of the River Amur. In the main the forest industries are concentrated in the southern part of this region.

Along the banks of the River Ussuri and the River Amur are several sawmills, but their total production is relatively modest. Up to now the pulp industry has been concentrated on the island of Sakhalin. A large pulpmill is under construction at Komsomolsk on the River Amur. Plans have been drawn up for a number of other pulpmills, for which there are excellent prospects. As there are relatively good conditions for growing deciduous trees in this region, the prospects of developing the plywood industry are favourable. The chief difficulty to the development of forest utilisation here is not the lack of raw material supplies but the lack of a sufficiently large demand for industrial roundwood even if the capacity of the wood-using industries is increased. The export of forest products from this region will certainly increase in the future.

Part IV

FOREIGN TRADE IN FOREST PRODUCTS

Foreign Trade in Forest Products

1. Introduction to Part IV

1.1 Formulation of the Problem

Russia has been the predominant nation in the world timber export markets at certain periods, and timber exports have played an important role in the economic development of Czarist Russia and in the industrial expansion of the U.S.S.R. However, the volume of exports of Russian timber has fluctuated considerably over the years. Before 1914, Czarist Russia was the biggest timber exporter to international markets, but exports dropped to a negligible level during the war years which followed.

Exports were practically non-existent during the first years of the new Soviet regime. When reconstruction work was started by the Soviets after the conclusion of the Civil War, the need for foreign currency became extremely urgent and the Soviets realised that the only solution of the difficulty was to resume exports, and in particular, timber exports. It was noted that timber exports constituted one of Czarist Russia's main sources of foreign currency.

The Soviets increased their timber exports year by year throughout the 1920's, and the peak was reached when the economic depression was at its worst in the rest of the world, a time when other timber exporting countries could find no market for their products. After the economic crisis in capitalist countries there was a systematic reduction in Soviet timber exports, so that by the outbreak of war in 1939 these were fairly negligible in comparison to the export volumes of the main competitors. Soviet timber exports were practically nil throughout the 1939—1945 war and for some time after the cessation of hostilities, or altogether for a period of more than ten years. The Soviets resumed their timber exports in the early Fifties, and these have been steadily increasing ever since.

The following questions are of particular interest both to those countries importing Soviet timber and those competing with the U.S.S.R. in timber export markets:

What has caused such excessive fluctuations in the volume of exports of Soviet timber?

Why did the Soviets systematically cut their timber exports during the Thirties?

What was the policy behind the decisions of the Soviet authorities to increase timber exports successively during certain periods?

Which marketing channels and sales policies have been used by the Russians, and how have they been able to compete successfully with other timber exporting countries in international markets?

What will the Soviet timber exports be in the future? Will the present rate of increase of Soviet timber exports be maintained, and how far can the Soviets go in this respect, considering the demand in the home market?

Of all these questions the last is the most important. One must have a good knowledge about Soviet potentialities and economic plans for the future in order to give an answer which would be adequate. The Soviet potential in timber exports has been discussed in previous chapters of this work from the standpoint of Soviet supplies of timber and the standpoint of the wood-processing industries. While the home demand for forest products has been dealt with only in passing, it is clear that Soviet export policies are determined to a great extent by home consumption, which in its turn comes within the centrally directed economic system. However, to some extent the volume of exports is determined by the same central authorities, who thus have to make the decision of balancing home consumption with exports.

To compare the U.S.S.R. to a giant business concern can probably be justified from the standpoint of the Soviet approach to foreign trade. Soviet marketing and sales policies in the main do not seem to differ much from the customer-dominated marketing policies pursued by private capitalists in their efforts to increase their shares of the market, or to put it more crudely, to expand at the expense of competitors. However, the U.S.S.R. as a business enterprise enjoys a distinct advantage over capitalist competitors in that its foreign trade is of a monopoly nature. Consequently, the following questions may be put:

How is the foreign trade agency organised, what are its functions and what competitive measures does it take to attain the targets set for foreign trade?

What are the goals of Soviet export policy and in particular of Soviet timber exports?

Before we are able to clarify and evaluate the measures taken to achieve export targets we must first clarify what these objectives are.

1.2 Identification of Ends and Means in Timber Trade

The operational goal of Soviet timber exports must be deduced from the ultimate or general objectives of the huge commercial enterprise which the U.S.S.R. can be said to be. As has been intimated in Part II, the ultimate ends of this enterprise are both political and economic. In the present context we shall ignore the political objectives, although they seem to have played an important role in determining foreign trade policy in certain cases. Instead, the approach will be to deduce the policy behind Soviet timber exports from the purely economic objectives. As has been pointed out before, the prime objective has been the industrialisation of the country or, to put it in more economic terms, the formation of domestic capital. Foreign trade must consequently be geared to this general objective. In practice this can be reformulated by saying that both exports and imports are planned to bring about capital formation in the country. The purpose of exports is, therefore, to obtain foreign currency which can be used to pay for the imports of capital goods. Thus, the timber exports can be said to be a means of acquiring foreign currency to pay for imports, and not as a means of making profits. This is the most important difference—at least in theory—between the export sales policies pursued by competing capitalist concerns and those of the monopoly enterprise responsible for Soviet exports.

The establishment of operational goals for Soviet timber exports is a matter of balancing the above-mentioned ends against the means for attaining them. The means used for the marketing of Soviet timber in importing countries, and which in Soviet terminology are called the “organisation of foreign trade” (*organizatsia vneshney torgovly*), do not differ basically from the marketing efforts of private companies in their export sales in a competitive economy. Primarily this applies to marketing channels or organisations through which forest products reach foreign markets. Nor do the general marketing operations or the functions of the marketing process differ greatly from those used by other exporters competing in the same market. On the other hand, the differences are considerable between the type of sales organisation used by the capitalist system and that of the Soviet planning system. The organisational structure of the Soviet timber trade should be regarded as one of the most important means of realising Soviet sales policy in the world market. For this reason we shall discuss it in more detail.

The most important parameter of Soviet timber trade has been price,

which has played a decisive role in Soviet timber marketing. One must obtain first of all a picture of the quantitative developments of the timber trade in order to be able to assess correctly Soviet export policies in general, and the measures taken as part of sales policy in particular. The volume and price of exported forest products constitute, therefore, the major problem to be studied in this part of the work.

2. Marketing Functions and Organisation of Soviet Timber Trade

2.1 *Monopoly Status of Soviet Trade*

According to classical economics, international trade is based on the assumption that nations can improve their economic position by exchanging their products. Theoretically, the principle of competitive advantage is pursued when one country buys and another country sells commodities in the world market. It is assumed that all countries have free access to any market and that there are no political considerations in selecting the market. However, this does not apply in the case of the U.S.S.R.

International trade serves "as a tool for Soviet foreign policy, which is altered to fulfil the demands of the political situation at any given time" (Katkoff, 1961, p. 430). The course of Soviet foreign trade had been "dominated by manipulation by the Government to achieve its other objectives" (Holzmann, 1963, p. 430). The most important instrument for attaining political and economic goals in the field of international trade is the so-called State Monopoly of Foreign Trade of the U.S.S.R. (*gosudarstvennaya monopoliya vneshney trgovly SSSR*), which came about as the result of legislation signed by Lenin on 22 April 1918 (Bakhtov, V. T., 1964, 10). This organisation is one of the oldest existing Soviet institutions. At first, during the period of War Communism, its role was negligible because trade with foreign countries was practically non-existent. However, when foreign trade was resumed in 1923, the organisation took on a decisive role. Indeed, it can be said that its importance for the western world is being felt more now, after 45 years of its existence, than it was during the first years of Communist rule. Let us, therefore, examine the position of the Monopoly of Foreign Trade.

A fairly exact description of the monopoly situation is contained in the following statement, which has been published in The Resolutions and Decisions of Meetings, Conferences and Plenary Sessions of the Central Committee of the Communist Party (KPSS, 1953, p. 55, quoted by Chervyakov, 1958, p. 10) :

“The socialisation of the means of production and, as a consequence, the planned direction of economy, are the obligatory economic conditions for the establishment of the monopoly of foreign trade.” The main point is that “the State itself exercises the direction of foreign trade through specially created organs (*vedenie vneshney trgovli cherez spetsialno sozdanny organ*); the State decides in which organisations, which branches and in what volume to conduct direct operations of foreign trade; starting from the tasks of economic growth and Socialist construction the State decrees through its export-import plan what and how much can be exported from the country and imported by the country; by means of a system of licences and quotas the State regulates directly imports and exports and the operation of foreign trade.”

The monopoly position of Soviet foreign trade, as part of the general economic plan, uses the services of the production apparatus at home for the procurement of the goods to be exported. The income earned from exports is not transferred back to the production units. The product price, which is fixed administratively and forms part of the plan, is accredited by the State to the producer. The remainder, if any, is retained by the State for various purposes, according to one of the recent standard works on Soviet foreign trade (Chervyakov, 1958, p. 10): “The State Monopoly of Foreign Trade has a very great political and economic importance . . . (for the purpose) of reverting the profits from foreign trade operations to the fund of Socialist accumulation.”

It is the home plan for production which largely determines the development of the foreign trade of the U.S.S.R. The emphasis placed on certain branches, priorities in production expansion, determine primarily the dynamics of imports which in their turn influence export policy. As the State Monopoly controls every single foreign trade operation, tariffs play a secondary role in the Soviet trade system (Spulber, 1962, p. 101).

As the monopoly of foreign trade also commands a monopoly of foreign exchange, and as the efforts to establish the rouble as an international currency have not achieved great success so far, this means that there is no real direct relationship between domestic price (paid by the export organisation) and the price at which the same commodity is sold abroad. Also, this has the curious effect in that the foreign trade organisations need not consider the cost-revenue ratio, which is customarily done in other countries with competitive economies.

Soviet foreign trade organisations often have one single considera-

tion when selling abroad, the necessity of finding a market for the commodity. When a commodity is sold abroad it is either surplus to the needs of the Soviet national economy, or one for which the need is not particularly great; thus it provides an opportunity of obtaining a foreign commodity, or the currency required for the purchase abroad of some commodity or service which is stipulated in the plan but not obtainable at home, or not obtainable in the quantities and qualities required.

The Soviets, by having a monopoly of trade at home, have been able to abolish competition in the domestic market, or rather, competition which would affect the pattern of production or development, pricing, qualities, etc. The foreign trade monopoly ensures that no competition abroad comes from the home market, and that—by protectionist means—the domestic market is fully protected and insulated from the effects of imports.

Consequently, Soviet trade as a whole has been converted into a planned policy instrument, and this has deprived it of one of the major advantages of a relatively free trade policy, a certain automatic influence on the pattern of production, the effect of competition which might result in a better use of the means of production, etc.

It is important to emphasise that the Soviet foreign trade monopoly does not involve a commodity monopoly—at least not in the West. Soviet exports still consist mainly of bulk commodities for which there is quite a wide range of other possible sources of supply. Thus the organisation cannot exploit its monopoly position; it has to ensure quality, assortment, world prices and other similar factors in international markets. It has to conform with what is customary or expected or do even better in order to compete and stay in the market.

One of the results of the monopoly status combined with the planned economy in all sectors of production is that Soviet foreign trade has been conducted in the main within the framework of bilateral arrangements, commercial treaties, payment agreements, etc. This pattern of foreign trade involves the transactions being based on values fixed in advance, and usually the types and quantities of the commodities are also fixed. As the trade involved in an agreement must be balanced bilaterally, the value of the envisaged trade is usually stated in roubles in bilateral agreements signed by the U.S.S.R. However, the goods to be exported are not fixed in terms of value but in volume or specific physical terms. Consequently, certain exported goods can be sold at prices below their costs of production (Spulber, 1962, p. 105). In this connection it should be remembered that operational and perspec-

tive plans are compiled for trade, just as they are compiled for any other sector of the economy.

2.2 General Organisational Structure

The State Monopoly of Foreign Trade of the U.S.S.R., according to the Soviet Constitution, shall be directed by the Ministry of Foreign Trade (*Ministerstvo vneshney torgovly*).

The Ministry prepares and brings into operation the means for establishing and promoting trade relations with foreign countries, as well as the planning, control and realisation of the approved plan for foreign trade. It does so in accordance with the general economic plan for the development of the entire national economy, which also includes foreign trade.

The Ministry negotiates and concludes trade agreements with foreign countries, it controls the operation of the All-Union bodies within foreign trade operations, it draws up customs policy, and directs the customs authorities, as well as seeing that all rules and regulations concerning foreign trade are kept.

As can be seen, the Ministry is responsible for all trade operations, both with the western world and with the countries coming within the Soviet sphere of influence. However, as a matter of principle it is not a policy-making body, as the types and quantities of the commodities to be exported and imported are finally determined by the State Planning Commission (Katkoff, 1961, p. 439), which has the duty of balancing the expected exports and imports of the U.S.S.R.

The actual export and import operations are carried out by organisations called trading corporations (*Vsesoyuznie vneshtorgovie obyedineniya*), which are subordinate to the Ministry of Foreign Trade. These are responsible for different, strictly limited, commodity groups and, in fact, these organisations have a monopoly in their respective fields covering the entire U.S.S.R. The Ministry controls the external trade by its licensing of exports and imports through these trading corporations which operate in both directions.

Each of these trading corporations has a charter defining its purpose in exact terms, and has the right to sign agreements in its particular field of activity. These agencies maintain their own staff and offices both at home and abroad. Here it should be mentioned that it is the agency and not the Soviet Government which is responsible for the obligations it contracts with foreign traders, individual citizens, commercial enterprises or Governments, even though these agencies are

acting within the framework of the general economic plan. This is because the agencies are formally organised as independent legal entities or as associations of individual industries (Chervyakov, 1958, p. 39). Presumably this is intended to protect the Soviet Government from the embarrassment of being involved in lawsuits in foreign countries (Katkoff, 1961, p. 441).

The relation of these corporations to the basic productive enterprises is that of customer and supplier; this is regulated by special contracts (Spulber, 1962, p. 102).

The trading corporation for timber in the U.S.S.R. is V/o Exportles. A following section will go in detail into the origin and development of this body. All that needs to be mentioned in the present context is that it is the agency for all commercial dealings with the Soviets as far as roundwood, sawnwood, pulp, paper and other forest products are concerned. In other words, V/o Exportles has the export monopoly of the Soviet timber trade.

In the first instance, the organs of the foreign trade monopoly are the permanent Trade Representatives of the U.S.S.R. (*Torgovoye predstavitelstvo, torgpredstvo*); these maintain offices in all the more important countries of the world. As a rule and in most countries, the Chief Trade Representative and his deputy are members of the Soviet diplomatic missions, although they are on the staff of the Ministry of Foreign Trade and not of the Foreign Ministry.

- The principal activities of these Trade Representatives are:
- representing the trade interests of the U.S.S.R. in the country in question, and working to expand trade between the two countries;
 - regulating Soviet trade within the country in question;
 - controlling the activities of trade corporations which are operating directly in markets abroad;
 - studying economic and trade conditions in the country in question;
 - submitting data about the economics of the country and its trade policy to the Ministry of Foreign Trade and to other Soviet institutions which might be interested;
 - informing Soviet institutions of exhibitions and fairs to be held in the country in question;
 - acting as legal intermediaries in business disputes between commercial interests in the country in question and the appropriate Soviet institution.

These Trade Representatives enjoy diplomatic status and diplomatic

immunity; their rights, functions and activities are chiefly regulated by trade agreements between the U.S.S.R. and the countries where they are established (Chervyakov, 1958, pp. 46-50).

The activity of the Ministry of Foreign Trade to promote business relationships abroad, is further supported by the Soviet Chamber of Commerce (*Vsesoyuznaya Torgovaya Palata*). The Chamber has two arbitration commissions, one for foreign trade and the other for maritime matters. A considerable part of the work of the Chamber consists of the preparation and the arranging of trade fairs and exhibitions. It is through this organisation that the U.S.S.R. participates in trade fairs and exhibitions abroad.

2.3 Trading Corporation *V/o Exportles*

The Soviets' need for foreign currency for reconstruction of the country immediately after the Civil War caused them to set about re-establishing trade relations with other countries, and it was realised that timber exports could provide an important and immediate source of revenue to pay for the necessary imports. As trade in Czarist Russia had been almost entirely in the hands of private concerns, it was necessary for the Soviets to establish a State organisation to look after the timber trade.

In 1921, the Soviets formed the timber trust "Severoles" in Archangel, to organise the sawmilling industry and to export timber. Other trusts, such as "Petroles" and "Dvinoles" were established both for manufacturing and exporting activities, and these operated independently of each other (Nichkov, 1959). The essential point is that all had the right to sell their products independently and directly in the international market; in other words, formally they would be on an equal footing with any concern run by private capitalists.

Under this system of sales organisation, each of the trusts made its own business contacts abroad and occasionally competed with other Soviet trusts in the world timber markets. Consequently, the Soviets later established, at the People's Commissariat of Foreign Trade (*Nar-kom Vneshtorg*), a special agency called the Central Timber Export Bureau (*Tsentralnoye lesoeksportnoye byuro*) with offices (*LEB*) in the main timber importing countries; this special agency had the task of co-ordinating Soviet timber sales activities and bringing about a more uniform trading policy. The Bureau was not directly involved in any sales activities; instead, it issued only general directives, and was engaged in the making of general policy, in price determination and

co-ordination work between the individual timber trusts which were actively engaged in the business of timber exports. One of the tasks of the Bureau was the carrying out of marketing research and market studies, the results of which it made available to the trusts. However, it soon became evident that this organisation, also, had considerable drawbacks, and that the management of timber exports was still unsatisfactory. Consequently, the Central Bureau was wound up in 1926.

In that year a new central office, V/o Exportles, was established to handle all operations in the timber trade. It was formed as a kind of joint stock company, and the shareholders were the Soviet trading trusts: Severoles, Karelles, Dvinoles and Gostorg RSFSR. During 1926-1928, it acted as an agent or a commission merchant in export sales for the above-mentioned timber trusts.

In 1929, V/o Exportles was reorganised as an independent enterprise having the monopoly of all timber sales operations, including the management of port facilities, namely, transport and loading installations in all major export ports for the timber trade (Leningrad, Archangel, Novorossisk, Vladivostok, etc.). It exported timber to buyers abroad. In 1930, this organisation was reorganised again, and acquired its present structure as the timber trading corporation; indeed, it was one of the many trading monopolies which were fashioned on the same pattern. V/o Exportles, which was capitalised at 58 million roubles in the 1930 reorganisation, operates on the basis of self-financing and strict business accounting (*khozyaistvenny razchet*). It has the authority to export all kinds of forest products, including pulp and paper (Nichkov, 1959). V/o Exportles is legally responsible for its own actions, as are all Soviet trading corporations. In suits for damages in law courts abroad it is liable only to the extent of the property it owns. The basic features of this organisation have not changed since the Thirties.

According to the charter of V/o Exportles, it is responsible for the sales of sawnwood and other forest products abroad, and its staff must work for the best possible prices (*nailuchim tsenam*) and on the most favourable terms possible (*vygodnym usloviam*); also the representatives must adapt their offers of supply (stock notes) as closely as possible to buyers' requirements (Vaganov *et al.*, 1960, p. 7). The question of how the making of sales at the best possible prices has been carried out in practice will be discussed in more detail in the following section. It is not intended here to study in detail the intricate question of the effectiveness of the competition of this organisation in the world market, or to comment on the claim that V/o Exportles is a much more

efficient and profitable trading organisation than the private companies which ran the timber trade in Czarist Russia. According to Elchibegoff, a U.S. consulting forest economist (*J.F.*, 1961, 10, pp. 753-754), V/o Exportles continued to operate with obsolete equipment inherited from pre-revolutionary Russia. Despite technical drawbacks which made it necessary for much work at ports to be done manually, V/o Exportles succeeded in attaining its primary objective; it obtained foreign exchange to pay for the import of machinery needed for the industrialisation of the U.S.S.R.

2.4 Marketing Channels

Forest products are not homogeneous, and their distribution, especially in world markets, is a problem which has to be tackled by the producers and/or the distributors of these goods. Largely it is a matter of selecting appropriate marketing channels, i.e. types of establishments through which the products are moved to the final consumers. In the present case the question is which marketing channels are used by V/o Exportles to sell Soviet forest products to consumer countries, and in what respects these channels differ from those used by the competitors of the U.S.S.R. The problem can be simplified by examining only the United Kingdom market, because this country is the greatest customer for Soviet timber. Furthermore, the examination will be restricted to sawn softwood alone, because this is the most important Soviet timber export product in terms of both volume and value. Naturally, the marketing operations differ from country to country, while the procedure varies further, depending on the type of the products sold, a factor which must be kept in mind in the present context.

Soviet Trade Representatives in a particular country work, as a rule, with the timber agents in all sales activities involving timber. The agents work on a selling commission basis under the authority of an agency agreement (Vaganov *et al.*, 1960, p. 10).

In the United Kingdom, the Soviets organised and reorganised a number of mixed-stock companies; here the usual pattern was for 50 per cent of the stock to be owned by the Soviet Government, while the other 50 per cent belonged to the broker firms. In 1929, Soviet timber was sold in the United Kingdom by a firm called Russian Softwood Import Ltd., one year later by the Central Softwood Buying Corporation, and in 1932 by Timber Distribution Ltd. (Söderlund, 1952, pp. 304-309). All these agencies were backed by V/o Exportles.

At the present time, Soviet sawn softwood is being sold primarily via a mixed Soviet-English joint stock company known as the Russian Wood Agency (*Russkoye lesnoye agentstvo*, otherwise *Russky les* or R.L.A.) with its offices in London. V/o Exportles, which is the actual shipper of timber, is the main Soviet shareholder, while the English shareholders are a few of the bigger timber agents (it should be added that four English agencies had Russian directors in 1964) or broker firms. In the pattern of business in the timber trade, the Russian Wood Agency distributes the stock notes to timber importers. The Agency thus enters into the first stage of the selling procedure by informing English importers what V/o Exportles can offer at various shipping dates during the following year. V/o Exportles compiles the stock notes on the basis of data received from the exporting sawmills. Naturally, the stock notes from the sawmills take into account the production approved under the operational plan, which in its turn is a part of the general economic plan drawn up by *Gosplan*.

These sawmills as basic production units know usually by 1 August what stock they will have for export purposes by the end of the year, and for sales during the following year. The stock notes, which are drawn up to meet the approximate market requirements as far as possible, are compiled on the basis of stocks which have been produced already, or which are to be produced. The Russian Wood Agency in London compiles information about market requirements and sends this in good time to V/o Exportles in Moscow, which in its turn passes it on to the sawmills. The Soviet policy for the production of sawnwood for export purposes is extremely rigid, and can be gauged from the Instructions for the Procurement of Goods for Export (*Uslovia postavki tovarov na eksport*). Other detailed regulations govern the relations between the timber-producing enterprises (sawmills) and V/o Exportles (Vaganov *et al.*, 1960, pp. 13—30).

Soviet timber is usually exported to the United Kingdom on a c.i.f. basis.

2.5 Timber Chartering

When timber is sold abroad on a c.i.f. basis, the practice is for the seller to arrange the freight contract. In theory, the seller makes the freight contract on behalf of the buyer (Mallinson—Leigh, 1965, p. 142). In practice, the seller has the freedom of choice in regard to the timber chartering. This factor is of considerable importance in Soviet timber exports to the countries of western Europe. The Soviets follow

in this respect a purposeful policy, which is intended to have the long-term effect of making the U.S.S.R. completely or substantially independent of foreign freight carriage (Savelyev, *M.F.*, 1964, 3, p. 39). The Soviets have been remarkably successful in this respect, primarily through their accelerated shipbuilding programme of the post-war years. Consequently, if this trend continues, there will probably be sufficient Soviet vessels to carry all the Soviet timber freights within the not-too-distant future.

The tonnage of cargo vessels in the Russian merchant navy has never been very large. According to Lloyd's Register of Shipping, the lowest figure since 1914 was in 1927, when the total commercial tonnage was about 300,000 gross register tons. A programme to reorganise the Soviet merchant navy was begun in 1928, and this led to an increase in the commercial fleet to 1,315,776 gross register tons. There was a heavy loss of shipping during the war. The Soviets made great efforts to build up a fleet in the post-war years, and both old and new ships were bought from abroad, while shipbuilding at home was accelerated.

Lloyd's Register of Shipping credits the U.S.S.R. with a merchant navy of a tonnage totalling 6,975,512 gross register tons on 1 July 1964, an increase of 1.5 million over the previous year.

Soviet shipbuilding in earlier years was mainly devoted to the construction of large vessels, especially of the *Slavsk* and *Poltava* types, for carrying general cargoes across the oceans. However, in the 1960's the Soviets started to build special freighters for the transport of timber of which the *Volgoles* and *Igarkales* types have proved particularly suitable for the transport of sawnwood from Archangel and Igarka. These types of vessels can take an average cargo of about 1,000 stds. V/o Exportles also needs smaller vessels for carrying cargoes of between 400 and 1,000 stds. So far, such vessels have been chartered from abroad, but it is now planned to concentrate on building this type of craft in the U.S.S.R. in the future (Savelyev, *M. F.*, 1964, 3, p. 3).

The chartering of ships for the transport of both exports and imports also comes within the scope of the State Monopoly of Foreign Trade (Vaganov *et al.*, 1960, p. 74). A special trading corporation of the same legal status as V/o Exportles has been established to take care of freights and transports which are generally connected with Soviet foreign trade. Earlier, this corporation, which went under the name of V/o Sovfrakht, was subordinate to the Ministry of Foreign Trade. However, a decision of the Council of Ministers, dated 5 July 1962, concentrated all freighting, chartering and other maritime transport operations in the hands of a single organisation, called V/o Soyuzv-

neshtrans, which was subordinate to the Ministry for the Merchant Navy (*Ministerstvo Morskovo Flota*). The new corporation conducts business along the same lines as its predecessor (Maslennikova, *V.T.*, 1963, 9, p. 43). It maintains its own offices abroad (in London and Hamburg) for chartering activities. It also handles foreign trade consignments in sea ports, under an agreement between the Ministry of Foreign Trade and the Ministry for the Merchant Navy.

Special agreements on timber transport have also been concluded between V/o Soyuzvneshtrans and V/o Exportles.

When V/o Exportles has to ship timber from Soviet ports, it orders the requisite tonnage from V/o Soyuzvneshtrans by issuing a freight order, a copy of which is sent to the Ministry of Foreign Trade. If the V/o Soyuzvneshtrans has no ships of its own available at the time, it sends a circular to all chartering agents in the main shipping countries of the western world, and then accepts the most favourable offer. Freight quotations are compared with other known contracts from neighbouring western ports to the port of destination. In the case of shipments from the White Sea, timber chartering is done on "Russwood" terms, while "Nubaltwood" terms are used for chartering from the Baltic.

3. Volume and Geographical Direction of Timber Exports

3.1 General Development of Export Trade

Russian exports have always contained a high proportion of forest products. Records show that as early as Hansa times, Novgorod exported timber to the Hanseatic cities. During the 17th and 18th centuries the most important items traded were mast timber, wood tar and potash, which were mainly shipped from the port of Archangel. St. Petersburg (now Leningrad) first exported timber in 1762, though timber had been shipped earlier from Baltic ports, particularly Riga. However, it is only since about 1870 that timber has been an important item of Russian foreign trade. Since then, timber exports have risen steadily. The greatest expansion took place in the early years of the present century prior to the outbreak of war in 1914. Up to 1903, statistics of Russian timber exports were published only in terms of monetary value, but after that date they were also given quantitatively.

Exports played a most significant role for the national income of Czarist Russia. In 1913, exports accounted for almost 12 per cent of the total national production. Almost half the exports consisted of agricultural produce, of which grain dominated with 33 per cent, while

meat and meat products accounted for 12 per cent. Manufactured goods, primarily cotton textiles and linen thread, constituted a relatively modest percentage, namely 9 per cent, as did oil products with 3 per cent. In that year the export of forest products, primarily lumber and roundwood, amounted to 11 per cent of the total exports (*V.T. SSSR, 1918-1940, Moscow, 1960*).

By 1930, the share of exports in the total national production of the U.S.S.R. had gone down to 3.5 per cent, and by 1937 the figure was 0.8 per cent (Nichkov, 1959). It should be added that there are no details about total production and how these figures have been derived. However, despite possible errors, it is clear that there has been a marked decrease in the share of exports, and this has been generally interpreted by western observers as an expression of a Soviet move towards autarchy (Katkoff, 1961, p. 433; Holzman, 1963, p. 304).

By 1930, the commodity structure of exports was showing considerable differences from that in 1913, e.g. the share of oil and oil products had increased to 15 per cent, while that of grain had declined to 19 per cent. By 1937, the corresponding figures were 9 per cent for oil and oil products, and 15 per cent for grain. On the other hand, the share of timber exports was increasing and had reached 16 per cent by 1930, and 25 per cent by 1937 (*V.T. SSSR, 1918-1940, Moscow, 1960*).

The volume of exports increased considerably after the last war, and at the same time the commodity composition of exports underwent great changes. The most striking feature is that machinery and equipment have become important export items, whereas previously they had hardly been exported at all. In 1963, the structure of exports by main commodities as a percentage of the total, was as follows: machinery and equipment 20 per cent, oil and oil products 13 per cent, agricultural products 7 per cent, and forest products 5 per cent (*V.T. SSSR, 1964, p. 20*).

This concentration of certain staple products is a characteristic feature of Soviet exports. When there are difficulties in placing certain products, then trade with other countries may cease. The Soviets recognise the dangers of having a relatively limited range of export items, and therefore it is not surprising that during negotiations for new trade agreements, they endeavour to offer the potential importing countries as wide a range of products as possible.

Table 4—1 shows how the share of forest products in total exports has changed over the years. This table has been compiled from various sources, and it has not been possible to ascertain the reliability of the

Table 4—1. Relationship between Total Exports and Exports of Forest Products from Czarist Russia and the U.S.S.R., selected years, 1800—1964

Years	Total exports	Exports of forest products	Percentage of timber exports from the total exports
	<i>millions of roubles</i>		
1800—1805.....	71.5	1.3	1.8
1861—1865.....	225.9	6.9	3.1
1871—1875.....	470.6	25.5	5.4
1881—1885.....	549.9	32.9	6.0
1891—1895.....	621.4	42.5	6.8
1896—1900.....	698.3	54.2	7.8
1901—1905.....	941.4	65.9	7.0
1906—1909.....	1,204.6	116.4	9.7
1910.....	1,449.1	138.2	9.5
1913.....	1,520.0	164.9	10.8
1925—1926.....	2,450.9	203.7	8.3
1930.....	3,611.9	596.3	16.5
1933.....	1,727.4	269.2	15.6
1936.....	1,081.4	286.4	26.5
1939.....	461.6	82.9	18.0
1955.....	3,121.7	157.0	5.0
1960.....	5,005.5	274.6	5.5
1963.....	6,545.2	372.7	5.7
1964.....	6,913.2	455.7	6.6

Sources: (1) Nichkov, V. N. *Razvitie sovetskovo lesnovo eksporta*, Moscow, 1959. (2) *Vneshnaya trgovlya SSSR za 1918—1940 gg.*, Moscow, 1960. (3) *Vneshnaya trgovlya SSSR, 1955—1964*, Moscow, 1956—1965

data used. The major objection is that the value of the rouble is not comparable for different periods. However, in this connection it is important to show how the share of forest products in total exports has changed, and the percentage figures are completely unaffected by the particular value of the rouble used for the calculations for the respective years. The table shows that the share of forest products in total exports in terms of value was greatest in the 1930's, and that there was a rising tendency just at the time when the Soviet share of world trade and the share of exports taken by industrial production were at the very lowest, apart from the obvious exception of the war years. It can be noted that before 1914, the Russian exports of forest products were increasing far more rapidly than the exports of other goods. Since the last war this trend has not been so pronounced; to some extent this has resulted from the unfavourable development in the prices of forest products compared with certain other goods.

Table 4—2 shows how the positions changed for the countries which were the greatest importers of Russian goods in terms of value during the period 1913-1963. Since the last war, it is evident that the coun-

Table 4—2. The Relative Positions of Main Importing Countries in Soviet Exports, selected years, 1913—1964

	1913	1930	1937	1955	1960	1963	1964
Germany, East (D.D.R.)				1	1	1	1
Czechoslovakia		10	6	3	2	2	2
Poland		7	7	2	3	3	3
Bulgaria	9	13	14	6	4	4	4
Hungary		14	13	7	5	5	6
Romania	7	12	12	4	6	6	5
India	11	9	10	14	14	7	8
Finland	5	11	9	8	8	8	9
United Kingdom	2	1	1	5	7	9	7
Italy	8	8	11	13	10	10	11
Germany, Fed. Rep.	1	2	4	11	9	11	12
Japan	10	6	8	15	11	12	10
France	4	3	5	9	12	13	13
Belgium	6	5	2	12	15	14	14
Netherlands	3	4	3	10	13	15	15

Sources: (1) *Vneshnaya torgovlya SSSR za 1918—1940 gg.*, Moscow, 1960. (2) *Vneshnaya torgovlya SSSR, 1955, 1960, 1963, 1964*, Moscow, 1956—1965

Table 4—3. Exports of Forest Products as a Percentage of Total Export Value, by Main Importing Countries, selected years, 1913—1964

	1913	1930	1937	1955	1960	1963	1964
United Kingdom	25.0	23.2	39.8	40.5	43.3	43.5	50.2
Japan	12.2	36.0	10.1	10.0	28.2	37.2	23.0
Belgium	11.6	37.4	26.1	46.4	37.0	32.2	33.1
Netherlands	14.7	71.1	59.0	35.1	25.1	21.7	26.4
France	10.5	16.5	27.3	9.9	11.5	17.9	17.9
Germany, Fed. Rep.	9.4	9.2	37.2	27.9	13.9	14.3	18.2
Hungary	—	—	—	9.0	10.2	10.5	10.5
Finland	0.9	43.1	26.8	1.2	3.2	10.1	13.5
Italy	1.2	5.2	—	16.0	7.4	8.8	8.3
Germany, East (D.D.R.)				0.6	3.8	4.8	5.2
Bulgaria	3.6	—	—	4.2	3.8	2.5	2.5
India	—	0.4	—	12.1	5.3	1.6	2.3
Czechoslovakia	—	2.8	—	0.9	2.1	1.5	1.6
Poland	—	18.1	—	(0.02)	1.0	1.1	1.5
Romania	0.3	—	—	0.1	—	—	—

Sources: (1) *Vneshnaya torgovlya SSSR za 1918—1940 gg.*, Moscow, 1960
(2) *Vneshnaya torgovlya SSSR, 1955, 1960, 1963, 1964*, Moscow, 1956—1965

tries which form the Soviet bloc have been the highest on the list of Russian goods, in terms of value. The industrial countries of western Europe, which occupied a leading position as importers of Russian

goods before 1914 and during the inter-war period, now take a more humble position in the Soviet export table. The United Kingdom, which previously had always been the foremost country importing Russian goods, in terms of value, was ninth in the table for 1963.

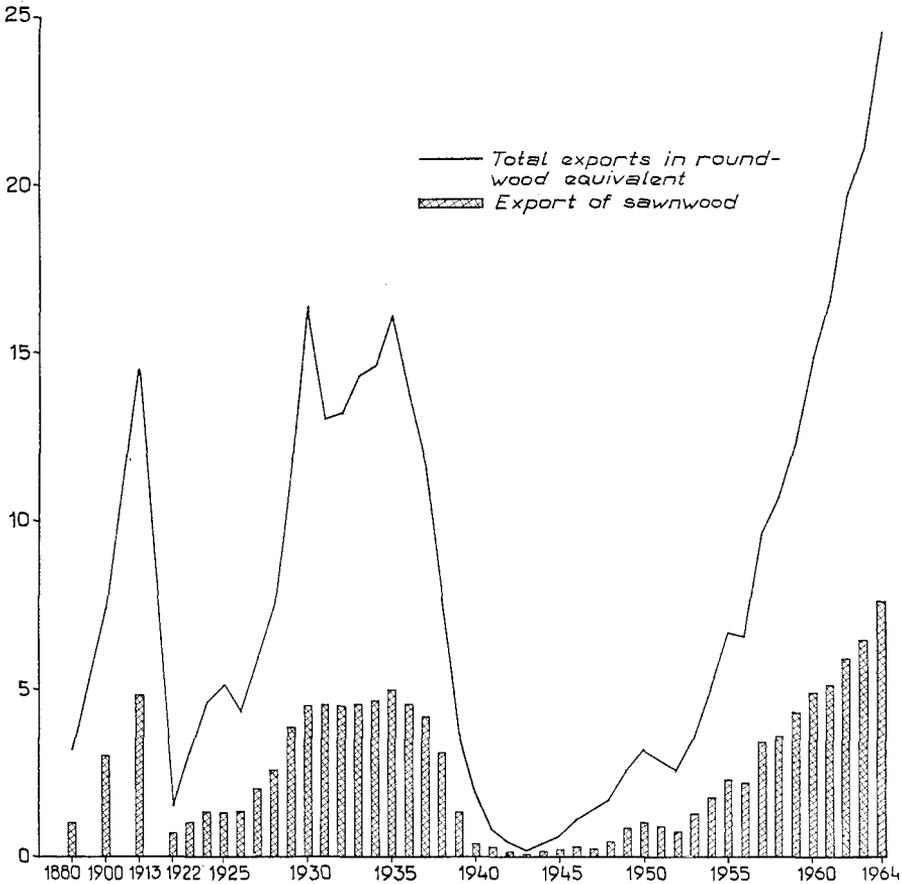
However, the order of the countries becomes quite different where it is a matter solely of the export of forest products or, to be more exact, the share of forest products in total exports. Table 4—3 sets out the main importing countries (which were listed in Table 4—2) in order of percentage of forest products of the total export value. From this it can be seen that, in terms of percentage of forest products exported, the United Kingdom is the most important of the traditional importing countries for Russian goods, while Japan took the second place in 1963. On the other hand, the countries of the Soviet bloc which are to some extent exporters of forest products in their own right (Poland, Romania), are now more in the background.

The order of importing countries for Soviet forest products in terms of absolute values (in roubles f.o.b. Soviet border) was in 1963 as follows: United Kingdom, German Democratic Republic, Hungary, Japan, Finland, German Federal Republic, France and Belgium.

If these countries are arranged according to the volume of exports of forest products, then the order is quite different, as the composition of exports according to types of timber varies very considerably for the countries in question. Large importers of Soviet roundwood, such as Japan and Finland, would then come higher up the scale.

A few words should be said about Soviet export statistics. The absence of Soviet official trade statistics for 1941-1954 prevents a more detailed analysis being made for this period. Timber trade statistics regarding volumes for this period have been obtained from semi-official publications, primarily from the comprehensive study on the timber trade compiled by Nichkov, head of V/o Exportles (Moscow, 1959). This source of information has been preferred to the official publication concerning trade statistics for the inter-war period (*V.T. SSSR, 1918-1940*, Moscow, 1960), which has been compiled on the basis of Soviet Customs statistics. For certain years and for certain products, the differences in the data in the two publications are quite large; this seems to be due to some extent to the conversions from cubic metres to tons and *vice versa*. It may be added that the details published by Nichkov correspond fairly well with the material published by Grottian (Berlin, 1942). Surprisingly, the statistical information regarding timber exports after World War II, furnished by official and semi-official Soviet sources, does not differ to any extent

Millions of
cubic metres



Sources: (1) Nichkov, V. N., *Razvitie sovetskovo lesnovo eksporta*, 1959
(2) *Vneshnaya trgovlya SSSR, 1956—1965*

Fig. 4:1. Total Exports of Forest Products and Exports of Sawnwood

worth mentioning from the statistics of the importing countries for the products in question. It is true that certain differences can arise between the data published by exporting and importing countries, and the same applies even to the statistics furnished by the Secretariat of the Timber Division of the United Nations Economic Commission for Europe, Geneva, but in this connection they can be ignored. Soviet statistics have been used in principle to provide data on exports here as well as in earlier parts of this work.

Table 4—4. Comparison between Removals of Roundwood¹ and Total Exports of Forest Products, selected years, 1913—1964

	1913	1928	1930	1935	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Removals of roundwood, million cubic metres	27.2	36.0	96.7	117.0	212.1	222.1	237.8	250.9	270.3	261.5	253.3	255.7	267.3	276.9
Exports of forest products, million cubic metres roundwood equivalent . . .	14.5	7.4	16.4	16.1	6.7	6.7	9.9	10.8	12.5	14.8	16.6	19.7	21.1	24.7
Exports as percentages of removals . . .	53.3	20.6	17.0	13.8	3.2	3.0	4.2	4.3	4.6	5.7	6.6	7.7	7.9	8.9

¹ Comprise logs, pulpwood and other industrial wood.

Sources: (1) Lesnaya Promyshlennost SSSR, *Statistichesky sbornik*, Moscow, 1957

(2) *Vneshnaya trgovlya SSSR za 1918—1940 gg.*, *Statistichesky obsor*, Moscow, 1960

(3) *Narodnoye Khozyaistvo SSSR v 1964 godu*, Moscow, 1965

(4) *Vneshnaya trgovlya SSSR, 1955—1964*, Moscow, 1956—1965

3.2 Total Exports of Forest Products

One of the questions which must be answered when assessing the timber export potential of a country is this: How large a part of the total timber output is exported? This is especially important when considering the U.S.S.R., as it was a general conception in western countries, particularly just before and after the last war, that the Soviet home consumption of forest products is so great that it would hardly be possible for the country to export timber, and even less for it to regain its old position in the world market in terms of volume. As can be seen from the graph in Figure 4: 1, Soviet export of forest products in terms of roundwood equivalents was, up to 1962, far above the previous peaks of 1913, 1930 and 1935. The answer to the above question can be obtained from Table 4—4, in which timber exports in roundwood equivalents are placed in relation to roundwood removals in selected years. The heading "roundwood removals" covers only industrial and construction wood (sawlogs, pulpwood, etc.) but not fuelwood. The reason why total timber output has not been included here, is that the total picture would be distorted to some extent because large quantities of fuelwood are still produced throughout the U.S.S.R., but not in the main logging regions.

One can see from the table that in 1913 more than half of the total output of construction and industrial wood was exported. However, it must be stated that the figure given for timber removals cannot be

Table 4—5. Timber Exports from the U.S.S.R., by Main Products, in thousands of cubic metres roundwood equivalent and as percentages of total, selected years, 1913—1964

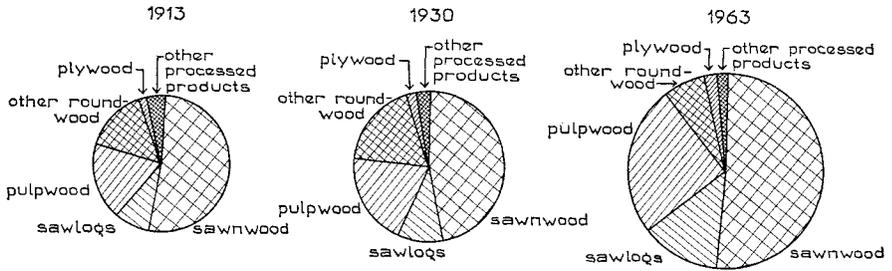
		Sawn-wood	Industrial round-wood (logs, pulpwood, pitprops)	Other timber products (ties, blocks, staves, fuel-wood)	Plywood	Wood pulp	Paper and paper-board	Total
1913	1,000 m ³	8,233.4	5,201.0	919.4	150.0	—	—	14,503.8
	%	56.8	35.9	6.3	1.0			100.0
1930	1,000 m ³	7,623.0	7,042.0	1,624.9	210.0	—	—	16,499.9
	%	46.2	42.7	9.3	1.3			100.0
1950	1,000 m ³	1,738.0	634.0	493.3	132.3	342.2	69.4	3,409.2
	%	51.0	18.6	14.5	3.0	10.0	2.0	100.0
1955	1,000 m ³	3,919.2	1,502.0	219.5	232.0	692.5	183.8	6,749.0
	%	58.1	22.3	3.2	3.4	10.9	2.7	100.0
1960	1,000 m ³	8,315.5	4,196.0	319.6	322.8	1,228.2	386.8	14,768.9
	%	56.3	28.4	2.2	2.2	8.3	2.6	100.0
1963	1,000 m ³	10,897.8	7,516.0	664.0	361.8	1,236.3	458.7	21,134.6
	%	51.5	35.6	3.1	1.7	5.9	2.2	100.0
1964	1,000 m ³	12,817.9	8,655.0	915.8	448.8	1,322.5	522.8	24,682.8
	%	51.3	35.1	3.7	1.8	5.4	2.1	100.0

Sources: (1) Nichkov, V. N. *Razvitie sovetskovo lesnovo eksporta*, Moscow, 1959
 (2) *Vneshnaya torgovlya SSSR, 1955, 1960, 1963, 1964*, Moscow, 1956—1965

regarded as correct (cf. Part II, p. 213). Probably the timber output for 1913 was higher than the Soviet official statistics indicate; this in its turn means that the percentage figure for exports will also be less. From the percentage figures it can be clearly seen that the share of exports before the last war was considerably greater than during the post-war period. Since 1955, a characteristic feature has been that the increase in exports in terms of volume has involved an increase also in the relative amount of timber removals; in recent years this has risen to almost eight per cent. Over the past 6-7 years the volume of roundwood removals has been at approximately the same level.

Table 4—5 shows that certain changes have taken place in the composition of timber assortments exported by the U.S.S.R. over the years. In this table, the export of forest products is given in terms of roundwood consumption, using the FAO conversion factors (Y.F.P.S., 1964) for all years. As different conversion factors have been used on various occasions, the total figures for the Soviet exports of forest products are not always uniform, and there might be some deviations from the statistical material presented (cf. Grottian, 1942, p. 83).

Table 4—5 shows that sawnwood makes up about half of the total export of forest products. Roundwood exports, which were considerable



Sources: (1) Nichkov, V. N., *Razvitie sovetskovo lesnovo eksporta, 1959*
 (2) *Vneshnaya trgovlya SSSR v 1963 godu, 1965*

Fig. 4.2. Structure of Exports by Main Forest Products

before 1914 and also during the inter-war period, did not cease after the last war, as has been alleged in certain quarters. One even finds that the export of sawlogs in absolute figures has in recent years reached a volume greater than ever before. In 1963, the export of pulpwood, in absolute figures, was at the same volume as that of the peak year of 1930. Figure 4: 2 shows in graph form the percentage distribution of the exports of forest products in 1913, 1930 and 1963. The interesting fact is that after the last war the U.S.S.R. became an exporter of pulp, paper and paperboard, even though at the same time it also imported a large amount of these products.

3.3 Exports of Sawnwood

The total volume of exports of sawnwood from Czarist Russia and the U.S.S.R. has changed from time to time, as can be seen from the graph in Figure 4: 1. One can see that in 1960 the volume of sawnwood exports exceeded the 1913 level, which had been the highest until then. Since 1960 there has been a continuous increase.

Table 4—6 shows a rather interesting course of development in the amount of timber production which has gone for export in certain selected years. From this it can be seen that the relative share of exports has been drastically reduced since the last war, but that it has risen again in recent years. In 1962 and 1963 it amounted to about six per cent of the total volume of production, as against more than 40 per cent before 1914, and 20 per cent at the beginning of the Thirties. From the standpoint of the flexibility of trade, it should be particularly noted that only 2—6 per cent of the production of sawnwood was exported during the last fifteen or so years. The fact is that a low percentage share makes exports more elastic in the sense that

Table 4—6. Production and Exports of Sawnwood, selected years, 1913—1964

	1913	1928	1930	1935	1939	1950	1951	1952	1953	1954
Production, million cubic metres	11.9 ^a	13.6	21.9	35.7	34.5	49.5	56.0	60.5	66.4	69.0
Exports, million cubic metres	4.9 ^a	2.7	4.6	5.0	1.4	1.0	0.9	0.7	1.3	1.7
Share of export in production, per cent	41.2	19.9	21.0	14.0	4.1	2.0	1.6	1.2	2.0	2.5
	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Production, million cubic metres	75.6	76.6	81.6	93.7	104.0	105.6	104.3	104.6	106.4	110.9
Exports, million cubic metres	2.3	2.2	3.5	3.6	4.4	5.0	5.2	6.0	6.5	7.7
Share of export in production, per cent	3.0	2.9	4.3	3.8	4.2	4.7	5.0	5.7	6.1	6.9

a 1938 area of the U.S.S.R.

Sources: (1) Lesnaya Promyshlennost SSSR, *Statistichesky sbornik*, Moscow, 1957

(2) Nichkov, V. M. *Razvitie sovetskovo lesnovo eksporta*, Moscow, 1959

(3) *Vneshnaya trgovlya SSSR za 1918—1940 gg.*, *Statistichesky obsor*, Moscow, 1960

(4) *Narodnoye Khozyaistvo SSSR v 1964 godu*, Moscow, 1965

(5) *Vneshnaya trgovlya SSSR, 1955—1964*, Moscow, 1956—1965

changes in volume are more easily made. For example, an increase in the share of exports from five per cent to ten per cent would double the volume of exports, while the effects of this on the home market would be less felt, and in any case would not give rise to complications in the supply of sawnwood for home consumption. On the other hand, should the volume of exports be doubled to the detriment of all exporting countries, for example from 30 per cent to 60 per cent of the total production (the latter percentage is that which is actually exported by the Scandinavian countries), then it would hardly be possible to maintain such exports without affecting home consumption. Should it be possible to realise such a percentage, then the increase in supply would almost cause chaos in the world market.

The main part of the forest products exported by Russia before 1914 came from that part of Russia which is within the continent of Europe.

Table 4—7. Exports of Coniferous Sawnwood, by Main Importing Countries, in thousands of cubic metres and as percentages of total, selected years, 1913—1964

	1913 ^a	1930	1937	1955	1960	1963	1964
Belgium..... 1,000 m ³	281.0	380.0	306.0	199.6	200.9	309.0	325.1
%		8.4	7.3	8.5	4.0	4.7	4.2
Czechoslovakia..... 1,000 m ³	—	—	—	—	177.4	154.1	159.6
%					3.5	2.4	2.1
Germany, Fed. Rep. . . . 1,000 m ³	777.0	355.0	253.0	88.6	282.0	439.4	507.2
%		7.9	6.1	3.8	5.7	6.7	6.6
Germany, East (D.D.R.)..... 1,000 m ³	—	—	—	2.4	729.4	1,114.5	1,229.8
%				0.1	14.6	17.1	16.0
France..... 1,000 m ³	336.0	142.0	169.0	76.7	93.3	279.2	303.8
%		3.2	4.0	3.3	1.9	4.3	4.0
Hungary..... 1,000 m ³	—	—	—	86.6	366.7	606.3	574.8
%				3.7	7.4	9.3	7.5
Italy..... 1,000 m ³	22.0	58.0	—	76.7	132.2	196.8	238.0
%		1.3		3.3	2.7	3.0	3.1
Netherlands..... 1,000 m ³	646.0	641.0	819.0	254.3	342.4	247.5	333.8
%		14.2	19.6	10.9	6.9	3.8	4.3
United Kingdom. . . . 1,000 m ³	2,583.0	2,447.0	2,220.0	1,143.0	1,797.0	2,100.3	2,419.6
%		54.3	53.3	48.9	36.1	32.2	31.6
Other countries 1,000 m ³	177.0	481.0	406.0	409.7	858.2	1,078.4	1,583.9
%		10.7	9.7	17.5	17.2	16.5	20.6
Total..... 1,000 m ³	4,822.0	4,504.0	4,173.0	2,337.6	4,979.5	6,525.5	7,675.6
%		100.0	100.0	100.0	100.0	100.0	100.0

^a Estimated on the basis of volume in tons.

Sources: (1) Lesnaya promyshlennost SSSR, *Statistichesky sbornik*, Moscow, 1957

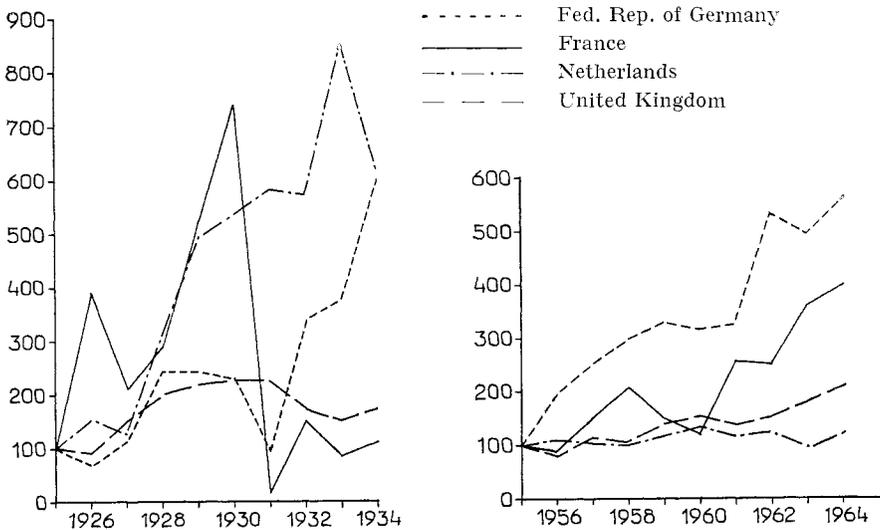
(2) *Narodnoye Khozyaistvo SSSR v 1960 gody*, Moscow, 1961

(3) Nichkov, V. N. *Razvitie sovetskovo lesnovo eksporta*, Moscow, 1959

(4) *Vneshnaya torgovlya SSSR, 1955—1964*, Moscow, 1956—1965

In the inter-war period there was some change in the geographical distribution of the origin of timber exports. Thus the centre of the exports of sawnwood shifted from the Baltic to the White Sea. Since the last war, the northern sea-lanes have begun to play an increasingly important role in exports from Siberia. It seems likely that in the future these sea-lanes will play an even bigger part in Soviet exports of sawnwood than previously, and that the greatest centre for exports will be situated on the River Yenisey in Igarka.

Table 4—7 shows the distribution of Soviet sawnwood exports by importing countries, both in terms of volume and percentages in selected years. One can see from the table that the United Kingdom tops the list as the foremost importer of Soviet sawnwood. From 1957 onwards, the German Democratic Republic has been second, and its imports of Soviet sawnwood have been increasing at a notable rate since that year. In 1963, the German Democratic Republic alone

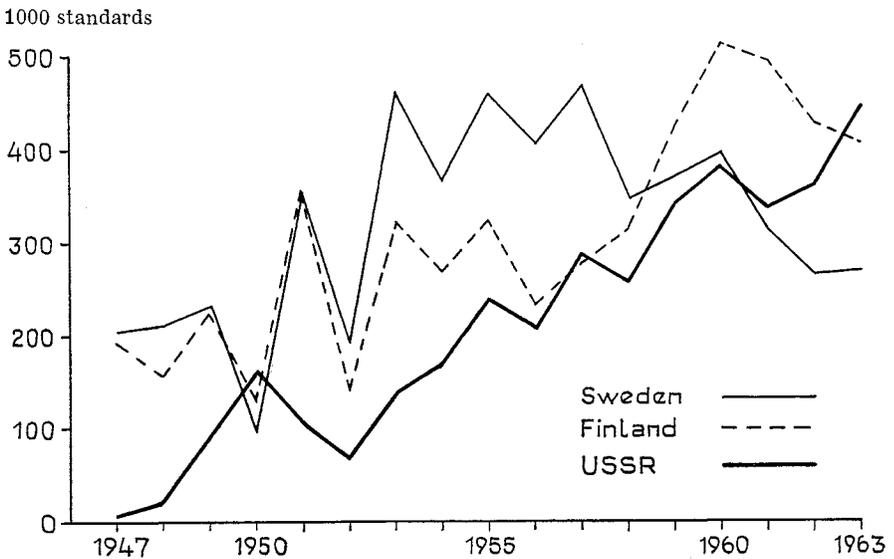


Sources: (1) *Vneshnaya trgovlya SSSR za 1918—1940 gg.*, Statistichesky obzor, 1960
 (2) *Vneshnaya trgovlya SSSR, 1956—1965*

Fig. 4:3. Indices for Soviet Export of Coniferous Sawnwood

imported quantities of sawnwood which substantially exceeded those imported in 1913 by the considerably more extensive German Empire. Even then Germany was in second place after the United Kingdom, and the volume of sawnwood imported by Germany from Russia was hardly one-quarter of the amount imported by the United Kingdom. However, in recent years the combined imports of the two German republics amount to about three-quarters of the quantity imported by the United Kingdom.

An interesting subject for study is the Soviet capture of sawnwood markets previously held by other countries. This has happened twice in the past half-century — once in the inter-war period and again since the last war. Figure 4:3 shows the geographical distribution of the increase in exports to certain of the main importing countries of western Europe during the periods 1925—1934 (1925=100), and 1955—1964 (1955=100). One can see that the Soviet capture of markets after the war has largely followed the same pattern as that of the inter-war period, although certain differences occur in the case of individual countries. For instance, in their latest export drive the Soviets were unable to regain the Dutch market which they had gained during the inter-war period. The situation was just the reverse in the case of France, where there was no success at first, but where the



Source: FAO, Yearbook of Forest Products Statistics, 1949—1964

Fig. 4:4. Exports of Coniferous Sawnwood from the U.S.S.R., compared with Exports from Sweden and Finland, to the United Kingdom, 1947—1963

market was captured on the second attempt, as can be seen from the table.

Figure 4: 4 gives a graphical representation of how Soviet exports of coniferous sawnwood have stood up against those of the most forceful competitors (Sweden and Finland) in the United Kingdom, which is the most important market for timber in western Europe. As can be seen from the diagram the increase in the amount of timber offered by the U.S.S.R. has brought about reductions in the shares of the English timber market previously held by Sweden and Finland.

The competitive means used by Soviet sales agents in their sales drive to capture timber markets will be given in detail later in this work. Here it need only be mentioned that the total number of countries which are now importing sawnwood from the U.S.S.R. has increased over the number in earlier periods.

3.4 Exports of Roundwood

Soviet timber exports to a large extent have been and still are in the form of unprocessed timber, i.e. roundwood, as can be seen from Table 4—5. The share of roundwood in the total exports of forest

Table 4—8. Exports of Roundwood, by Main Assortments, in thousands of cubic metres and as percentage distribution, selected years, 1913—1964

Assortments	1913	1930	1938	1950	1955	1960	1963	1964
Sawlogs..... 1,000 m ³	1,270	1,720	245	107	116	1,496	2,628	3,219
(<i>pilovochnik</i>)	%	23.5	21.0	11.9	11.8	7.4	33.9	33.7
Pitprops..... 1,000 m ³	1,889	1,806	938	378	839	1,111	1,396	1,390
(<i>stoika rudnichnaya</i>)	%	34.9	22.0	45.6	41.6	53.5	25.1	17.9
Pulpwood..... 1,000 m ³	2,042	3,516	876	149	547	1,589	3,492	4,046
(<i>balansy</i>)	%	37.8	42.8	42.5	16.4	34.8	35.9	44.9
Other roundwood..... 1,000 m ³	207	1,165	—	275	68	226	278	269
products	%	3.8	14.2	—	30.2	4.3	5.1	3.5
Total..... 1,000 m ³	5,408	8,207	2,059	909	1,570	4,422	7,794	8,924
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total timber exports in roundwood equivalent ... 1,000 m ³	14,504	16,500	7,703	3,409	6,749	14,769	21,135	24,683
Share of roundwood	%	37.3	49.7	26.7	26.7	23.3	29.9	36.9

Sources: (1) Nishkov, V. N. *Razvitie sovetskovo lesnovo eksporta*, Moscow, 1959

(2) *Vneshnaya torgovlya SSSR, 1955—1964*, Moscow, 1956—1965

products in terms of roundwood equivalent is between 25 and 50 per cent. Table 4—8 shows the state of affairs for selected years.

The most noticeable feature of the development is that although it has varied very much, the relative share of roundwood in the total exports of forest products has shown a rising trend in recent years. The largest purchasers of Soviet timber in unprocessed form are now Japan and Finland. The U.S.S.R. has long-term bilateral trade agreements with these two countries; in these agreements it is specifically stipulated the quantities of roundwood to be delivered annually and these quantities are increasing year by year.

As can be seen from Table 4—9 and Figure 4:5, Japan occupies first place, and is well ahead of all other importing countries for Soviet sawlogs (*pilovochnik*). About half of the Soviet export of sawlogs goes to Japan, while a long way behind in second place comes Finland.

There has been a particularly marked upswing in imports of sawlogs by Finland since 1960. Even in the 1930s, Finland was a large buyer of Soviet sawlogs, and at times the imports by Finland have been greater than those by Japan.

Soviet pulpwood has not had any individual export market which has been particularly greater than others, though for the last two or three years the German Democratic Republic has been the leading importing country in terms of volume, as can be seen from Table 4—10. The combined imports by the two German republics in 1963 hardly amounted to half the quantity of pulpwood which the U.S.S.R. exported

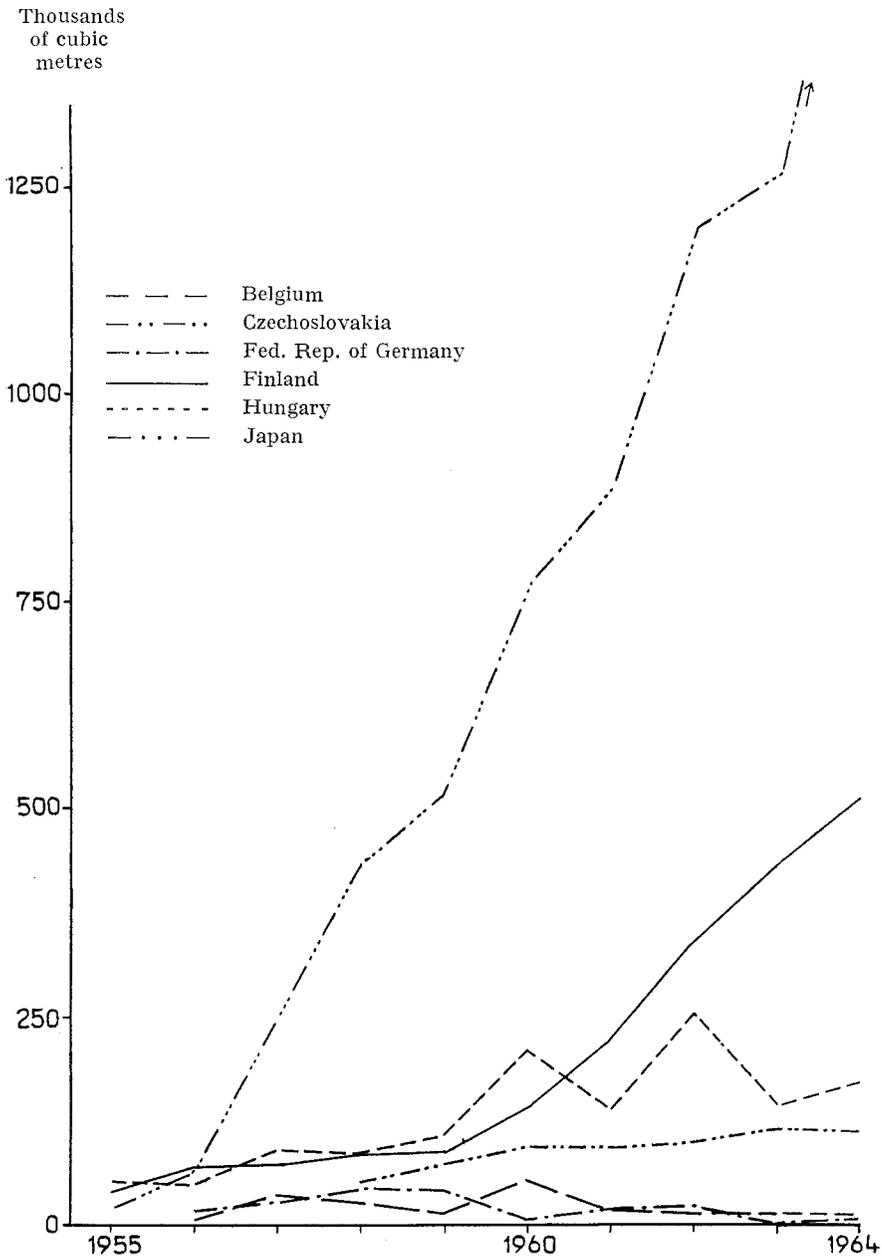
Table 4—9. Exports of Sawlogs, by Main Importing Countries, in thousands of cubic metres and as percentages of total, selected years, 1930—1964

	1930	1937	1955	1960	1963	1964
Belgium..... 1,000 m ³	2.0	38.0		50.7	15.7	13.4
%	0.1	6.0		3.4	0.6	0.4
Czechoslovakia... 1,000 m ³	—			96.4	118.6	112.1
%				6.4	4.5	3.5
Germany, Fed. Rep. 1,000 m ³	3.0			8.0	4.2	7.2
%	0.2			0.5	0.2	0.2
Germany, East (D.D.R.)..... 1,000 m ³				94.9	0.7	0.3
%				6.3	—	—
Finland..... 1,000 m ³	394.0	274.0	40.0	143.3	434.0	507.5
%	22.9	43.3	34.5	9.6	16.5	15.8
France..... 1,000 m ³	4.0					
%	0.2					
Hungary..... 1,000 m ³	—		53.0	214.4	145.7	158.8
%			45.8	14.4	5.5	4.9
Japan..... 1,000 m ³	634.0	131.0	20.5	768.2	1,267.4	1,820.8
%	36.9	20.7	17.7	51.4	48.2	56.6
Netherlands.... 1,000 m ³	2.0	23.0		37.7	22.5	20.3
%	0.1	3.6		2.5	0.9	0.6
Poland..... 1,000 m ³			—			50.9
%						1.6
United Kingdom . 1,000 m ³	176.0	18.0	—	—	—	—
%	10.2	2.8				
Other countries .. 1,000 m ³	505.0	149.0	2.3	82.8	619.6	527.3
%	29.4	23.6	2.0	5.5	23.6	16.4
Total..... 1,000 m ³	1,720.0	633.0	115.8	1,496.4	2,628.4	3,218.6
%	100.0	100.0	100.0	100.0	100.0	100.0

Sources: (1) Nichkov, V. N., *Razvitie sovetского lesnogo eksporta*, Moscow, 1959
(2) *Vneshnaya torgovlya SSSR, 1955—1964*, Moscow, 1956—1965

to the Germany of 1930. An explanation of this — though it is by no means the only reason — is that several of the most important pulp-mills of the former German state were situated in East Prussia around Königsberg (now Kaliningrad); this area is now part of the U.S.S.R. Large quantities of pulpwood from the northern parts of the U.S.S.R. still go to this area, but of course are no longer included in foreign trade statistics.

In 1962, the second place on the Soviet export table for pulpwood was occupied by France. In that year, France imported a quantity almost as large as that imported in 1937, but in the years between French imports from the U.S.S.R. had undergone marked fluctuations. Since 1960, the imports of pulpwood have been constantly rising, probably because of the long-term trade agreement between France and the U.S.S.R. It might be mentioned that other quotas provided for



Source: Vneshnaya Torgovlya SSSR, 1956—1965

Fig. 4.5. Exports of Sawlogs from the U.S.S.R. to the Main Importing Countries, 1955—1964

Table 4—10. Exports of Pulpwood, by Main Importing Countries, in thousands of cubic metres and as percentages of total, selected years, 1930—1964

	1930	1937	1955	1960	1963	1964
Belgium..... 1,000 m ³	—	136.0	19.0	128.7	318.2	322.0
%		7.4	3.5	8.1	9.1	8.0
Germany, Fed. Rep. 1,000 m ³	1,609.0	590.0	105.0	320.6	135.0	101.2
%	45.8	32.2	19.2	20.2	3.8	2.5
Germany, East (D.D.R.) 1,000 m ³			141.0	248.0	633.1	701.3
%			25.8	15.6	18.2	17.3
Finland..... 1,000 m ³	61.0	—	28.4	97.8	513.4	592.4
%	1.7		5.2	6.1	14.7	14.6
France..... 1,000 m ³	242.0	557.0	102.4	98.8	555.4	432.5
%	6.9	30.4	18.7	6.2	15.9	10.7
Hungary..... 1,000 m ³	—	—	—	185.6	282.0	306.1
%				11.7	8.1	7.6
Japan..... 1,000 m ³	—	—	—	178.0	468.8	595.1
%				11.2	13.4	14.7
Netherlands.... 1,000 m ³	326.0	294.0	—	—	—	—
%	9.3	16.0				
Norway..... 1,000 m ³	165.0	7.0	4.0	175.6	170.6	473.0
%	4.7	0.4	0.7	11.0	4.9	11.7
Poland..... 1,000 m ³	—	—	—	44.1	118.2	214.5
%				2.8	3.4	5.3
United Kingdom . 1,000 m ³	248.0	214.0	—	22.3	31.4	59.4
%	7.0	11.7		1.4	0.9	1.5
Other countries .. 1,000 m ³	865.0	35.0	147.4	89.9	266.2	248.2
%	24.6	1.9	26.9	5.7	7.6	6.1
Total..... 1,000 m ³	3,516.0	1,833.0	547.2	1,589.4	3,492.3	4,045.7
%	100.0	100.0	100.0	100.0	100.0	100.0

Sources: (1) Nichkov, V. N. *Razvitie sovetskovo lesnovo eksporta*, Moscow, 1959
 (2) *Vneshnaya torgovlya SSSR, 1955—1964*, Moscow, 1956—1965

under the trade agreement were not fully taken up in 1963 (Fokin, V.T., 1964, 11, p. 20). The new long-term trade agreement between France and the U.S.S.R. for the period 1965—1969 provides for an increase in Soviet exports of pulpwood from 600,000 cubic metres (stacked) in 1965, to 800,000 cubic metres in 1969.

Soviet exports of pitprops to the main importing countries are given in Table 4—11. It should be noted that the total volume of exports of pitprops has been rising continuously since the latter half of the 1950's, but has not reached inter-war level. In recent years Hungary has become the largest importer, while the United Kingdom, traditionally the greatest importer of Russian pitprops, is now second.

Table 4—11. Exports of Pitprops, by Main Importing Countries, in thousands of cubic metres and as percentages of total, selected years, 1930—1964

	1930	1937	1955	1960	1963	1964
Belgium..... 1,000 m ³	131.0	425.0	92.4	4.2	3.1	—
%	7.2	27.0	11.0	0.4	0.2	
Germany, Fed. Rep. 1,000 m ³	9.0	—	209.1	219.6	217.6	201.0
%	0.5		24.9	19.8	16.0	14.5
Hungary..... 1,000 m ³	—	—	49.8	452.1	507.9	640.9
%			5.9	40.7	37.4	46.1
Netherlands..... 1,000 m ³	52.0	44.0	8.8	12.0	23.8	28.9
%	2.9	2.8	1.0	1.1	1.8	2.1
United Kingdom . 1,000 m ³	1,533.0	1,077.0	477.3	256.8	303.7	498.3
%	84.9	68.3	57.0	23.1	22.3	35.8
Other countries .. 1,000 m ³	81.0	30.0	2.0	165.9	303.8	20.8
%	4.5	1.9	0.2	14.9	22.3	1.5
Total..... 1,000 m ³	1,806.0	1,576.0	839.4	1,110.6	1,359.9	1,389.9
%	100.0	100.0	100.0	100.0	100.0	100.0

Sources: (1) Nichkov, V. N. *Razvitie sovetskovo lesnovo eksporta*, Moscow, 1959
(2) *Vneshnaya trgovlya SSSR, 1955—1964*, Moscow, 1956—1965

Table 4—12. Production and Exports of Paper and Paperboard, selected years, 1913—1964

	1913	1928	1930	1935	1939	1950	1951	1952	1953	1954
Total production, thousand tons	217.0	331.6	572.3	748.6	958.8	1,485.1	1,675.6	1,834.9	2,054.1	2,268.5
Exports, thousand tons						22.1	99.2	107.3	66.4	59.2
Export as percentage of production						1.5	5.9	5.8	3.2	2.6
	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Total production, thousand tons	2,407.7	2,581.2	2,782.3	2,956.4	3,090.7	3,226.9	3,445.5	3,668.1	3,853.1	4,120.0
Exports, thousand tons	59.2	70.6	85.4	93.8	103.9	123.0	141.8	153.6	145.6	165.5
Export as percentage of production	2.5	2.7	3.1	3.2	3.4	3.8	4.1	4.2	3.8	4.0

Sources: (1) *Narodnoye Khozyaistvo SSSR v 1964 godu*, Moscow, 1965
(2) Nichkov, V. N. *Razvitie sovetskovo lesnovo eksporta*, Moscow, 1959
(3) *Vneshnaya trgovlya SSSR za 1918—1940 gg., Statistichesky obsor*, Moscow, 1960
(4) *Vneshnyaya trgovlya SSSR, 1955—1964*, Moscow, 1955—1965

3.5 Trade in Pulp and Paper

Pulp and paper are relatively new export items in Soviet trade. The first export of these products took place after the last war. Earlier, both before 1914 and during the inter-war period, Russia had been an

Table 4—13. Imports and Exports of Pulp, Paper and Paperboard, in thousands of tons, 1945—1964

Year	Pulp		Paper		Paperboard	
	Export	Import	Export	Import	Export	Import
1945.....	23.3	43.1	15.9	59.3	—	8.0
1946.....	60.0	89.5	51.2	119.9	4.5	23.8
1947.....	84.6	18.2	50.6	35.3	7.6	4.9
1948.....	61.3	28.6	51.8	49.4	4.5	9.2
1949.....	52.6	26.0	38.6	51.2	1.4	9.6
1950.....	67.9	2.7	21.9	18.2	0.2	6.9
1951.....	66.0	—	99.2	18.8	—	6.8
1952.....	68.1	0.02	107.1	50.4	0.2	13.6
1953.....	86.5	16.0	66.0	69.0	0.4	20.4
1954.....	103.4	29.7	58.7	119.3	0.5	20.2
1955.....	137.4	37.4	59.0	75.6	0.2	25.8
1956.....	145.8	55.4	70.5	79.5	0.1	42.7
1957.....	150.5	81.7	85.2	85.3	0.2	65.9
1958.....	218.9	75.9	92.7	76.9	1.1	56.7
1959.....	203.4	64.0	103.4	65.6	0.5	46.8
1960.....	243.7	82.8	122.5	69.9	0.5	43.3
1961.....	265.8	107.4	139.1	112.4	2.7	67.7
1962.....	266.7	108.3	145.2	102.0	8.4	52.7
1963.....	245.3	84.5	143.2	107.0	2.4	64.0
1964.....	262.4	123.5	163.3	111.7	2.2	61.1

Sources: (1) Lurye, N. A. "Vneshnaya trgovlya SSSR tsellyulozno-bumazhnymi tovarami", *Bumazhnaya Promyshlennost*, 1960, 3.

(2) Nichkov, V. N. *Razvitie sovetkovo lesnovo eksporta*, Moscow, 1959

(3) *Vneshnaya trgovlya SSSR, 1960—1964*, Moscow, 1961—1965

importer of these items. Imports still take place, the quantities of which have been rising in recent years.

Strangely enough, official statistics give no data on the production of pulp, but only details about its exports and imports. On the other hand, there are complete statistics for the production of paper and paperboard, as well as for the foreign trade in these products.

As can be seen from Table 4—12, there has been a constant rise in the production of paper and paperboard over the last 50 years. The volume of production increased greatly as a consequence of the total expansion after the last war, and since then the rate of increase has been steadily rising. However, the Soviet output of these products is rather limited compared with that of the large production areas such as Scandinavia and North America. Despite the constant rise, the exports of these products represent a very modest contribution to world trade. One can hardly discern any great changes in terms of the relative share of exports in production. In recent years, exports in round figures have amounted to four per cent of production, which is quite

Table 4—14. Exports of Pulp, by Main Importing Countries, in thousands of metric tons and as percentages of total, 1955—1964

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Belgium..... 1,000 tons	6.6	4.7	4.9	6.2	1.6	3.4	0.9	0.1	0.1	—
%	4.8	3.2	3.3	2.8	0.8	1.4	0.3	—	—	—
Bulgaria 1,000 tons	9.7	8.5	21.4	12.1	14.0	14.2	17.8	25.1	15.7	26.8
%	7.0	5.8	14.2	5.5	6.9	5.8	6.7	9.4	6.4	10.2
Czechoslovakia... 1,000 tons	6.7	5.7	6.6	5.7	0.6	0.1	—	—	—	11.2
%	4.9	3.9	4.4	2.6	0.3	—	—	—	—	4.3
Germany, Fed. Rep. 1,000 tons	1.2	0.3	0.3	1.2	2.6	9.4	8.1	10.5	15.4	18.4
%	0.9	0.2	0.2	0.5	1.3	3.9	3.0	3.9	6.3	7.0
Germany, East . . 1,000 tons	1.8	10.8	23.0	14.2	18.7	25.0	25.5	39.8	35.1	43.8
(D.D.R.)	1.3	7.4	15.3	6.5	9.2	10.3	9.6	14.9	14.3	16.7
France 1,000 tons	6.0	22.8	17.8	47.4	35.6	42.4	50.0	47.5	36.6	21.8
%	4.4	15.6	11.8	21.7	17.5	17.4	18.8	17.9	14.9	8.3
Hungary 1,000 tons	18.8	12.7	22.1	15.4	16.5	13.4	11.2	14.4	10.3	13.3
%	13.7	8.7	14.7	7.0	8.1	5.5	4.2	5.4	4.2	5.1
Italy 1,000 tons	—	—	—	2.6	5.1	16.1	20.2	18.6	16.6	16.3
%	—	—	—	1.2	2.5	6.6	7.6	7.0	6.8	6.2
Spain 1,000 tons	—	—	—	37.8	26.9	22.2	10.2	0.4	5.6	—
%	—	—	—	17.3	13.2	9.1	3.8	0.1	2.3	—
United Kingdom. 1,000 tons	70.2	50.7	43.7	60.1	64.6	81.8	73.3	65.5	63.9	69.4
%	51.1	34.9	29.0	27.5	31.8	33.6	27.7	24.6	26.0	26.4
Other countries . . 1,000 tons	16.4	29.6	10.7	16.2	17.2	15.7	48.6	44.8	46.0	41.4
%	11.9	20.3	7.1	7.4	8.4	6.4	18.3	16.8	18.8	15.8
Total 1,000 tons	137.4	145.8	150.5	218.9	203.4	243.7	265.8	266.7	245.3	262.4
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: *Vneshnaya trgovlya SSSR, 1955—1964*, Moscow, 1956—1965

low when compared with the corresponding figures for the large producing countries.

Table 4—13 shows the exports and imports of pulp, paper and paper-board in the post-war period, from which it can be seen that the total volume of pulp and paper products has been largely in balance. However, there is a rising trend in both exports and imports.

The geographical distribution of pulp exports is seen in Table 4—14. Here the United Kingdom, France and the German Democratic Republic are the foremost importers of Soviet pulp. Unbleached sulphite is the main type of pulp exported. Lesser quantities of bleached sulphite and unbleached sulphate have also been exported.

Total paper exports by major consuming countries are shown in Table 4—15. The main type of paper exported is newsprint. The largest importer of Soviet paper is now Bulgaria, while no other country occupies a particularly noticeable position. The interesting point is that the major industrial countries play a relatively unimportant part as importers of Soviet paper.

Table 4—15. Exports of Paper, by Main Importing Countries, in thousands of metric tons and as percentages of total, 1955—1964

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Bulgaria 1,000 tons	11.1	15.9	18.7	15.9	22.7	12.9	21.6	28.4	30.2	27.2
%	17.7	21.0	21.9	17.1	21.9	10.5	15.5	19.6	21.1	16.7
Czechoslovakia . . . 1,000 tons	0.7	0.8	0.7	1.0	1.3	1.2	1.2	1.5	1.5	1.8
%	1.1	1.1	0.8	1.1	1.3	1.0	0.9	1.0	1.1	1.1
Germany, East (D.D.R.) 1,000 tons	—	—	—	0.7	3.4	9.2	3.6	4.8	7.2	22.9
%	—	—	—	0.8	3.3	7.5	2.6	3.3	5.0	14.0
France 1,000 tons	—	—	—	17.6	—	—	—	2.6	—	—
%	—	—	—	19.0	—	—	—	1.8	—	—
Hungary 1,000 tons	—	—	—	9.4	—	—	—	15.5	13.9	14.6
%	—	—	—	10.1	—	—	—	10.6	9.7	8.9
Netherlands 1,000 tons	0.2	8.2	—	2.4	2.4	1.3	0.5	0.4	0.1	—
%	0.3	10.8	—	2.6	2.3	1.1	0.4	0.3	0.1	—
Poland 1,000 tons	—	—	—	5.4	—	—	5.6	4.9	—	—
%	—	—	—	5.8	—	—	4.0	3.4	—	—
Jugoslavia 1,000 tons	—	—	—	4.7	0.5	0.5	—	4.2	5.9	4.2
%	—	—	—	5.1	0.5	0.4	—	2.9	4.1	2.6
Other countries . . . 1,000 tons	50.6	50.8	65.8	35.6	73.1	97.4	106.6	82.9	84.4	92.6
%	80.9	67.1	77.3	38.4	70.7	79.5	76.6	57.1	58.9	56.7
Total 1,000 tons	62.6	75.7	85.2	92.7	103.4	122.5	139.1	145.2	143.2	163.3
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: *Vneshnaya trgovlya SSSR, 1955—1964*, Moscow, 1956—1965

One can clearly see that the Soviets are making efforts to increase the number of countries which buy Soviet paper, although the export quantities to most countries are relatively small. The list of so-called "developing countries" receiving Soviet paper is very remarkable, although from the purely economic standpoint such a wide distribution of exports in small quantities can hardly be a very lucrative proposition. The main ports for the export of pulp and paper are Leningrad, Archangel, Tallinn, Kaliningrad and the ports of Southern Sakhalin.

3.6 Trade in Other Processed Forest Products

Russia has long been an exporter of plywood. Since 1960, details of plywood production have not been published in the official statistics, but in that year the output of plywood (*fanera kleennaya*) was 1.4 million tons. As can be seen from Table 4—16, exports were almost 10 per cent of the production. This table also shows the distribution of the Soviet exports of plywood by main importing countries. One can note that once again the United Kingdom is still the largest buyer, as it was during the inter-war period. The combined quantities taken by all other importing countries came to less than England's purchases.

Table 4—16. Exports of Plywood, by Main Importing Countries, in thousands of cubic metres and as percentages of total, selected years, 1930—1964

	1930	1937	1955	1960	1963	1964
Belgium..... 1,000 m ³	4.7	9.9	1.2	2.9	8.9	9.1
%	5.6	6.7	1.4	2.2	6.1	5.1
Germany, Fed. Rep. 1,000 m ³	11.4	—	—	0.1	0.7	0.9
%	13.6			0.1	0.5	0.5
Germany, East (D.D.R.)..... 1,000 m ³			0.2	2.2	9.5	8.0
%			0.2	1.7	6.6	4.5
Greece..... 1,000 m ³	0.4	2.9	2.3	4.8	4.1	4.7
%	0.5	2.0	2.6	3.7	2.8	2.6
Hungary..... 1,000 m ³	—	—	0.6	0.9	—	1.0
%			0.7	0.7		0.6
Netherlands 1,000 m ³	4.2	12.6	8.2	3.3	4.3	5.6
%	5.0	8.5	9.2	2.6	3.0	3.1
United Kingdom . 1,000 m ³	38.4	103.6	68.3	101.1	102.8	129.1
%	45.7	70.0	76.9	78.3	71.0	71.9
Other Countries .. 1,000 m ³	24.9	18.9	8.0	13.8	14.4	21.1
%	29.6	12.8	9.0	10.7	10.0	11.7
Total..... 1,000 m ³	84.0	147.9	88.8	129.1	144.7	179.5
%	100.0	100.0	100.0	100.0	100.0	100.0
Production..... 1,000 m ³	339.0	679.0	1,049.0	1,353.0		
Share of Export in Production.... %	24.8	21.8	8.5	9.5		

Sources: (1) Nichkov, V. N. *Razvitie sovetkovo lesnovo eksporta*, Moscow, 1959
 (2) *Vneshnaya trgovlya SSSR, 1955—1964*, Moscow, 1956—1965
 (3) *Narodnoye Khozyaistvo SSSR v 1960 godu*, Moscow, 1961

Production of particle board has increased from 34,000 cubic metres in 1958 to 584,000 cubic metres in 1964 (Rebrin, *D.P.*, 1965, 8). Imports in 1962 were almost 0.6 million square metres, while the corresponding figure for 1963 was 1.1 million. In the main, these imports came from Romania, and to a lesser extent, from Bulgaria.

The U.S.S.R. is at the same time an exporter of particle board, and in 1962 exported 18,900 cubic metres; in 1963 these exports totalled 17,400 cubic metres. The importing countries were the German Democratic Republic and the Netherlands. Although the quantities of particle board exported are rather insignificant, larger quantities of fibreboard were exported. Here the development has been as follows:

1959 — 260 cubic metres
 1960 — 273 cubic metres
 1961 — 269 cubic metres
 1962 — 1,325,500 sq. metres
 1963 — 4,482,100 sq. metres.

Soviet fibreboard exports go mainly to the United Arab Republic, Pakistan and Ethiopia (V.T. SSSR, 1959—1963).

Soviet prefabricated houses have been exported in small quantities in recent years. In 1963, the prefabricated houses exported had a floor area totalling 32,000 sq. metres, and had a total export value of 1.2 million roubles.

The foreign trade in furniture has also developed in recent years, and by way of example it may be mentioned that in 1963 furniture imports totalled 134 million roubles, and furniture exports 1.6 million roubles. One can see that there has been a steeply rising trend in imports since 1955, while exports have declined.

4. Prices and Price Policies of Soviet Timber Trade

4.1 Price Formation in the Soviet Type of Economy

The pricing policy in the U.S.S.R. is carried out according to plans, and is not determined by market conditions. In other words, prices are used by the State authorities as one of the instruments for goal attainment. Nevertheless, prices play an important role in the guidance of economic activity. As a rule, the production plans contain not only physical targets but also value targets; these enable the financial authorities to evaluate and control the plans and their fulfilment (Stolyarov, 1963, p. 8; Kondrashev, 1963, p. 5). Actually, in the U.S.S.R. there are several distinct price structures which serve many and often conflicting purposes. Firstly, there are "transfer prices" (*optovye tseny*), at which goods actually change hands within the State sector. These are identical with the enterprise wholesale prices received by producing firms. A variant of these is the "settlement price" (*raschetnaya tsena*); these are used in some industries where the marketing organisation buys the goods for resale to the user at the transfer price (Grossman, A.E.R., 1959, 2, pp. 53—54). Secondly, there are retail prices (*roznichnie tseny*) at which goods are sold to households. There are two different types of retail prices, namely, state retail prices, charged by State retail stores, etc., and collective farm market prices (Bornstein, A.E.R., 1962, 1, p. 88). Moreover, in the forestry sector there are also special kinds of fixed prices for standing timber. Our main concern here will be the transfer prices for processed forest products.

In the Stalin era prices in the State sector had, in theory, no role to play in allocating resources or in determining incomes (Nove, *E.P.*, 1963, 3, p. 185). However, in actual planning work, prices affected choices between alternatives, and investment projects were compared in terms of roubles.

In the Soviet economy, the price system determines in the first place the distribution of money income, which is achieved primarily by the sale of goods and services. In principle, the wholesale prices do not reflect need, relative scarcity or usefulness. Roughly they should cover average cost and allow producers to earn a limited profit. This planned profit has been intended to permit the producing enterprise to meet the financing of additional capital formation in accordance with the principle of "reproduction on enlarged scale" (Turetsky, 1959, p. 13).

Average cost pricing in calculating transfer prices has been the rule, but there exist important deviations from this standard. Average cost for an entire industry means that different enterprises earn different profits, and some of them suffer losses, which have to be compensated by granting "subsidies" through the State budget. In some cases prices have been related to the costs of the advanced plants, sometimes to those of the less advanced ones (Bergson, 1964, p. 165). Thus the pricing system seems to differ from industry to industry and in actual practice the Government has revised prices on several occasions. After the price reform of January 1949 when the wholesale price level was considerably raised with the intention of reducing budget subsidies, large-scale revisions were undertaken in January 1950, July 1950, January 1952, July 1955, April 1957 and in 1961 and 1963 (Kondrashev, 1963, pp. 217—245).

Judging by the discussions in the Soviet literature on price formation there is much concern about the fact that average cost pricing inevitably means higher profits for lower-than-average-cost producers and lower profits or losses for higher-than-average-cost producers. Wide variations in production costs exist in the forestry sector, particularly in primary production (forest management) and the secondary production phase (logging). There is ample proof that forestry as an enterprise for the raising of the forest crop (prime production) was run during certain periods at a loss to the Soviet economy (Motovilov, *T.I.L.*, V, 1950, p. 69). In order to eliminate these losses and generally to finance the increasing outlay for forest management (including silviculture), the Soviet Government decided in 1949 to re-introduce the fixed stumpage prices (see Part II, p. 181) which had been eliminated

when the First Five-Year Plan was launched. This step was considered to constitute an essential turning-point in financing the activities in primary forest production.

The logging operators, who had to pay these charges for standing timber, however, were opposed to the stumpage price schedule of 1949. On account of this opposition the price level was lowered on average by 53 per cent in 1950 and raised again in 1961. Despite this rise the 1961 stumpage prices were still not sufficiently large to cover all the monetary outlay needed for the financing of the primary forest production (Kondrashev, 1963, p. 240). The fixed stumpage price schedule which has been applied since 1 January 1965, and according to which the prices were raised by 80 per cent compared with the schedule of 1961, is stated to secure now a sufficient revenue in forestry to cover the total management costs (Shkatov, *L.Kh.*, 1964, 4, p. 62).

Also the secondary forest production, i.e. procurement of industrial roundwood, involved large losses, which could only be made good either by "subsidies" from the State budget or by increasing prices for industrial roundwood. The main purpose of the price revision in April 1957, when the prices for the forest products were raised by 30 per cent, was to eliminate these losses in the timber industry (Turetsky, 1959, pp. 184—185).

One can obtain an idea of the price level and the price formation for processed forest products from the following statistical data (Zheludkov, *V.E.*, 1966, 1, p. 65):

	Production cost (<i>sebestoymost</i>)	Transfer price (<i>otpusknaya tsena</i>)
in roubles per unit		
Sawnwood, cu.m.	25.80	31.50
Pulp, ton	145.00	220.00
Veneer, cu.m.	78.70	142.10
Paperboard, ton	80.00	150.00
Fibreboard, ton	75.00	120.00
Particle board, cu.m.	42.08	70.30

The source provides no details as to the time and place of delivery for which these costs and prices apply. Probably the prices refer to average cost pricing for each production sector as a whole. However, it is not possible to determine which cost items are included in the total "production cost".

It should be emphasised here that, as a rule, the Soviet concept of production cost (*sebestoymost*) has no exact equivalent in cost account-

ing used in western countries, as both rent and interest on capital are generally omitted. However, the term "production cost" is used for convenience in this paper as there does not exist a more appropriate conception in English.

Nevertheless, the difference between production cost and transfer price is interesting. Actually this difference should represent the "profit mark-up" intended to provide a "normal" profit for the particular production sector as a whole. However, it is not clear how the transport costs are accounted for in this connection. One should therefore not attempt to go into further detail in the profit aspects connected with this difference.

When studying the competitive potentialities of the Soviet timber trade it is probably of great importance to make a comparison of the wholesale prices in the home market, i.e. transfer prices, and the export selling prices. The development of export prices for various forest products will be dealt with later in this chapter. Here it is sufficient to mention that transfer prices for sawnwood are round about the average of the export prices (see Fig. 4: 6); however, export prices have fluctuated considerably. Transfer prices for wood pulp are considerably higher than the export prices (see Fig. 4: 10). Export prices to countries in western Europe (which are quoted f.o.b. Soviet border) are hardly half of the prices in the home market. This in itself is a confirmation that there is no correlation between these two price levels.

4.2 Some Pricing Aspects of Foreign Trade

In the West, production and trade are in the hands of firms which carry out their activity on the basis of economic considerations and on the calculations of the entrepreneur concerning the costs of production, transport and sales which determine pricing and the development of trade. In a given period, the actual course of foreign trade depends primarily on the calculations of costs, the pricing policy based on such calculations, and the ensuing competitive conditions with firms in the various countries. However, the pricing policy in Soviet foreign trade is based on quite different assumptions and considerations, while the costs of production apparently play a lesser role. In addition, the prices of goods and the cost of living in the U.S.S.R. have hardly any influence on Soviet foreign trade. This is made possible to some extent by the State monopoly of foreign trade, which protects the Soviet economy from the effects of price movements in the world market.

Financial factors nevertheless have significance for the conduct of Soviet international transactions, as long as trade is not conducted on a strictly barter basis. Consequently, the international economic connections assume equilibrium in the balance of trade and some adjustment of prices and exchange rates for the respective countries. The important point here is that the Soviets say that the "world market prices" serve as the basis for the determination of the prices of goods exported, and this applies especially to trade with other communist countries (Bystrov, *V.T.*, 1961, 4, p. 4). As free-market prices do not remain constant, the adjustment of them to a centrally directed economy must be planned in some way or other, and must be determined for a more or less long period in advance. Here the desired end is that the prices should be "fair" and remain stable for a lengthy period. This means that the prices in the "world market" are not automatically accepted in the delivery contracts. It is asserted that the problem of finding to-morrow's true market price can be solved by subjecting yesterday's actual market price to some corrective manipulation. By eliminating the "undesirable fluctuations" resulting from changes in business activities, "speculation" or "sharp competition", it is claimed that the "fair price" can then be determined objectively (Mendershausen, *R.E.S.*, May 1959, p. 106). How this determining process for prices actually works is not further explained.

In this connection, it may be pointed out that in fact there are several price systems in operation side by side in the Soviet bloc. The important points for the Soviets are: (1) the modified prices in the world market which can be used in trading with countries of the Soviet bloc; and (2) world market prices in the ordinary economic sense in trade with the West. It would seem that these levels of prices exist independently of each other. One must first get an idea of the Soviet means of payment and determine more exactly the rouble as an international currency, in order to be able to assess accurately the U.S.S.R. as a trading partner.

An exchange rate is the price of one currency in terms of another currency. The common denominator of currencies has previously been gold in most countries, but since the great depression the gold standard has been abandoned by one country after another. In a free market in which prices and exchange rates are allowed to find their own levels, the relative prices of two currencies will indicate broadly the purchasing power of each currency in its internal market. However, it should be added that the connection between the price levels of the various countries, on the one hand, and between the rates of exchange,

on the other, will be far less close in the conditions characterised by exchange control and clearing than those in a completely free foreign exchange market. In many countries it has been shown that foreign exchange restrictions involve an extensive State control of the economy, but nowhere in the West has this control been as extensive as that in the U.S.S.R., where controls are an integral part of the planning system. These controls make it possible "to maintain a balance on current account with a disequilibrium exchange rate. The Soviet exchange rate has typically been so far out of line and controls have operated so successfully that it seems fair to describe the rate as no more than an accounting device for converting foreign currency prices of Soviet exports and imports into roubles for the purpose of constructing foreign trade accounts in local currency" (Holzman, 1959, p. 428).

Despite the fact that the rouble exchange rate has no direct relationship to the prices of goods, the Soviet authorities have made certain adjustments of the exchange rates at different times. However, it should be emphasised that in the sphere of international payments prior to World War II the rouble was hardly ever used, and payments made by the U.S.S.R. to other countries were at that time effected in foreign currencies only. A great part of the international payments is now made in roubles. Primarily this is the case for countries within the Soviet bloc, but the rouble as a means of foreign payment is also used for transactions between the U.S.S.R. and certain other countries outside the Soviet bloc, for example Finland. Consequently, a more detailed account of the value of the rouble at different times would seem to be necessary.

In 1917 after the October Revolution the rouble was maintained at the same rate of exchange as before 1914. The nominal value of the rouble in terms of dollars was 0.5146 and its gold content was specified at 0.774234 grams. After the devaluation of the dollar on 1 January 1934 the rouble was worth 0.8712 dollars, though after the dollar devaluation the rouble was actually quoted in terms of francs at 13.1 francs to the rouble. When the franc was devalued and taken off the gold basis, the Soviets redefined the value of the rouble on 19 July 1937 in terms of dollars at 5.3 roubles to the dollar, the rouble being the equivalent of 0.1887 dollars. The rouble maintained nominal stability at that level until 1950, when it was placed on a gold basis again. In actual fact, the rouble was revalued upwards in terms of dollars by 32.5 per cent. From 1 March 1950 the rouble was specified as having a gold content of 0.222168 grams of pure gold, or four roubles to the dollar. The Soviet authorities said that this change was made because

Table 4—17. Exchange Rate of the Rouble in Foreign Currencies, selected countries, for 1 January 1961

Currency	Exchange rate valid until Jan. 1, 1961				Exchange rate valid from Jan. 1, 1961 (with reservation for later changes and fixings)	
	Official		With surcharge for non-commercial payments		Rouble	Kopek
	Rouble	Kopek	Rouble	Kopek		
Pound Sterling.....	11	20	28	—	2	52
Italian Lira, 1,000....	6	44	16	10	1	45
U.S. Dollar.....	4	—	10	—	—	90
Finmark (old), 1,000..	12	58	31	37	2	82
French Francs, 100...	81	—	202	50	18	37
Deutschmark, W., 100	95	24	238	10	22	67
Swiss Francs, 100....	92	88	232	20	20	82
Jap. Yen, 1,000.....	11	14	27	85	2	51
Hungarian Forint, 100	34	10	71	43	7	67
Deutschmark, E., 100.	180	—	258	—	40	50

Source: Bystrov, F. "Rubl v mezhdunarodnykh raschetakh", *Vneshnaya trgovlya*, 1961 4, p. 8.

of the decrease in the purchasing power of the dollar brought about by the inflation of the post-war period.

On 1 January 1961 a further change was made in the value of the rouble. Its gold content was increased to 0.987412 grams of pure gold or, in other words, the new rouble was worth 4.444 times the value of the old rouble, which had been used up to then.

This amounted to a reduction of 77.5 per cent in the exchange rates of foreign currencies to the rouble. The new exchange rates of certain foreign currencies to the rouble are set out in Tables 4—17. This revaluation of the rouble was carried out "due to the success of the Soviet economy" (*na osnove uspekhov v razvitii narodnovo khozyaistva SSSR*), which "guarantees the conditions for a further increase in the role of the rouble and the widening of its application in the sphere of international payments" (Bystrov, *V.T.*, 1961, p. 3).

This is a very wide assertion and cannot be accepted without going into the matter in detail. However, in this connection it is not necessary to go further into the reasons why the rouble exchange rate has been set at that level, though it can be mentioned that the international payments of the U.S.S.R., both for commodity exchange and for non-commercial operations, are effected through the State Bank of the U.S.S.R. (*Gosudarstvenny Bank SSSR*) and the Foreign Trade Bank of the U.S.S.R. (*Bank dlya vneshney trgovli SSSR*). The principal provisions in the payments agreements usually define whether or not

a convertible currency is to be employed and, if not, provide for the establishment of clearing accounts in the appropriate financial institutions of both trading partners. The agreements also provide for methods of clearing balances in the clearing account. The accounts are credited in favour of the exporting country by the value of export shipments and debited by the value of imports and other transactions giving rise to payments to the other trading partner. In all these transactions, official exchange rates are employed (Allen, 1959, p. 413).

In the role of a currency for international payments, the rouble is primarily used for the payments in the current commodity exchange between the countries within the Soviet bloc. The openly declared policy in the bloc is to go over to multilateralism with transferable roubles (*perevodnie rubli*) replacing the old clearing roubles. Also the gold content of a transferable rouble is fixed at 0.987412 grams of pure gold (*V.T.*, 1964, 8, p. 47). This multilateral system is governed by the International Bank for Economic Co-operation (*Mezhdunarodny bank ekonomicheskovo sotrudnichestva*), which started to operate on 1 January 1964. Until now, multilateralism has been applied only to a limited extent.

Western economists are of the opinion that the rouble has been, and still is, overvalued. As the Soviet export organisations are credited for export sales at the official exchange rate, this means that receipts from sales will usually be below the average internal price level and will involve the export organisation in a loss (Holzman, 1959, p. 433).

Before starting to analyse Soviet export prices, it is necessary to introduce a further consideration, namely, that Soviet foreign data are not always based on a consistent set of statistics. Such inconsistencies mainly result from the Soviet practice of revaluing the previous statistical material regarding trade, every time the value of the rouble is changed in terms of foreign currencies. As a rule, the revaluing is accomplished by making the full amount of changes in exchange rates—a procedure which must be regarded as unique in international practice. After the last revaluation of the rouble in 1961, the official trade statistics (*V.T. SSSR*), which are published annually by the Soviet Ministry of Foreign Trade, were revalued for previous years as well (published statistics for 1958 are available). This method of revaluing earlier trade returns is justified by the possibility of making comparisons between different years. As a further argument for the desirability of making such a revaluation, it is maintained that the Soviet foreign trade prices are fixed in accordance with world prices, and by implication when the external exchange rate of the rouble

Table 4—18. Export Prices for Coniferous Sawnwood, Roubles per cubic metre f.o.b., from the U.S.S.R. to the Main Importing Countries, annual average, 1955—1964

Year	Belgium	United Kingdom	France	Netherlands	Italy	Poland	Czechoslovakia	Hungary	Germany, Fed. Rep.	Germany, East (D.D.R.)	Denmark	Bulgaria
1955	38.7	35.0	37.8	35.9	29.6	—	—	38.0	36.7	112.6	32.6	—
1956	36.1	34.1	37.3	31.8	32.1	—	—	37.3	33.2	41.2	40.1	—
1957	34.9	32.9	35.4	31.4	30.5	—	38.8	40.3	29.0	40.0	27.1	—
1958	34.2	31.4	37.2	28.2	29.5	—	39.2	39.3	29.8	37.8	30.1	—
1959	30.9	37.6	31.0	24.8	31.2	—	37.8	38.6	26.5	37.1	27.8	37.8
1960	34.0	30.1	33.0	29.8	30.9	—	38.4	37.8	30.9	36.7	29.2	38.7
1961	37.0	34.0	35.9	33.0	33.1	—	39.0	37.8	31.0	37.1	33.1	40.7
1962	31.2	29.9	30.6	28.5	33.8	38.9	39.1	37.2	28.6	36.9	30.1	41.0
1963	32.1	30.6	31.5	28.8	32.2	40.9	38.8	36.4	29.4	36.8	24.9	40.5
1964	34.0	33.0	33.3	33.0	30.1	41.6	38.4	37.7	30.0	36.6	28.5	40.0

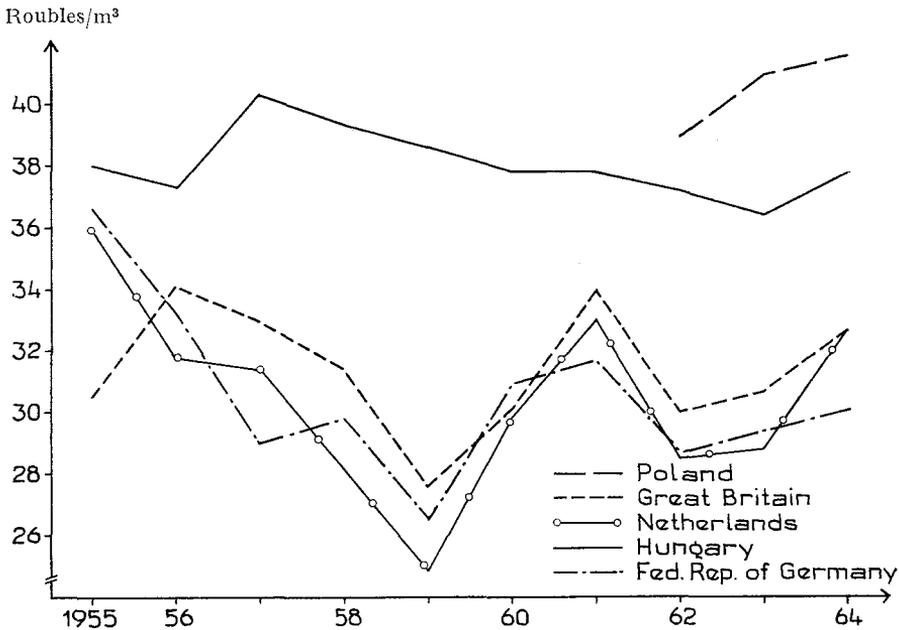
Source: *Vneshnaya Torgovlya SSSR, 1955—1964*, Moscow, 1956—1965

changes, the world price remains the same but the value of the "domestic" rouble changes.

Here it is not intended to go further into Soviet statistical methods and the theoretical justification of them. The only conclusion that can be drawn is that it is essential to check very carefully the price basis underlying any series of trade data published by the Soviets.

4.3 Export Prices for Selected Forest Products

As has been mentioned before, the Soviets state that in the main Soviet foreign trade is done at world market prices. The logical conclusion which can be drawn from this is that even in the international timber trade, efforts are made to sell at prices which largely coincide with the general level of prices for the goods concerned. On the other hand, it has been said that price is one of the foremost means of competition which the Soviets have used in the marketing of forest products in most of the countries of western Europe, both in the inter-war period and since the last war. In addition, it has been alleged that the Soviets use different prices in different markets. As the Soviet trade statistics which are available contain not only data in terms of physical quantity but also in terms of value, this makes possible a comparison between the average prices paid by the different importing countries during the post-war period. Table 4—18 gives the average prices for coniferous sawnwood in roubles per cubic metre, calculated f.o.b. Soviet port (or border in the case of land transport) to different



Source: Vneshnaya Torgovlya SSSR, 1956—1965

Fig. 4.6. Export Prices for Coniferous Sawnwood, Roubles per cubic metre f.o.b., from the U.S.S.R. to the Main Importing Countries, 1955—1964

importing countries. Figure 4: 6 shows graphically the course of export prices for coniferous sawnwood to some of the main importing countries.

As to the selling prices in different countries, the material presented shows an interesting feature which might be considered a characteristic of the Soviet trade policy with the countries forming the Soviet bloc, such as Hungary and Poland. On average, these countries pay higher prices than such capitalist countries as the United Kingdom, the German Federal Republic and the Netherlands pay for sawnwood imported from the U.S.S.R. Details about the types and qualities of timber which make up the exports to the various countries are lacking, but there is no special reason to believe that exports to Hungary and Poland contain higher grades of timber than exports going to the United Kingdom. Assuming that the average composition of dimensions of timber going to the importing countries in question is approximately the same, and seeing that the prices are f.o.b. Soviet port or border, then it could be expected that the average price per unit of sawnwood would be lower for the countries of the Soviet bloc than for the more distant countries of western Europe. This assumption is justified by

Table 4—19. Export Prices for Coniferous Sawlogs, Roubles per cubic metre f.o.b., from the U.S.S.R. to the Main Importing Countries, annual average, 1955—1964

Year	Belgium	Finland	Netherlands	Poland	Czechoslovakia	Hungary	Germany, Fed. Rep.	Germany, East (D.D. R.)	Japan
1955	—	10.2	—	—	—	20.2	—	—	9.5
1956	16.1	10.3	18.8	—	—	20.2	19.2	—	8.9
1957	17.3	8.6	17.4	—	—	20.2	16.6	15.7	—
1958	15.1	10.0	18.0	—	—	20.2	16.4	15.8	—
1959	14.8	10.0	16.2	20.3	—	20.3	16.7	18.1	10.5
1960	18.3	11.5	16.8	—	22.0	17.9	18.6	17.3	11.0
1961	20.4	11.8	21.7	20.2	20.9	20.3	18.8	17.1	11.9
1962	18.7	11.2	18.9	20.3	20.6	19.9	17.9	17.1	15.7
1963	15.0	11.5	16.0	—	20.3	20.3	18.3	24.3	13.1
1964	17.7	12.8	17.8	20.3	20.2	20.3	22.9	23.3	15.2

Source: *Vneshnaya Torgovlya SSSR, 1955—1964*, Moscow, 1956—1965

Table 4—20. Export Prices for Pitprops, Roubles per cubic metre f.o.b., from the U.S.S.R. to the Main Importing Countries, annual average, 1955—1964

Year	Belgium	United Kingdom	Netherlands	Poland	Hungary	Germany Fed. Rep.
1955	11.8	11.3	13.4	—	14.1	12.1
1956	14.5	11.4	12.9	—	13.4	12.6
1957	12.1	11.4	14.8	—	13.2	13.0
1958	12.0	10.6	12.5	10.5	14.2	11.9
1959	7.2	11.0	10.5	11.2	14.2	9.8
1960	8.1	7.7	10.1	10.9	13.3	8.4
1961	—	8.8	—	13.0	13.7	9.4
1962	—	8.3	13.2	13.2	13.8	9.3
1963	10.0	8.4	12.1	13.2	14.3	8.1
1964	—	9.0	14.9	—	14.3	9.7

Source: *Vneshnaya Torgovlya SSSR, 1955—1964*, Moscow, 1956—1965

the fact that coniferous sawnwood, which goes by railway transport across the western borders of the U.S.S.R. comes, as a rule, from areas where the quality of the timber is inferior to that from those areas where sea transport is used for exports, i.e. the Archangel and Yenisey areas. One could therefore expect that Soviet timber sold to the United Kingdom would be of a higher average quality than the timber going to Hungary. However, as can be seen from the statistical data presented, the average price per cubic metre for timber going to Hungary has been rather higher than that going to the United Kingdom for the entire period under survey.

Another interesting fact which should be noted is that the average price in sales to capitalist countries has been subject to considerable

Table 4—21. Export Prices for Pulpwood, Roubles per cubic metre f.o.b., from the U.S.S.R. to the Main Importing Countries, annual average, 1955—1964

Year	Belgium	United Kingdom	Finland	France	Poland	Hungary	Germany, Fed. Rep.	Germany, East (D.D. R.)	Japan
1955	8.1	—	5.3	13.3	—	—	13.9	13.8	—
1956	14.7	14.1	5.3	10.2	—	13.8	10.7	13.0	—
1957	13.8	14.2	6.3	12.2	—	13.3	14.2	13.4	—
1958	12.2	11.3	5.4	9.3	—	13.3	11.1	13.2	—
1959	8.8	9.0	5.1	8.4	12.5	13.3	9.2	12.6	7.4
1960	10.1	11.6	5.2	8.4	12.4	12.0	10.2	12.7	6.4
1961	12.5	13.0	5.3	11.4	12.0	13.1	13.7	12.3	8.8
1962	12.0	13.0	5.4	12.0	12.3	11.9	12.0	12.5	10.5
1963	9.6	10.0	6.8	9.0	12.1	12.1	9.4	12.3	8.3
1964	11.5	9.0	7.3	11.5	11.9	12.1	12.5	12.6	9.5

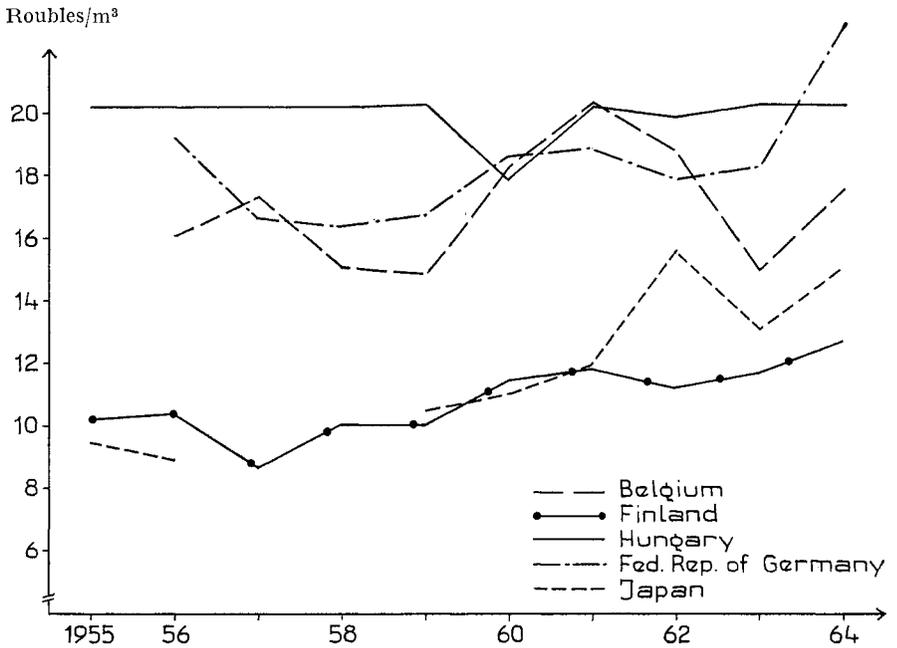
Source: *Vneshnaya Torgovlya SSSR, 1955—1964*, Moscow, 1956—1965

fluctuations, whereas the prices for the countries forming the Soviet bloc show a more even course. In the case of Hungary this can be easily seen in Figure 4:6. This is evidence that the fluctuations in the economy have more or less been eliminated from the price policy within the Soviet bloc, and in areas where the U.S.S.R. holds such a position in the market that it can determine the prices for its exports to the markets in those areas. This also occurs in the exports of certain other forest products which can be regarded as being more homogeneous than sawnwood.

Table 4—19 shows the average prices for exports of coniferous sawlogs, while Table 4—20 gives the corresponding prices for pitprops and Table 4—21 for pulpwood. Furthermore, the price developments can be followed in Figures 4:7, 4:8 and 4:9.

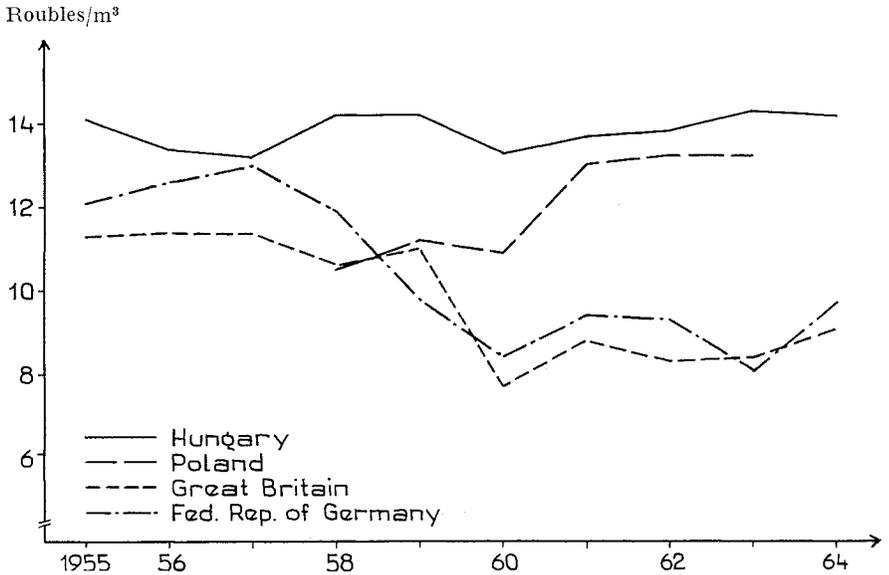
One cannot say that the assortment of roundwood is particularly homogeneous for sawlogs in the case where it is for internal use. However, where it is a matter of exporting the timber in unprocessed form, there is reason to assume that only large timber is exported, and that on average the exported sawlogs can be regarded as being reasonably homogeneous. No such doubts arise with coniferous pulpwood and pitprops, as these are products which are obviously homogeneous within certain limits.

As can be seen from the data presented, the price differences between the various importing countries are rather large for roundwood. Particularly striking are the relatively low prices paid by Finland for Soviet deliveries of roundwood. The explanation of this may be that



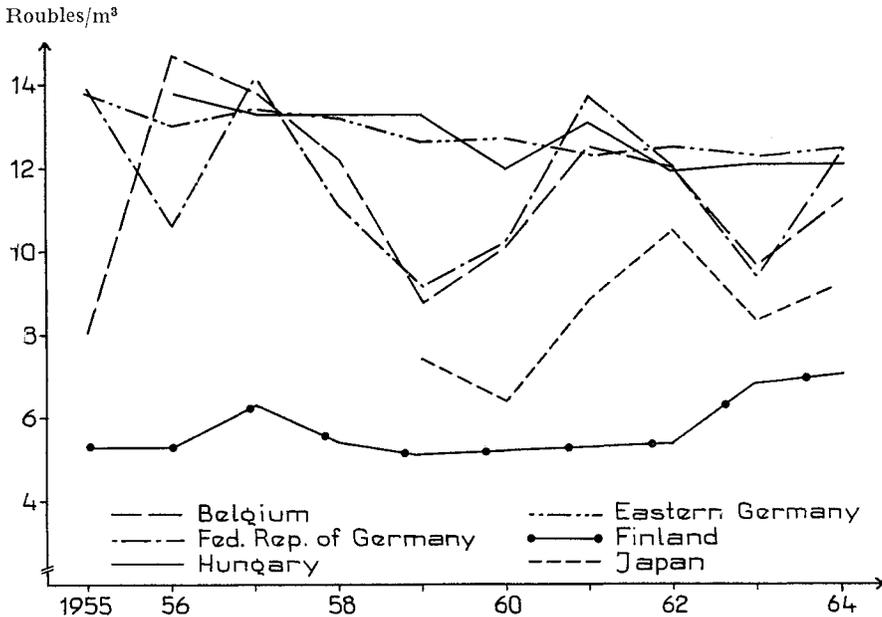
Source: Vneshnaya Torgovlya SSSR, 1956—1965

Fig. 4:7. Export Prices for Coniferous Sawlogs, Roubles per cubic metre f.o.b., from the U.S.S.R. to the Main Importing Countries, 1955—1964



Source: Vneshnaya Torgovlya SSSR, 1956—1965

Fig. 4:8. Export Prices for Pitprops, Roubles per cubic metre f.o.b., from the U.S.S.R. to the Main Importing Countries, 1955—1964



Source: Vneshnaya Torgovlya SSSR, 1956—1965

Fig. 4:9. Export Prices for Pulpwood, Roubles per cubic metre f.o.b., from the U.S.S.R. to the Main Importing Countries, 1955—1964

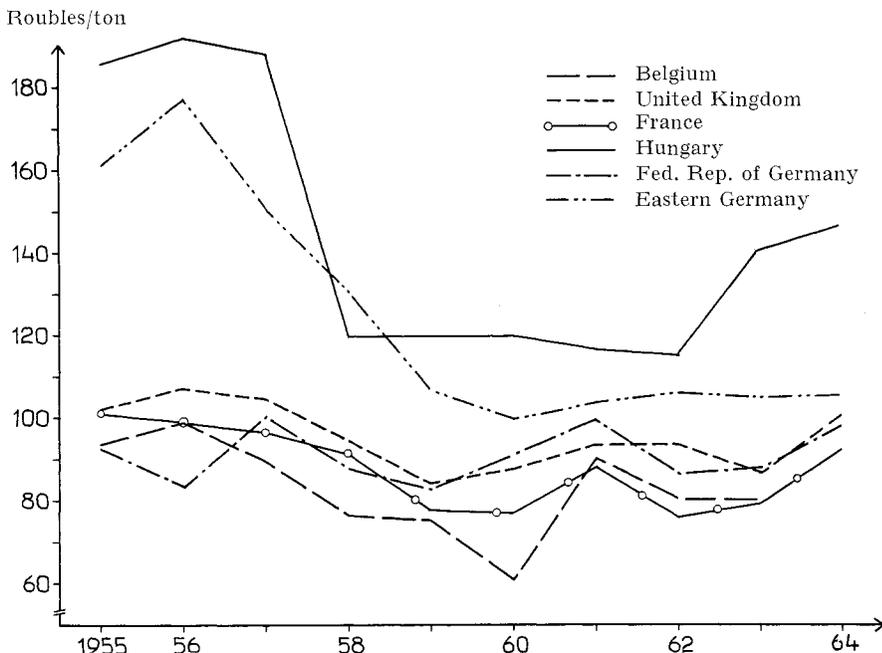
the roundwood comes directly from the border area, and that no costs of transport are involved in the prices. One can see in other cases the typical differences in the prices quoted by the Soviets for their exports to the countries of the Soviet bloc and the rest of the world. A particularly interesting price development occurs in the export of Soviet pitprops to the United Kingdom and Poland. As can be seen from Figure 4:8, both these countries paid approximately the same price for pitprops in 1959; in the following years the prices for the United Kingdom have gone down, while the prices for Poland have showed a successive increase. Here, too, there is evidence that the Soviets neither follow world market prices when pricing their exports to the countries of the Soviet bloc, nor maintain constant export prices, but on the contrary adopt an arbitrary price policy which seems to depend entirely on their position in the market.

Table 4—22 shows the average selling prices per ton of woodpulp. Unfortunately, there are no details of the types of pulp exported, nor of the countries to which they were exported, but as in this field the main product of the U.S.S.R. is unbleached sulphite pulp, it may be assumed that unbleached sulphite pulp forms part of the Soviet exports both to countries in the Soviet bloc and in the rest of the world.

Table 4—22. Export Prices for Wood Pulp, Roubles per ton f.o.b., from the U.S.S.R. to the Main Importing Countries, annual average, 1955—1964

Year	Belgium	United Kingdom	France	Italy	Hungary	Germany, Fed. Rep.	Germany, East (D.D. R.)	Bulgaria	Spain
1955	93.6	102.1	101.2	—	185.6	92.5	161.1	196.4	—
1956	98.9	107.1	98.7	—	192.0	83.3	177.0	205.8	—
1957	89.6	104.7	96.5	—	187.9	100.0	150.5	125.3	—
1958	76.1	94.8	91.3	97.3	119.9	87.5	130.2	178.1	105.2
1959	75.0	84.4	77.7	79.4	119.6	82.7	106.3	139.4	88.7
1960	60.9	87.5	77.0	85.5	119.8	90.9	99.7	143.5	94.1
1961	90.0	93.4	87.9	92.8	116.2	99.6	103.5	138.7	92.4
1962	80.0	94.7	80.5	85.6	115.1	86.3	105.9	136.0	72.5
1963	80.0	90.2	79.7	79.7	140.6	87.8	104.7	143.9	77.9
1964	—	103.7	92.3	93.2	144.0	97.2	105.3	148.2	—

Source: *Vneshnaya Torgovlya SSSR, 1955—1964*, Moscow, 1956—1965



Source: *Vneshnaya Torgovlya SSSR, 1956—1965*

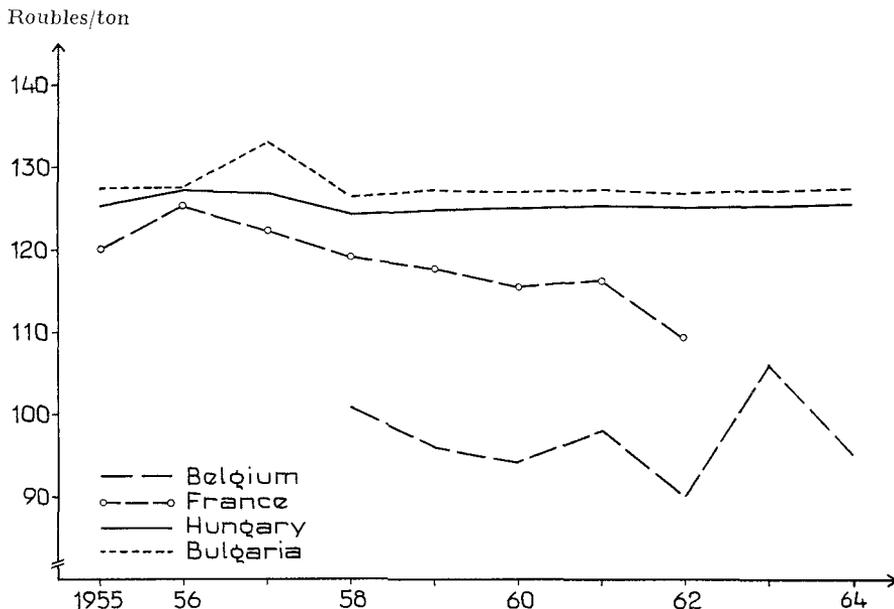
Fig. 4:10. Export Prices for Wood Pulp, Roubles per ton f.o.b., from the U.S.S.R. to the Main Importing Countries, 1955—1964

Figure 4: 10 shows in graphical form the course of the prices of pulp for the different importing countries. One can clearly see that in the case of pulp exports also the Soviets quote different prices for different

Table 4—23. Export Prices for Newsprint, Roubles per ton f.o.b., from the U.S.S.R. to the Main Importing Countries, annual average, 1955—1964

Year	Belgium	France	Hungary	Bulgaria	Greece	Jugoslavia
1955	—	120.0	125.3	127.6	—	130.6
1956	—	125.4	127.2	127.6	—	136.4
1957	—	122.9	126.8	133.2	—	132.8
1958	101.7	119.2	124.3	126.6	—	107.7
1959	96.2	117.8	124.8	127.2	107.6	106.4
1960	94.3	115.5	124.9	127.1	107.1	114.3
1961	98.0	116.4	125.3	127.4	114.8	118.8
1962	90.0	109.2	125.0	126.8	114.1	121.0
1963	106.0	—	125.3	127.1	(150.0)	121.2
1964	95.8	—	125.3	127.2	90.0	120.5

Source: *Vneshnaya Torgovlya SSSR, 1955—1964*, Moscow, 1956—1965



Source: *Vneshnaya Torgovlya SSSR, 1956—1965*

Fig. 4:11. Export Prices for Newsprint, Roubles per ton f.o.b., from the U.S.S.R. to the Main Importing Countries, 1955—1964

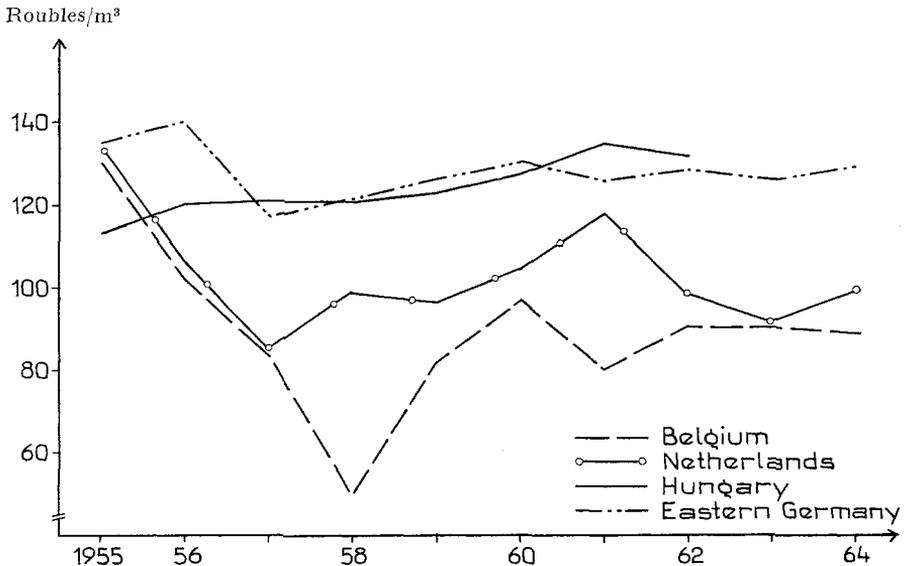
groups of countries, and in this connection the dependence of the trading partner on the U.S.S.R. seems to be the decisive factor.

Newsprint seems to be a relatively homogeneous item, and the course of its export prices can be seen in Table 4—23 and Figure 4:11. A noticeable feature is that in the case of certain countries in the Soviet bloc, e.g. Hungary, almost unchanged prices have been applied through-

Table 4—24. Export Prices for Plywood, Roubles per cubic meter f.o.b., from the U.S.S.R. to the Main Importing Countries, annual average, 1955—1964

Year	Belgium	United Kingdom	Netherlands	Hungary	Germany Fed. Rep.	Germany East (D.D.R.)	Greece	Arab Republics
1955	130.0	125.1	134.1	113.3	—	135.0	131.4	—
1956	102.6	87.5	106.0	120.0	93.3	140.0	113.6	—
1957	83.8	86.4	85.5	121.4	94.2	117.6	112.2	104.7
1958	50.0	101.1	99.1	121.0	103.5	121.6	117.1	125.2
1959	82.2	93.5	96.8	123.0	95.6	126.4	106.7	125.4
1960	97.2	94.7	104.5	127.8	130.0	130.5	109.6	138.2
1961	80.0	97.0	118.2	135.0	100.0	126.0	110.2	141.1
1962	90.8	98.0	99.3	132.0	109.4	128.6	111.4	—
1963	90.3	91.0	92.1	—	100.0	126.3	100.0	—
1964	91.9	93.0	100.7	127.0	106.5	128.5	107.0	133.3

Source: *Vneshnaya Torgovlya SSSR, 1955—1964*, Moscow, 1956—1965



Source: *Vneshnaya Torgovlya SSSR, 1956—1965*

Fig. 4:12. Export Prices for Plywood, Roubles per cubic metre f.o.b., from the U.S.S.R. to the Main Importing Countries, 1955—1964

out the entire period under survey (1955—1964), while the purchasing prices outside the Soviet bloc have shown a declining trend for the period in question. The fluctuations here were usually very marked.

Table 4—24 and the graph in Figure 4: 12 give the course of prices of plywood in roubles per cubic metre. Also for this item there can be noted the typical development of selling prices between the different groups of countries. The fluctuations in prices here are particularly

marked in the case of exports to countries outside the Soviet bloc, while there are hardly any fluctuations for the countries forming the Soviet bloc. In the latter instance the prices show an almost even rise which seems to be almost independent of price fluctuations in the capitalist countries.

4.4 Terms of Trade in Pulp and Paper Products

In its trade relations with western industrialised countries, the U.S.S.R. is primarily an exporter of raw materials and an importer of capital goods. Consequently, this means that when the prices of forest products decline, as they have in some recent years, the Soviet ability to import machinery and equipment falls in real terms.

The most direct expression for the conditions of exchange regarding the relationship between the average prices of imports and exports for the commodities exchanges, is "terms of trade". In non-monetary terms this concept can be formulated as the physical quantity of goods and services a country must give up in exports in order to obtain a given quantity of imports.

In the previous section were presented the statistical details concerning the pricing policy of the Soviet trade monopoly in the case of exports of forest products. In this section an attempt will be made to elucidate the question of the terms of trade regarding exports and imports of pulp and paper, as it is mainly in this field that the U.S.S.R. appears as both a buyer and a seller in the world market. Obviously the relationship between import and export prices, or the price index for the products concerned, cannot be a direct expression of the terms of trade in the usual sense, although such a comparison would provide an interesting picture of the price conditions. The question can be put in this way: How do the prices of Soviet exports of pulp and newsprint compare with the prices of Soviet imports of these products?

Such a comparison involves errors, despite the fact that as items of trade both woodpulp and newsprint are usually relatively homogeneous. However, Soviet official statistics do not give full details of assortment and type, e.g. sulphite or sulphate pulp; consequently, on the basis of the total quantity in tons and the total value in roubles, the unit prices can be worked out only as rough averages. Table 4—25 provides details of the exports and imports of woodpulp and newsprint for the period 1955—1964. This table has been compiled only for the purpose of giving an idea of the quantities and values which are involved in this particular analysis. However, it is interesting to note

Table 4—25. Exports and Imports of Wood Pulp and Newsprint by the U.S.S.R., 1955—1964

Year	Wood pulp						Newsprint					
	Export			Import			Export			Import		
	Vol- ume	Value		Vol- ume	Value		Vol- ume	Value		Vol- ume	Value	
	1,000 tons	total, 1,000 roubles	roubles per ton									
1955	137.4	17,622	128.25	37.4	6,322	169.04	52.3	6,482	123.94	12.0	1,432	119.33
1956	145.8	18,871	129.43	55.4	9,106	164.37	60.9	7,526	123.58	14.0	1,741	124.36
1957	150.5	19,270	128.04	81.7	13,494	165.16	69.7	8,851	126.99	14.3	1,901	132.94
1958	218.9	23,374	106.78	75.9	11,857	156.22	74.0	9,002	121.65	14.5	1,606	110.76
1959	203.4	19,242	94.60	64.0	9,588	149.81	80.3	9,853	122.70	15.0	1,637	109.13
1960	243.7	22,594	92.71	82.8	12,782	154.37	94.2	11,554	122.65	15.2	1,659	109.14
1961	265.8	26,415	99.38	107.4	16,887	157.23	98.2	12,206	124.30	44.1	4,993	113.22
1962	266.7	25,739	96.51	108.3	17,318	159.91	107.3	13,429	125.15	56.1	6,195	110.43
1963	245.3	22,995	93.74	84.5	14,308	169.32	105.2	12,449	118.34	57.8	6,337	109.64
1964	262.4	27,993	106.68	123.5	21,425	173.48	118.8	14,157	119.17	46.5	5,145	110.65

Source: *Vneshnaya Torgovlya SSSR, 1955—1964*, Moscow, 1956—1965

that earlier the quantities of imports and exports almost balanced each other, while in recent years exports have predominated.

As already mentioned in the previous section, the value of exports is given in f.o.b. prices at the port of loading or at the Soviet border in the case of land transport. It needs only be added that the value of imports is given in f.o.b. prices foreign port or at the border of the country of origin in the case of land transport. On the basis of such data it is possible to compute the unit value of exports and the unit value of imports and to determine how the figures compare in a time-series, which will give a picture on Soviet terms of trade in pulp and newsprint. The unit value of exports and imports and the unit value ratio of trade for pulp and newsprint, under the period 1955—1964, are presented in Table 4—26. The instrument of measurement regarding changes of the terms of trade is the unit value ratio of exports to imports. These relationship figures are constructed by dividing the unit value of exports by the unit value of imports, or the corresponding indices (1955 = 100) of these values.

What conclusions can be drawn from the statistics presented? One can see that, for example, in 1956 the unit value index of pulp exports increased, while the unit value index of similar imports fell. The consequence of these changes was, that the unit value ratio of exports to imports rose to 104. That means in other words, that in 1956 one unit of exported pulp bought 1.04 units of imported pulp.

Table 4—26. Unit Value Indices of Exports and Imports, and Unit Value Ratio, for Wood Pulp and Newsprint, 1955—1964

Year	Wood pulp			Newsprint		
	Unit value indices		Unit value ratio	Unit value indices		Unit value ratio
	Export	Import		Export	Import	
1955	100	100	100	100	100	100
1956	101	97	104	100	104	96
1957	100	98	102	102	111	92
1958	83	92	90	98	93	105
1959	74	89	83	99	91	109
1960	72	91	79	99	91	109
1961	77	93	83	100	95	105
1962	75	95	79	101	93	109
1963	73	100	73	95	92	103
1964	83	103	81	96	93	103

Source: *Vneshnaya Torgovlya SSSR, 1955—1964*, Moscow, 1956—1965

In newsprint trade an opposite development of prices could be observed in the same time. In 1956, the unit value index of newsprint exports remained unchanged, while the unit value index of imports increased to 104. As a result, the unit value ratio of exports to imports decreased to 96. That is, in 1956 one unit of newsprint exports bought only 0.96 units of imports compared with the single unit it had bought one year previously.

However, by following these figures carefully, one can see that the unit value ratio for pulp during the period under survey is for the most part below 100, while the corresponding figure for newsprint is mostly over 100. Consequently, this means that the terms of trade are more favourable for the U.S.S.R. for its trade in newsprint and less favourable for its trade in pulp.

Disregarding the possible differences in quality, the explanation of this may lie in the direction of Soviet trade in pulp and newsprint. The great bulk of Soviet imports of woodpulp as well as of newsprint comes from Finland. As the U.S.S.R. has a long-term bilateral trade agreement with that country, in which the quantities are fixed, but not the prices, which seem to be determined at annual negotiations, it can be assumed that the current world market prices are used as a basis for the negotiations on prices; the fixed unit price for exports of pulp and newsprint corresponds in the main with the price level in the world market. However, in these trade agreements also, the approximate value of pulp and paper products is determined in advance; for example, in 1966—1970 the total value of these products will be 300

million roubles (Piskulov, *V.T.*, 1965, 2, p. 16), which means that the pricing cannot be considered to be completely free during the price negotiations.

For the greater part, the exports of pulp and newsprint were concentrated to a few industrial countries in the western world (e.g. the United Kingdom and France), and to countries in the Soviet bloc (e.g. Hungary, Bulgaria and the German Democratic Republic). In the first-mentioned countries Soviet prices must be below the world market prices, otherwise the Soviets could hardly sell their pulp and paper products in these markets on account of the competition from other countries. On the other hand, as can be seen from Tables 4—22 and 4—23 as well as the Figures 4: 10 and 4: 11 in the previous section, it seems that the U.S.S.R. has the possibility of dictating its prices to the last-mentioned countries, and that these prices are considerably higher than the export prices to western countries. The total result is that the unit value ratio, or the terms of trade in pulp and paper products during the period under survey, has been evened out to a large extent, and no marked trends can be detected here. However, the reason why there are price differences in the various groups of countries will be dealt with more thoroughly later.

4.5 Examination of Price Differentiation between Importing Countries

As can be seen from the material presented in the previous sections, there are noticeable differences in the pricing of Soviet exports to different countries. This material shows quite clearly that for exports of forest products the U.S.S.R. quotes higher prices to countries in the Soviet bloc than to western countries. Western observers have been cognisant of this for a long time. It has been maintained that the U.S.S.R. appears to discriminate against its partners in the Soviet bloc, and seems to increase prices to them to compensate partially for the price reductions afforded to western countries (Bowles, *P.T.J.*, 1960, pp. 44—48). This can be seen not only in the exports of forest products, but also for other goods which are supplied by the U.S.S.R. (Mendershausen, *R.E.S.*, May 1959 and May 1960). However, there are certain differences of opinion as to the actual background of such price discrimination—if the term discrimination can be used at all in this connection. Let us examine the conditions in more detail.

Soviet export prices are probably determined by some sort of negotiations and agreements; despite the fact that there is bargaining among communist trading partners, its existence is usually denied (Menders-

hausen, *R.E.S.*, 1959, p. 106). One cannot doubt that the bargaining power of the U.S.S.R. in price negotiations is much stronger than that of its satellites. The monopolistic-monopsonistic position, which the U.S.S.R. holds in relation to its dependencies in many areas of trade, allows some dictation of prices in price negotiations. In addition, these countries are often unable to buy elsewhere, and must use their existing credit balances, etc. (Mendershausen, *R.E.S.*, 1962, p. 495). Moreover, in trade with its satellite countries, the U.S.S.R. enjoys priority over all others.

In trading with free countries, the bargaining position of the U.S.S.R. is different. She cannot expect to have special favours from trade partners who have the freedom to buy elsewhere. Where it is found desirable to enhance her competitive position in the industrial countries of the free world, this can be done only by underselling or outbidding competitors. This is precisely what the U.S.S.R. has done in the marketing of forest products, both in the inter-war period and since the last war.

The Soviets have said that they do not practise price discrimination in exports to countries within or outside the Soviet bloc.

However, criticism from the west has been met by arguments which can in no way set it aside; the allegations are based directly on data provided by the U.S.S.R. itself. Consequently, these should be accepted by the Soviet also.

Abramov states in an article published under the title "The pseudo-scientific Research of Bourgeois Economists" (*V.T.*, 1963, 10, p. 14) that western critics totally ignore the proven differences in the delivery conditions and compare exclusively prices f.o.b. Soviet border. Here it is appropriate to quote Abramov directly: "But it is a well-known fact that the majority of the Eastern European countries are receiving their commodities delivered directly at their border with the U.S.S.R., whereas the Western European countries are paying in addition the costs for the delivery of these commodities to their borders. Western European importers, when importing purchased goods into their own countries, are also compelled to pay the import levies and other indirect import charges." This statement is correct in itself, insofar as the value of Soviet exports is published f.o.b. at the Soviet border; the costs of the exports to the recipient countries do not include freight, insurance, etc. from the Soviet border onwards. These statistics are not concerned with the costs of further transport to the final recipient country. The purpose has been to indicate differences between realised prices at the Soviet border or loading port, averaged over the trans-

actions of one year, but not to make any comparisons of prices within the importing country itself, i.e. when the goods arrive at their final destination. Thus the argument that the prices are not comparable can be set aside without further ado.

Another argument advanced by Abramov (V.T., 1963, 10, p. 15) is the following: "The basis of the difference is the contrast between the planned socialist economic system (*planovaya sotsialisticheskaya sistema khozyaistva*) and the anarchist one of the capitalist system (*anarkhicheskaya kapitalisticheskaya sistema*) . . . The prices of the socialist world market (*mirovoy sotsialisticheskyy rynek*) are characterised by stability: they are fixed in agreement between the countries for prolonged periods. But the prices of the capitalist market are subject to spontaneous fluctuations". Continuing directly from that statement Abramov writes: "Thus it is entirely clear that the prices in the mutual trade between the socialist countries, even if they are fixed on the basis of world prices, cannot and should not exactly coincide with the prices of the capitalist market . . . And this, of course, does not by any means represent a deficiency but, instead, a considerable advantage for the prices in the mutual trade of the socialist countries."

The content of this argument can be summarised thus: that the Soviets regard it as perfectly normal that certain price differences occur, and accept that the cause is primarily to be found in the differences between the economic systems involved. In fact, the way in which prices are determined in trade between the U.S.S.R. and its trading partners of Eastern Europe seems to indicate that there is a mechanism inherent in the system which exerts an influence on price developments. Where the world market price is used in trade between countries of the Soviet bloc, then there must be a systematic lag in price movements. If this were so, the tendency would be for lower prices to be maintained in the Soviet bloc when world timber prices increased, and for higher prices to remain when world timber prices decreased. However, this cannot be deduced on the basis of the material which was presented in the earlier sections dealing with trade in forest products. The prices for forest products exported to satellite countries seem to follow their own independent course, which varies from country to country and from time to time. Undoubtedly, qualitative variations may also have played a role in price fluctuations. One can see that the price level in trade with countries of the Soviet bloc is considerably more stable than that in trade with countries in the rest of the world, a fact which has certainly been brought about to some extent at least by the inherent internal conditions which regulate trade

within the Soviet bloc. The countries which have imported forest products from the U.S.S.R. have paid higher prices in roubles than they would have done if the Soviets had strictly applied world market prices for trade with these countries.

5. Appraisal of Marketing Policies and Trends in Timber Exports

5.1 General Remarks on Underlying Policies

Soviet exports of forest products have been subject to noticeable fluctuations over the years, as has been indicated in the previous sections. As the export of forest products is an integral part of the total export activities of the U.S.S.R and is determined by the central authorities, the fluctuation in the volume of exports has to be explained primarily against the background of the general trade policy of the U.S.S.R. This in turn necessitates a closer examination of the underlying general policies of foreign trade and the objectives behind these policies. As has been pointed out in Part II (p. 163), the over-all objective of the Soviet Government and the Communist Party of the U.S.S.R. can be considered to be economic and military power, and the most effective means of achieving this ultimate goal are the industrialisation of the country and its economic growth. The latter, which we described as means for the achievement of the "ultimate" ends, can be regarded as a goal on the lower level of economic activities involving foreign trade (Simon, 1961, p. 63). Such a goal will constitute the norm in shaping trade policy and the realisation of the aims in this special field. Consequently, the industrialisation of the country and its economic growth will be the factors which will determine the shape of foreign trade and trade policy. The adaptation of the timber trade to the general foreign trade policies is a logical consequence of this approach.

The divorce between internal and world prices and the unrealistic official exchange rates effectively hamper calculations of the comparative advantage in foreign trade. Thus the latter does not affect the decision-making process in the timber trade. The corporation dealing with export and import of forest products—V/o Exportles—does not concern itself with the domestic price or domestic costs. It buys or sells as required by the *Gosplan*, and the necessary financial adjustments are then made through the respective banks (*Gosbank* and *Vneshtorgbank*) and the budget. Therefore trade decisions are very largely quantitative (Nove, 1961, p. 190), and this applies especially to the trade in forest products. It is evident that such

“quantitative” trading, unrelated to domestic costs, can permit sales which are “unprofitable” according to calculations used in the competitive economy of the western countries. In the Soviet type of economy with monopolised trade, the principle of comparative cost obviously makes little sense in trade transactions, where financial factors seems to play a less important role in comparison with those in the foreign trade of other nations.

The explanation of this seems to be found, to some extent at least, in an overvalued exchange rate. If the Soviets in order to compete in world markets are selling below actual production costs, this does not necessarily involve them in a real loss, because they would be compensated by being able to import needed goods at a similar or greater percentage below domestic prices (Holzman, 1959, p. 429). This must be specially emphasised when one is looking for an explanation of the Soviet approach to the marketing for forest products. Soviet trade was predominantly carried out on a multilateral basis during the Twenties, and basically remained multilateral during the Thirties, although some bilateral agreements were signed during the great depression. Since World War II, Soviet trade deals have often been bilateral in character. The reason for bilateralism seems to be that the planning of quantitative exchange lends itself far more easily to two-way arrangements. Soviet foreign trade has as its characteristic feature the maintenance of a direct balance between imports and exports with the trading partners. Bilateral agreements are therefore a common practice in trade with satellite countries and a number of countries outside the Soviet orbit.

The individual transactions under bilateral trade agreements are carried out, as a rule, by ordinary commercial contracts after negotiations on quantities and prices have occurred. The agreements regarding payments specify the financial arrangements by which trade is conducted. The principal provisions define whether or not a convertible currency is to be employed. As a rule, official exchange rates are employed.

In trade with western industrial countries, these bilateral trade agreements, for example, with the United Kingdom, which is in a strong bargaining position, are in fact not necessary from the standpoint of either trading partner. Countries in a weaker trading position are obliged to accept this form of Soviet trade, which through such an agreement usually specifies an equal value of trade for both countries at a given level. Most-favoured-nation clauses, although used in those agreements, seem to have no meaning when trade is handled

by the governments, as in countries under Soviet domination (Allen, 1959, pp. 412-414).

Bilateral trade agreements involving timber have some significance for those countries which are dependent on the U.S.S.R. for their imports of unprocessed roundwood; here the prime examples are Finland and Japan. In the agreement on commodity turnover and payments between the U.S.S.R. and Japan for the period 1963-1965, it is stipulated that the U.S.S.R. shall export to Japan quantities of industrial roundwood totalling 1.8 million cubic metres in 1963, 1.9 million cubic metres in 1964, and 2.0 million cubic metres in 1965. In the same period Japan is to supply the Soviets with the following equipment for paper and pulp mills: (1) for a pulpmill for the production of 300,000 tons of bleached sulphate pulp a year; (2) for a boardmill for the production of 140,000 tons of white paperboard for packing foodstuffs; and (3) papermaking machinery for the production of 100,000 tons of printing paper a year (*V.T.*, 1963, 6).

In this case it is quite obvious that the bilateral trade agreement favours the forest industries of both trading partners at present. However, when the deliveries of paper and pulpmill equipment have been fulfilled, the situation will be different, as the new mills themselves will need the raw materials which are now being exported to pay for the equipment necessary for their installation. It is not intended to go into the consequences of the bilateral trading system in this connection. The intention is only to give an example of how trade agreements are drawn up to the benefit of the forest industries of both trading partners. However, it must be emphasised that the interests of both trading partners cannot always be met by bilateral agreements, and the example cited may be regarded more as an exception than as the rule.

An important difference between countries having a private enterprise economy and those which work with the Soviet type of economy is in the assessment of foreign trade and especially of exports by the firms themselves. In the former countries, company management which is engaged in production generally regards exports more highly than it does imports; also, the governments of such countries encourage exports for their effect on employment and in order to have a more favourable balance of payments. Soviet authorities take an opposite view, and employ an import policy which will help them to develop import-competing industries or, in other words, to relieve the U.S.S.R. of the need to import (Holzman, 1963, p. 302). If this element in Soviet foreign trade policy proves to be relevant in the future, it will introduce the factor of uncertainty into the assessment of the future course of

the exports of forest products. In a centrally directed economic system, substantial changes in foreign trade can always be brought about for political and economic reasons. For this reason, trade policy in the past deserves closer attention.

5.2 The Inter-War Period

The political and economic chaos which followed immediately after the outbreak of the October Revolution in 1917 almost put a stop to Russian foreign trade. When the Civil War was over and the situation more or less stabilised, the problem was how to pay for the imports needed for economic recovery. Owing to the general distrust and fear of the Bolsheviks by the rest of the world, the Soviet Government was unable to obtain credit from abroad (Katkoff, 1961, p. 431). The only way out was to export those goods which could be produced most easily in the prevailing circumstances, and to send them abroad and sell them there despite a general reluctance on the part of buyers to take Soviet goods, and the fierce competition from other exporting countries. In this difficult situation, the rich forest resources of the country, and Russia's traditional position as a big timber exporter, became the centre of attention.

However, the most important question remained to be solved, namely, how would it be possible to restore the logging and sawmilling industry so as to make it a source of export income and thus of foreign currency to pay for essential imports and, at the same time, for the re-establishment of the monetary system? It may be added that this was the time when Lenin contemplated his New Economic Policy (N.E.P.) within whose framework the Soviets were to resume Czarist Russia's old trade with foreign countries (Lieberman, 1945, p. 96).

As Russia had lost the position it had held in the world timber market at the turn of the century, the re-establishment of former business contacts went very slowly. However, after the signing of the London-Moscow trade agreement in March 1921 there was a considerable improvement in the prospects of selling Soviet forest products in England. The shrewd sales policy of the Soviets, primarily in their choice of marketing channels, helped to achieve success.

Traditionally, several large firms in England acted as middlemen in the extensive business of buying and distributing imported timber. These were and still are large and financially sound concerns with considerable staff, and having great financial power and excellent credit connections. Almost all major operations involving the importing

of timber must go through these commission agencies. Many of these firms owned sawmills in different parts of Czarist Russia, especially in Archangel, where the major part of the sawmills which were involved with the export trade had been in the hands of non-Russians.

In London the Soviets succeeded in organising some mixed-stock companies in which one-half of the shares belonged to the Soviet Government, while the other half was distributed among the former owners and concessionaires, or broker firms. Similar sales organisations were established in other countries also, for example in the Netherlands in 1924. It proved that by means of these new mixed-stock companies the Soviets were able to break the strong ring of hostility then prevailing against them in the West, and to break it to their own advantage.

In the early stages of Soviet development the exporter of forest products from the U.S.S.R. was "*Severoles*" or the Northern Timber Trust, which operated the sawmills at Archangel. Its former chief Liberman (1945, p. 141), whose statements in this respect should be of great importance and can be regarded as a reliable source of information, writes as follows: "In this way did our . . . Trust, a fundamentally business-like organisation, play in a number of countries the role of a political vanguard, of a battering-ram breaking the very first holes in the wall of the blockade, of a trail-blazer preparing the ground for better, more normal relations between the Soviet Republic and the rest of Europe."

In this study we shall not go into details of how the management of these organisations succeeded, by manipulations in the timber trade, in obtaining credits for the U.S.S.R. and eliminating the difficulties involved for the recognition of the new regime in Russia. However, it should be emphasised that primarily because of the above-mentioned marketing channels, the sales of Russian sawnwood in Great Britain and in other countries increased rapidly, and very soon the Soviet competition created the greatest difficulties for other exporting countries, particularly Sweden (Söderlund, 1952, p. 278).

Price was the primary means of competition used by the new Russian timber exporters, whom Lenin called *krasnie kuptsy* or Red Merchants (Liberman, 1945, p. 103). In practice it was a matter of selling at any price, in other words to underbid all other competitors in order to "catch up and overtake the capitalists" (Albrecht, 1939, p. 87). However, the real purpose of such a method of trading was to obtain foreign exchange in order to pay for imports. Lenin himself had formulated the goal of timber exports in the following way (according

to Liberman, 1945, p. 105): "Timber is one of our natural resources which we will transform into money to carry out the electrification of Russia." As the Soviet economy progressed, the word electrification—which was Lenin's favourite term—became synonymous with the term industrialisation.

The idea behind all this was definite enough, namely to obtain more foreign exchange from exports, and against this background the large price reductions which the Soviets made when selling their timber abroad perhaps seem inexplicable. But the fact remains that as a result of the price reductions the Soviets succeeded in increasing their share of the English market as well as in other importing countries; this can be seen from Figure 4:3. The expansion of timber exports from the U.S.S.R. was one of the major factors influencing the market conditions in all importing countries throughout the inter-war period. Soviet strategy in marketing was more or less successful in all importing countries with which Soviets considered that it was important to renew trading relationships. Soviet exports of forest products increased by 260 per cent during the period 1923—1929, while Swedish exports increased by 26 per cent and Finnish by 34 per cent (Söderlund, 1952, p. 316). Especially large was the increase of Soviet exports during the period 1929—1931, that is, during the first stage of the world-wide economic depression when other countries suffered reductions in the quantities of their exports as a consequence of the difficulties in selling. Russian exports of sawnwood reached a peak in 1935 (Grottian, 1942, p. 83). However, from then until the outbreak of war, there was a decline in the quantities exported.

Principally, the Soviets have pursued a price policy which seems to have no direct relation to costs. In consequence, the competition from Russian timber became a very disturbing factor in world markets. Soviet competition was severely felt in the United Kingdom, the Netherlands, Belgium and Germany. According to German investigations (Köstler, 1934, p. 153), Russia reduced prices by 18 per cent from 1928 to 1930, that is the time when their conquest of the market was greatest, while over the same period Sweden cut its prices by only 9 per cent, and Finland by 10 per cent. This marketing policy involving large price reductions, which was continued throughout the depression, was regarded by many in the west as dumping (Söderlund, 1952, p. 310). Actually the U.S.S.R. has offered forest products below market prices not only during the great depression. The question which now arises is whether the term dumping has any meaning for State-trading countries. In this connection it can be interpreted as "unfair competi-

tion", which is brought about by lowering the price far below the costs of production. However, if the price reductions have no significant role to play in foreign trade, as in the Soviet case here, then the dumping question remains unanswered and the accusation of dumping is a mere empty phrase (cf. Buchholz, *Z.f.W.*, 1938, p. 161).

One may try to determine the reason why the Soviets carried out such a marketing policy for forest products — a policy which resulted in the costs of urgently needed imports being very high in terms of exports. The answer is that actual export prices had fallen much more than the import prices. In fact, the index of export prices had fallen from 100 in 1929 to 49 in 1932, and the index of import prices from 100 in 1929 to only 68 in 1932 (Holzman, 1963, p. 305). Thus the basic task of timber exports—to earn foreign exchange to finance expenditure on importing producer goods—turned out to be rather bad business. Soviet authorities, who at that time were in charge of marketing policy and responsible for putting it into effect, rejected all approaches from other exporting countries to try to achieve jointly a stabilisation in the level of prices. Nor would the Soviets, in their negotiations with delegates from other countries, accept the proposals for a quota scheme comprising the export volume of all kinds of sawnwood and roundwood. In this connection it is significant that a reduction in Russia's total export quantity was in no circumstances acceptable to Soviet representatives; a cited case is that of the negotiations in Stockholm on 13 January 1932 (Söderlund, 1952, pp. 330—331). This quantity was sacrosanct to them and nothing could make them change it. The explanation of this attitude is that during the early five-year-plans, the quantities stipulated in the plans had to be fully met, and this applied to the export plans, too. Soviet officials had more freedom in pricing policy and export sales, and this provides an explanation as to why the Soviets consistently pursued a marketing policy for forest products during the inter-war period, in which their main concern was the quantitative increase.

There is no doubt that during early years of industrialisation, according to the First Five Year Plan (1928—1932), foreign trade became a vital source for obtaining industrial equipment and machinery. But with the revival of domestic industrial production the imports were gradually reduced. Beginning with the Second Five-Year Plan (1933—1937), a general reduction of international trading activities was quite remarkable, and this reduction is described as the period of withdrawal of the U.S.S.R. from the world markets. In the main, the reason for this is thought to be that the Soviets had achieved self-suf-

iciency in most goods which were important for starting their industrial drive in 1929 (Katkoff, 1961, p. 433), and that as a result of this, autarchy had become to them a more feasible policy (Holzman, 1963, p. 304).

However, this does not apply to exports of forest products and, as has been mentioned above, the exports of sawnwood reached a peak in 1935, while a more marked decline in the volume of exports of forest products can be noted in 1938. This meant that the relative share of forest products in the total export volume was greater in the latter half of the 1930's than it was at the beginning of this decade (cf. Table 4—1). It is true, however, that timber exports of the U.S.S.R. show a declining trend after 1935, but this can hardly be connected with the changes in the general trade policy and the efforts to achieve self-sufficiency through Soviet production.

The real reason why the export of forest products involved lesser amounts in the Third Five-Year Plan (1938—1942) than in the two previous plans, seems to be the difficulties connected with producing sufficient timber and particularly the increased domestic requirements. Neither can the possibility be ignored that the preparations for the war which was threatening compelled the Soviet Government to reduce the exports of forest products. The fact is that there was a steady reduction in the volume of exports until the Nazi invasion of the U.S.S.R. in 1941. Most remarkable was the decline in roundwood exports. In retrospect we can now see that the deliberate throttling of timber exports was only a temporary measure. As post-war developments have shown, all the speculations that the U.S.S.R. would relinquish its position as the world's leading exporter of forest products have proved to be ill-founded.

5.3 The Post-War Period

The demands of the war forced the Soviets to change their foreign trade policy. They reduced their exports to a minimum but increased imports many times. During the war most of the imports were made up of Lend-Lease goods. Timber exports totalled in the same time about 0.2 million cubic metres.

The transfer of Eastern Europe to the Communist orbit marked a completely new situation for foreign trade. The U.S.S.R. with its satellites had become a unified bloc, in which the dominating position was held by the U.S.S.R. Within this bloc, efforts were made to increase trade, and self-sufficiency was no longer regarded as an ultimate ob-

jective of these activities, as it was during the inter-war period. However, autarchy was considered to refer to trade policy vis-à-vis non-bloc nations (Holzman, 1963, p. 306).

After World War II, which had involved so much terrible damage that it was uncertain how long the reconstruction would take, it was not clear whether the U.S.S.R. had any intention of regaining its position as a leading country in timber exports. It was thought that the domestic requirements in the U.S.S.R. and its satellite countries would absorb the whole timber production in this area.

Soviet export policy prior to the Nazi invasion had shown signs that even in more normal times Soviet exports of forest products would not be of the same magnitude as Russian exports before 1914, and during the period 1930—1935. Table 4—5 and Figure 4:1 show that these signs were incorrectly interpreted. From 1949 onwards, exports increased, and by 1964 the U.S.S.R. was exporting a considerably greater volume, in terms of roundwood equivalents, than in the peak year of 1935. It is true that this trade recovery took a period of 15 years, but it is clear that the annual rate of increase for timber exports has been remarkable.

This increase in the volume of exports has obviously been favoured by the rising demand for forest products in the world market, a situation contrary to that at the beginning of the 1930's. According to FAO statistics (Y.F.P.S.), the world consumption of sawnwood — both coniferous and deciduous—increased from 186 million cubic metres in 1946, to 348 million cubic metres in 1963; the corresponding figures for sawnwood involved in international trade were 13 million and 46 million cubic metres respectively. The important thing here is that during this period other countries which export large amounts of sawnwood have not been able to increase their volume of exports appreciably, and that there has even been a declining tendency for some countries.

There can be no doubt that the increase in Soviet exports in the world market for forest products in general, and the expansion in certain markets in particular, has been done purposefully and according to plan. The aim has been the large-scale capture of the market, and also to obtain trade connections with as many countries as possible within the framework of the general trade policy. Contrary to the trading method of the inter-war period, the post-war marketing strategy has been more prudent and long-term.

Parallel with this increase in exports, the Soviets have made great endeavours at the same time to satisfy the demand in the home market.

The proclaimed policy that only goods which can be spared from the home market shall be exported does not seem to have been fulfilled in all respects. A more elastic interpretation has been given to the trade policy theory, which has been so formulated that the exports of forest products must primarily be maintained for the purpose of obtaining foreign exchange for the import of commodities which are more urgently needed by the economy than is timber. This means that in certain circumstances it may be necessary to export also forest products which are in short supply in the home market. On this point the following statement has been made by the head of V/o Exportles, Nichkov (1959, pp. 222—223): “The proportion of export possibilities (*razmer eksportnykh vozmozhnostey*) of one or another kind of products of our national economy . . . must be decided not so much from the point of view of the indispensability of a full and urgent satisfaction of the internal market (*neobkhodimosti polnovo i prvoocherednovo udovletvorenia potrebnosti vnutrennovo rynka*), as also from the aspect of necessity to export these products (*s obyazatelnyim uchetom potrebnosti v eksporte etoy produktsii*) as a source for the acquisition of foreign currencies (*kak istochnika poluchenia valyuty*). It is possible to determine, with fair accuracy, the extent of the Soviet exports of timber and pulp products for the next few years, resulting almost entirely in the first place not so much from their production volume (*ob'em ikh proizvodstva*), but from the surmised national requirements of foreign currency for the payments of imported goods (*predpolagaemoy potrebnosti strany v valyute dlya oplaty importiruemyykh tovarov*), and also services, which are to be paid in international currencies (freight payments, ship repairs, etc.) as well as for the maintenance of the administrative apparatus abroad.”

It is evident that the post-war Soviet export drive has not deviated in practice from the timber export policy formulated by Lenin at the beginning of the 1920's. In a speech reported in *Pravda*, 7 March 1964, to stress the necessity for a considerable increase in exports of forest products from the U.S.S.R., Khrushchev said: “One could ask which is easier — the extraction of gold or the conversion of timber and the sale of products of such conversion to obtain in exchange, from the currency thus gained, producer and consumer goods? Naturally, the second is more advantageous . . . This permits the development of a wider international trade. We will also be able to buy equipment which interests us. Our country particularly has large possibilities of increasing exports of pulp and other forest products. We have the largest timber resources in the world.”

One can assume from the above authoritative statement that in planning the volume of forest products to be exported, the balance of payments is more decisive than the satisfaction of the demand for such products in the home market. However, the entire matter seems to be a question of balancing one against the other, and one where several arguments are examined before a decision is made concerning the quantities for export in each particular case. One can see quite clearly by following the development of Soviet exports of forest products that, throughout the last 15 years, the sales volume, and not the revenue from sales, has played the decisive role in the export plan applied.

5.4 Examination of Sawwood Marketing in the United Kingdom

In assessing the Soviet export policy the first important question to be put is: How has it been possible in practice for the U.S.S.R. to market forest products to such an extent and in constantly increasing quantities, despite the intensified competition in the market in almost all countries? It should be particularly emphasised that the increasing development of Soviet timber exports is not so much due to the increasing demand for these products in the world market, as it originates primarily from deliberate Soviet policies for increasing exports to the world timber markets. Price has been the most effective means of competition which the Soviets have had at their disposal in the marketing of forest products, both before and after the war. Soviet prices have always been below the prices demanded by competitors, but the differences have not always been very large. However, the very rigid pricing system under which the prices have been determined centrally by V/o Exportles in Moscow has seemed to be a drawback in marketing matters. For instance, if an upward trend appears in the market other exporters can make price adjustments on a day-to-day basis.

One can make a more detailed comparison of the means of competition, other than price, which are being used by the Soviets on the one hand and by the Scandinavian exporters on the other: this will show that the differences are insignificant.

Limiting ourselves to sawwood, and starting with the advantages and disadvantages for English importers, then:

1. Terms of sale: All timber sales from the U.S.S.R. are on c.i.f. terms. This means that a firm or rising market is advantageous to importers because they are protected against any possible rise of freight rates, as the risk of such a rise is borne by the seller or shipper.

Soviet endeavours to increase their merchant fleet and especially their small vessels for timber exports (see p. 355) can be explained by the advantage of selling on a c.i.f. basis. It may be added that sales on c.i.f. terms also mean that it is possible for an importer to buy a small quantity instead of a full cargo, which he must take when buying from Scandinavian exporters on f.o.b. terms.

With certain exceptions, the Soviet exporters are responsible not only for demurrage at the loading port, but also for demurrage at ports of discharge. This can sometimes mean a considerable saving for sawnwood importers.

2. **Fall Clause:** Because Soviet timber is sold through one organisation at fixed schedules of prices which do not fluctuate from day to day, it is possible for the Russian Wood Agency to offer a fall clause, i.e. a clause specifying that sawnwood bought at a certain price schedule will be invoiced at the prices of a lower schedule if this latter schedule has been published before the goods are shipped. This provision is obviously a great protection for the importers. This also means that the advantages of f.o.b. terms are removed from a market where the freight rates are not stable or are falling.

However, the fall clause is not automatically included with every schedule, though it has been a feature of Soviet sales in recent years. With more flexible prices which can fluctuate from day to day, the fall clause ceases to be of importance, and as a rule is not used by the exporters of other countries.

3. **Specification:** The Russian offers of sawnwood, in the principal stocks, usually comprise a full range of thicknesses, and the individual specifications are close in pattern to the comprehensive original specifications. The Russian specifications as a rule meet the buyers' general demands, but it is more difficult to agree a selective specification with the sellers of Soviet sawnwood. Scandinavian sellers have in this case a clear advantage.

4. **Quantity Discount:** In recent years the Soviet sellers have offered a quantity discount to apply to all sawnwood assortments to an importer who has reached a certain target figure. The basis of the target figure has varied from year to year, but, as results show, it has always been a realistic one. In simple terms, the discount means that an importer must make up his mind either to refrain from buying Soviet goods, or, in order to be in the best competitive position, to make sure of reaching his target. The quantity discount has, undoubtedly, been one of the principal means of achieving high sales for the Soviet sellers.

5. **Condition of goods:** Kara Sea U/S Redwood is widely regarded as

being of the very best quality joinery material available from Eurasia. The sawnwood shipped from Russian ports, especially at the end of the navigation season, very often appears to be insufficiently seasoned, and there have been instances of severe discolouration. It is considered a serious matter if expensive U/S sawnwood of pine is discoloured. This happens occasionally with shipments from Scandinavia. However, in recent years, the Soviets have made very great efforts to eliminate this fault and the danger of receiving discoloured sawnwood is not now regarded as being great enough to be a decisive factor.

In brief, these five points give an account of the means of competition which have proved important in the marketing of sawnwood in England (Mallinson—Leigh, 1965). However, the strong point of Soviet marketing seems to lie in the fact that there is only organisation, V/o, Exportles, which directs centrally the entire selling of forest products, and which can make substantial price reductions as the need arises. This puts the other exporting countries at a considerable disadvantage, because as a rule their sales organisations are fragmented and are often in competition with each other.

5.5 Outlook for Increase in Timber Exports

Soviet trade in forest products has shown a continuous increase over the past 15 years. Whether this trend in exports will continue, and how great the volume of exports will be in the future, are matters of great importance both for the countries importing forest products, and those competing with the Soviets for those markets. Once again it must be emphasised that the basic factor in Soviet trade policy is that imports are regarded as being more vital for the country than exports. The export of timber is primarily conducted to obtain essential producer goods from abroad which are still needed as long as the industrialisation of the country has not been completed. The Soviet position as one of the foremost exporting countries of forest products will certainly increase rather than diminish in the future, because Soviet exports of forest products command an extremely strong competitive advantage in the world market; this can be attributed, firstly, to the products themselves and, secondly, to certain internal factors inherent to the system, connected with marketing. This conclusion can be drawn not only from statements made in other connections by leading politicians and economists, but can also be drawn directly from the long-term bilateral trade agreements which have been signed recent-

Table 4—27. Exports of Forest Products from the U.S.S.R. to France, according to Trade Agreement, 1965—1969

Product	Unit	1965	1966	1967	1968	1969
Fibreboard	1,000 m ²	1,000	1,000	1,000	2,000	2,000
Particle board	1,000 m ³	1	2	3	4	6
Pulpwood	1,000 m ³ (stacked measure)	600	700	700	750	800
Sawnwood	1,000 m ³ (solid measure)	300	350	400	450	500
Pulp	1,000 ton	30	40	60	120	150
Newsprint	1,000 ton	5	5	10	10	15

Source: *Vneshnaya Torgovlya*, 1964, 12, p. 45.

ly and which will apply well into the future. Soviet exports of forest products went to over sixty countries in 1964, and the intention seems to be to increase this number and to gain a share of the market in as many countries as possible. However, what is important is that each new trade agreement, or renewal of the old bilateral agreements, where they contain fixed quotas, stipulates an increase in the volume of forest products. Some examples are cited here to confirm this.

Under the trade agreement with Japan, which runs for three years, the exports of industrial roundwood from the U.S.S.R. to Japan shall be successively increased in the following manner: 1.8 million cubic metres in 1963, 1.9 million cubic metres in 1964 and 2.0 million cubic metres in 1965 (*V.T.*, 1963, 6, p. 52).

Under the trade agreement with France (*V.T.*, 1964, 12), which covers the period 1965—1969, the exports of forest products will be increased according to the volumes shown in Table 4—27. What is remarkable here is that the volume of exports will be increased successively for all the products in question, and that the largest increase will be for pulp.

Under the trade agreement with Italy, which covers the period 1966—1969, Soviet exports of roundwood will increase from 550 million cubic metres in 1966, to 600 million cubic metres in 1969; for sawnwood there will be an increase from 450 million cubic metres in 1966, to 600 million cubic metres in 1969; for pulp the amounts will increase from 60,000 tons in 1966, to 75,000 tons in 1969 (*V.T.*, 1964, 4, p. 71). For fibreboard and particle board the volume of exports has not been fixed; all that is given is the average value in Italian lire a year (150 million lire for both these products).

The new trade pact with Finland, which is valid for the period 1966—1970, is supplemented by a special contract for Soviet deliveries of roundwood to Finland for a future period of 20 years (Piskulov, *V.T.*, 1965, 2, p. 13). The exact quantities of timber have not been published, but considering Finland's shortage of raw materials in the wood-processing industries, it can be assumed that the quantities of these deliveries will be constantly increased.

Another kind of long-term trade pact has been signed by the U.S.S.R. with a number of western industrial countries, including Sweden, for the period 1965—1970. These trade pacts are not in the nature of skeleton agreements to which have been appended lists indicating the items which are expected to be exchanged by the respective countries during the validity of the agreements. Contrary to the trade agreements earlier mentioned, the list of items appended to the last-mentioned pacts does not fix any quantities. Such amounts can be continuously adjusted, and supplements, as agreed between the parties (or, in other words, the quantities of the items to be exchanged) shall be determined annually. Thus the exact development of the future Soviet exports of forest products cannot be deduced on the basis of these skeleton agreements.

Soviet interest in increasing exports of forest products to those countries which up to now have been the main importers of Soviet timber can be discerned from statements made by certain experts (Khvoynik, *V.T.*, 1964, 2; Vagonov, *V.T.*, 1965, 2). In its trade with western industrial countries, it seems that the U.S.S.R. is endeavouring to increase its exports along the lines established in its trade agreement with France (see Table 4—27).

Assuming that the aims of the present trade policy will be followed in the future, and that no external or internal events will make the attainment of the goals impossible, then it can be expected that the Soviet exports of forest products in the future will develop in the following manner:

Exports of coniferous sawnwood, which up to now has been the most important item of trade in the forestry sector, will retain their position in the future. To the extent that sawmilling output increases in the timber-surplus regions, particularly in the basin of the River Yenisey, a constant increase in the total volume of exports can be expected. Soviet exports are determined for a long time ahead in accordance with economic plans, and thus it can hardly be expected that there will be large fluctuations or sudden changes in the quantities and export pattern.

One can expect that the export of roundwood will be maintained in the near future at the same level as at present, or perhaps slightly higher. The export of sawlogs to Japan and pulpwood to Finland will constantly increase for the reasons given above, but for other countries where relatively small quantities are involved, the total increase cannot be particularly great. Owing to the decline in demand from western industrial countries, the export of pitprops in the near future is unlikely to be subject to any changes.

An increase in the export of plywood seems to be possible. No great expansion of the exports of pulp, paper, fibreboard and particle board can actually be expected. However, it is significant that official circles reckon that there will be an important increase in pulp production during the next few years, when a number of new installations go into operation (Baklanov, *Pl.Kh.*, 1965, 8, p. 2).

On the basis of this increase in production, the Soviets have already extended their offers of pulp for export to world markets, and significantly enough these offers start in 1968, as is also provided for in the trade agreement with France (cf. Table 4—27). This indicates that the long-term plans for Soviet exports provide for a definite and systematic increase in the field of processed forest products; up to now this has been hindered by the lag in the expansion of industrial capacity. Pulp and paper exports on a increased scale can be considered to be one of the foremost targets of Soviet foreign trade.

6. Summary of Conclusions from Part IV

Soviet exports of forest products are made primarily to obtain foreign currency in order to pay for imports which are needed for the industrialisation of the country and for economic growth. The high quality of Soviet timber, and especially coniferous sawnwood, has proved to be excellent in competition for the market of the traditional importing countries. Furthermore, marketing has been greatly facilitated by the monopolistic status of the Soviet timber trade, and by the existence of other institutional organisations which are not to be found in the competitive economies of capitalist countries. This has resulted in the U.S.S.R.'s always being able to increase its share of the market when supply conditions have permitted, and when the economic plans have provided for an increase in exports.

The actual operations in exporting and importing forest products are executed by the trading corporation V/o Exportles, which has the

monopoly in trading with roundwood, sawnwood, pulp, paper and all other products based on wood as raw material.

Principally, the marketing channels used by V/o Exportles in foreign countries are similar to those which are used by other timber exporting countries. The marketing of sawnwood is accomplished mainly by timber agents. In the United Kingdom, the Russian Wood Agency, a joint Soviet-English stock company, holds the key position. The Soviet timber sales to foreign countries are as a rule on a c.i.f. contract basis.

The chartering of tonnage for transport of timber is carried out also by a single corporation, V/o Soyuzvneshtans, which has the monopoly status in external transport activities. There is a definite tendency in the U.S.S.R. to ship all goods in Soviet vessels as far as possible, and as a consequence of this policy the Soviet merchant fleet has greatly expanded in recent years.

Soviet exports of forest products in the past have fluctuated considerably in terms of volume. Primarily, the reduction in the exports of forest products has been caused by the two great wars and the following periods of rebuilding, which greatly increased the home consumption of timber. The increased amounts of timber needed for the industrialisation of the country, and the difficulties in obtaining timber from the more remote areas of virgin forests, made it necessary to reduce the volume of exports of forest products during the latter half of the 1930's. However, this reduction was regarded only as a temporary measure. The general endeavour of Russian governments, both Czarist and Soviet, has always been to increase timber exports, despite the difference in the purpose of exports under the two economic systems. One can clearly discern in the post-war trade policy the great endeavour to expand the export of forest products. The result of these efforts has been that in recent years the Soviets have exported quantities of timber which, expressed in terms of roundwood equivalents, are much higher than those in all previous peak years. Trade with the countries of eastern Europe which are in the Soviet sphere of influence has greatly contributed to this increase.

Price has been one of the foremost means of competition used by the U.S.S.R. in the marketing of forest products, both in the inter-war period and since the last war. One can see from Soviet statistics that the U.S.S.R. has applied different prices in different markets. In most cases the countries belonging to the Soviet bloc have paid higher prices than importing countries in the west. Furthermore, it can be seen that the average prices for sales to the western countries have been subject

to considerable fluctuations, while the prices for eastern Europe have taken a more even course. Here is evidence that fluctuations in business activities which affect the West have more or less been eliminated from the price policy within the Soviet bloc.

The divorce between Soviet internal prices and world market prices, as well as the unrealistic exchange rates, make it impossible to calculate the comparative advantage in foreign trade. This comparative advantage does not affect the decision-making process in trade with forest products. In practice, trade decisions are very largely quantitative and unrelated to domestic costs. Consequently, this "quantitative" trading can permit sales which would be "unprofitable" according to calculations used in the competitive economies of the western world. To some extent an explanation of this lies in overvalued exchange rate. Soviet exports of forest products command an extremely strong competitive advantage in the world market and thus it seems very probable that the Soviet position as one of the foremost exporting countries of forest products will increase rather than diminish in the future. This conclusion can be drawn not only from statements made by leading politicians and economists, but can also be drawn from the long-term bilateral trade agreements which have been recently signed and which will apply well into the future.

General Conclusions

**SOVIET COMPETITIVE POTENTIALITIES
IN THE FORESTRY SECTOR**

General Conclusions

Soviet Competitive Potentialities in the Forestry Sector

The main object of this study has been to provide a background for the appraisal of the competitive ability of the U.S.S.R. in the international trade in forest products. The material has been presented in four parts which can be regarded either as independent theses, that can be studied separately or as a successive series of studies treating different aspects of the same question. These studies are integrated parts of a whole, and it is this consideration which has had a decisive influence on the presentation as the main object of the study would not be complete if any of the four parts had been omitted.

The basic idea has been to give as complete a picture as possible of the timber resources of the U.S.S.R., which provide the material for the development of the forest industries and thus the competitive ability of the forestry sector of the economy. Geographical location and the accessibility of the forests play a particularly important part as we are considering a country containing a quarter of the entire forest area of the world. In view of the natural and economic backgrounds as well as the historical development of forest management it is appropriate to make a distinction between timber-deficient and timber-surplus regions. The economic importance of these regions as suppliers of timber for the home market and as potential suppliers of forest products for exports can be summarised as follows.

1. Timber-Deficit Regions

To a large extent the broad latitudinal belts of natural vegetation (see Fig. 1:2) have influenced the distribution of population in the Eurasian plains (see Fig. 1:11). The demand of the growing population for food in the past led to a continuous increase in the areas devoted to agriculture, and in the case of European Russia development was mostly at the expense of forest land. Here gradually grew up the large industrial centres which also became the country's largest consumers of forest products. One can state that in the south-western parts of the U.S.S.R. comprising economic regions Nos. 6—10 (see Fig. 1:10) the local production of timber does not cover requirements

and thus it is necessary to bring in timber from other forest regions. Naturally, certain parts of the large area are self-sufficient in the sense that the local production of timber satisfies the local demand. However, what is important is that most of the wood-processing industrial establishments within this area are dependent on supplies of raw material from other regions.

This vast area, which for purpose of this study has been classified as a timber-deficient region, has almost 80 per cent of the total Soviet population, about 15 per cent of the total forest area and 10 per cent of the total volume of growing stock. Present removals of industrial roundwood comprise some 25 per cent of the Soviet total.

The main objective of forest policy in Czarist Russia was to prevent the forest area being reduced and to see to it that forest land in the densely populated areas was kept in productive condition. One has to admit that the Czarist Government was not particularly successful in this respect. However, the fact is that when the capitalist system in Russia was brought to an end half a century ago, the standard of forest management (measured in terms of volume and composition of the growing stock) in forests "in use" was considerably better than it is now. First and foremost, there is evidence of this in the enormous increase in the amount of cut-over areas and the extent to which more valuable coniferous stands have been replaced by less valuable deciduous species.

The reforestation work which has been started after World War II in the old timber-producing areas of European Russia is a long-term project. One must therefore expect a "permanent" shortage of timber, especially of industrial roundwood, in the heavily populated western and south-western parts of the U.S.S.R. throughout the foreseeable future. This is the reason why it is not planned to establish in this area any new large wood-processing factories which use high-grade coniferous roundwood as raw material. The new projected forest industries, e.g. for the production of particle board and other panel products, are based primarily on roundwood from deciduous species and low-grade coniferous timber.

To-day the important problem which must be solved in this area is the industrial utilisation of timber raw material of the kind which is now available in enormous quantities as a result of previous mismanagement of the forests. This is the reason why this particular forest production region is and will be for a long time to come of little significance in international trade. However, the timber output of the area is of importance for the domestic supply of timber.

2. Timber-Surplus Regions

The ever-growing need for forest products in the Soviet economy and the shrinking timber resources in the old settled areas have made it necessary to transfer the forest industry to the more remote virgin forests in northern parts of European Russia and Siberia. These forests, which are to be found in economic regions Nos. 1—5 (see Fig. 1:10), comprise approx. 85 per cent of the total forest area and 90 per cent of the existing timber stock. Removals from these forests account for 75 per cent of the total industrial roundwood of the U.S.S.R. However, only 20 per cent of the Soviet population lives in these five regions.

Our main concern has been to investigate whether the timber resources in the virgin forests are physically accessible and economically workable and to determine to which extent they could provide raw material for the wood-processing industries. According to official Soviet statistics, there are at present about 278 million hectares of unexploited forests constituting 45 per cent of the total forest area in these regions. Soviet planning authorities propose to leave these virgin forests untouched for the next 20 years, because they are considered to be physically and economically inaccessible for the time being.

Moreover, there are practically no transport facilities to bring the products from these remote forests to consumers outside these regions, and there is insufficient demand within the regions themselves. Also the majority of the forests not "in use" are of poor growth and belong to the site-quality classes which cannot be regarded as commercial forests (see Fig. 1:4 and 1:7). The establishment of wood-processing industries based on raw materials from these low-productive forests can hardly be justified under present conditions — even if the question of profitableness is ignored.

The remaining forest area, which is already in use or which will be opened up for exploitation in forthcoming decades, is nevertheless of a considerable size covering roughly 340 million hectares and having a growing stock of 40,000 million cubic metres. There are reasons to assume that about half of this volume is merchantable timber stock comprising in the main mature coniferous species, such as pine and spruce, which could be used as industrial roundwood. The total usable timber volume in the timber-surplus regions can thus be estimated at 20,000 million cubic metres.

Even though such a figure has been arrived at, this does not mean that the entire growing stock is immediately exploitable. Enormous

stretches of access roads must be built, thousands of new workers' dwellings must be put up, and a whole number of technical problems of a widely different nature must be solved before these reserves of timber can be utilised. One can take it for granted that the Soviet authorities can solve these problems, especially with their experience of logging operations in virgin forests.

However, the exploitation of the forests is not an end in itself. Roundwood must be processed into forest products, and this in its turn brings the question of the localisation of the wood-processing industries into the picture. Up to now, the major part of the roundwood produced in the new logging areas in the northern and eastern parts of the U.S.S.R. has been sent over long distances to wood-using industries in other economic regions. This is quite an abnormal situation, and the Soviet authorities regard it only a temporary condition brought about by necessity and one which will change as soon as circumstances permit. The normal solution would be to establish wood-processing industries in the immediate vicinity of the supplies of raw material. This solution means that it would be only the finished products which have to be sent over long distances to consuming areas. This is the goal of the Soviet policy of industrialisation in the forestry sector of the economy; the achievement of such an end has been one of the most important post-war matters for the Soviet authorities.

Up to now the establishment of new wood-processing industries has not been in accordance with the plan, and big discrepancies have arisen between the targets and the fulfilments of the plans. Particularly this is so in the case of the new pulpmills in the virgin forest areas. However, this does not mean that the difficulties cannot be overcome. It is only a question of time before several large industrial installations will go into operation and these will increase considerably the production of pulp and paper within the next few years.

One should not think of this expansion of capacity as a once-and-for-all phenomenon. On the contrary, the activity will be permanent as the raw material sources and the other prerequisites for industrial expansion are not lacking in these areas. Up to now it has been to some extent also a question of priority as other sectors of the economy seem to have had priority in the distribution of supplies. There is reason to assume that the new Five-Year Plan for industrial expansion in the forestry sector of the economy is more realistic than the previous ambitious plans, the realisation of which took more time than the planners had thought originally.

3. Structural Changes in Home Consumption of Wood

Soviet consumption of wood in absolute terms has been steadily increasing, as the economy has required increasing amounts of forest products. However, consumption in the Soviet type of economy is not regulated by the potential demand but by means of the general economic plans which are made periodically by the State authorities. Actually, the State Planning Commission (*Gosplan*) determines the quantities of processed forest products which can be consumed in the country each year and the structural changes which are to be made in wood consumption in general. Also the Commission decides which forest products are to be replaced by materials other than those based on wood.

The Seven-Year Plan (1959—1965) and the latest Five-Year Plan (1966—1970) provide for a reduction in the consumption of wood for different purposes, partly by a more thorough processing of industrial roundwood and partly by the substitution of other products where wood had been used previously. As a consequence, the use of timber in housing and non-residential building is being successively decreased compared with the use of other building materials such as steel, bricks and concrete. Here the intention is to replace sawnwood with wood-based panel products to the greatest possible extent. Such a structural change was not possible previously because the production of fibreboard and particle board had not yet got properly underway. However, this deficiency should be eliminated within the coming five-year period.

Also the consumption of sawnwood used for packaging purposes will be considerably reduced in the future, provided that the production of paper and paperboard increases according to plan.

The fulfilment of the planned structural changes in wood consumption thus depends on the progress made in increasing the industrial capacity of the forestry sector of the economy. It is therefore quite clear why the main emphasis has been put on an accelerated rate of expansion of the wood-processing industry, and it can be assumed that this policy will be continued for a long time to come.

4. Prospective Exports of Forest Products

Timber exports have played an important role both in Czarist Russia as well as in the U.S.S.R. However, the volume of exports has fluctuated considerably over the years. Exports were largely non-existent during the two war periods but revived after the cessation

of hostilities. The volume of exports has steadily increased since the mid-fifties. One can thus state that the U.S.S.R. is now the world's largest exporter of coniferous sawnwood and has far surpassed Czarist Russia in the quantities of timber exported.

Soviet exports are made primarily to obtain foreign currency in order to pay for imports which are needed for the country's industrial expansion. The high quality of Russian sawnwood has proved to be excellent in competition for the markets in Western Europe. The objectives in timber export have always been to increase the physical volume. The reason for this has been that timber is something which the Soviets can produce in quantity, and which is competitive in the markets of the most important consumer countries. However, in actual practice it has not always been possible to adhere to this expansive export policy. Decreases in the volume of exports and the contraction of the Soviet share of the market—that is, if one disregards the direct consequences of war—have been due mainly to domestic causes, such as production difficulties or increased demand in the home market. Such decreases have not been brought about by external conditions, such as sales difficulties resulting from increased competition in certain markets abroad. This is borne out by the fact that the U.S.S.R. has so far been able to sell all the forest products it has planned to sell in international markets, whereas competitors have frequently been forced to reduce the volume of forest products offered by them in the face of effective Soviet competition. Price has been one of the foremost means of competition used by the U.S.S.R. in the marketing of forest products. The divorce between Soviet internal prices and world market prices, besides the arbitrary exchange rates, makes possible a freer use of prices as a means of competition. Moreover, the export prices are unrelated to the costs of production; this means that even “unprofitable” sales are permissible.

The upper limit for timber exports is largely determined by domestic requirements. The whole policy is obviously a matter of the correct balancing of home consumption against the necessity to export and to acquire foreign currency.

Assuming that the present trade policy will be followed, one can expect that Soviet timber exports will continue at approximately the same rate as hitherto, but with certain changes in the product range.

Exports of coniferous sawnwood, which up to now has been the most important item of trade in forest products, have accounted for in recent years an average of six per cent of the total output of the sawmilling industry; this is quite a modest figure in comparison with

the exports of other important countries. However, this percentage represents an increasing trend. One can therefore assume that timber exports will retain their position in the future even if the total output of the sawmilling industry would decline. Within a few years the centre of the sawmilling industry will undoubtedly be Siberia. However, it would be unrealistic to expect a manifold increase in the volume of sawnwood exports from Siberia owing to the limited period of navigation in the Kara Sea.

Exports of roundwood will probably be maintained in the near future at the same level as at present, or perhaps slightly higher, but, in the long run, when the Soviet wood-processing industries expand still further, such exports may gradually disappear.

An increase in the export of woodpulp and its products, as well as wood-based panel products, can be expected within the very near future. Up to now the lag in the expansion of industrial capacity has been the main obstacle to the planned increase in output and, consequently, also for increased exports of these products. One can expect that the Soviets will overcome the obstacles to production and will be able to demonstrate their competitive potentialities also in the markets for pulp, paper, plywood and a number of other end-uses of wood-based products.

5. Central Planning System as a Means of Competition in International Timber Trade

As may be seen in Part II, the Central Planning System applied in the U.S.S.R. has not been able to bridge the gap between the conflicting interests of the timber industry and wood consumers, on the one hand, and the need for forest conservation, on the other. This conflict between the production function and the protection function of the forests existed under capitalism in Czarist Russia and under socialism in the U.S.S.R. The fact that the State owns the means of production, which include the forests, does not eliminate the conflict between the forest management and the logging industry. The systems of forest management practised in Czarist Russia and in the U.S.S.R. resemble each other more than Soviet circles are willing to admit.

The principle of sustained yield played a leading role in forestry science and practice in Czarist Russia. The same principle is to some extent the *Leitmotif* in forestry activities in the U.S.S.R., too, despite the fact that during certain periods this principle has been completely abandoned, and later attempts have been made to justify this

abandonment on the grounds of ideology. If one disregards modernised techniques and the mechanisation of the working operations which these have brought about, one can then detect many common features in the administrative machinery and the practice of forestry in general, which indicate that the new system is only a copy of the old. However, the way of carrying out these measures in the Soviet type of economy is different from that used under capitalism, though it cannot be proved that the Soviet system itself in forestry practice is superior to the private-enterprise system. In the case of primary forest production there are past signs which indicate that it may be inferior, which in the long run will have fatal consequences on the competitive potentialities of the whole forestry sector.

Soviet trade derives great advantages from its monopoly status over the un-coordinated offers of the capitalist countries in the marketing of forest products. The existence of such a powerful economic weapon, which is denied to western countries as a consequence of their competitive economies, provides the Soviets with the possibility of eliminating most of their competitors in the international timber market. Actually, the U.S.S.R. acts as a discriminating monopolist, charging lower prices in markets where the demand is elastic and under conditions of keen competition, as lower prices result in substantially increased sales. This policy is systematically pursued when selling to the traditional importing countries of the western world. In contrast to this, higher prices will be charged when selling to the countries of the Soviet bloc, which can be considered as markets where the demand is inelastic when buyers are practically indifferent to price changes.

Summing up, the competitive potentialities of the U.S.S.R. in the international timber markets depend not only on Soviet timber resources and facilities to process wood into end-use products but also to a high degree on the Soviets' monopoly status and policy of timber trade. This may be a matter of concern for the many nations and corporations involved with long-term planning affected by international trade in forest products.

Sammanfattning

Skogsekonomi i Sovjetunionen med en analys av landets potentiella konkurrenskraft

Huvudsyftet med detta arbete har varit att erhålla en bakgrund till värderingen av Sovjetunionens konkurrenskraft på den internationella skogsproduktmarknaden. Materialet har framlagts i fyra delar, vilka antingen kan ses som oberoende avhandlingar, som kan läsas separat, eller som en serie av studier behandlande samma fråga från olika utgångspunkter. Delstudierna är integrerade delar av helheten, och detta betraktelsesätt har haft ett avgörande inflytande på presentationen, eftersom arbetets huvudsyfte inte skulle vara komplett om någon del uteslutits.

Avsikten har varit att ge en så komplett bild som möjligt av Sovjetunionens virkesresurser, vilka utgör grunden för utvecklingen av skogsindustrierna och den potentiella konkurrensförmågan hos den skogliga sektorn av ekonomin. Skogarnas geografiska belägenhet och tillgänglighet spelar en mycket stor roll, då landet innehar en fjärdedel av världens totala skogsareal. Med utgångspunkt från de geografiska och ekonomiska förutsättningarna samt den historiska utvecklingen av skogsbrukets skötsel, är det lämpligt att skilja mellan virkesunderskotts- och virkesöverskottsregioner. Dessa regioners ekonomiska betydelse som leverantörer av virke för hemmamarknad och för potentiell export kan sammanfattas på följande sätt.

1. Regioner med virkesunderskott

I stor utsträckning har de breda naturliga vegetationsbälterna påverkat befolkningslokaliseringen i landet. Den växande befolkningens efterfrågan på födoämnen ledde i det förgångna till en oavbruten ökning av jordbruksarealen, vilket i det europeiska Ryssland skedde på bekostnad av skogsbruket. Här växte så småningom stora industricentra fram, vilka även blev landets största konsumenter av skogsprodukter. Man kan fastslå att den lokala produktionen av virke i Sovjetunionens sydvästra delar inte täcker behoven, och att en tillförsel från andra regioner är nödvändig. Naturligtvis förekommer det smärre lokaler inom detta område som är självförsörjande, men det viktiga är att större delen av den förädlade skogsindustrin i detta område är beroende av råmaterial från andra regioner.

Denna vidsträckt underskottsregion hyser nästan 80 procent av landets befolkning, omkring 15 procent av den totala skogsarealen och 10 procent av det totala virkesförrådet. Regionens avverkning av industriellt rundvirke utgör 25 procent av landets totala avverkning.

Huvudmålet i Tsar-Rysslands skogspolitik var att förhindra reduktion av skogsarealen och att vidmakthålla ett gott skogstillstånd inom de tätbe-

folkade delarna av landet. Man måste erkänna att denna politik inte var särskilt framgångsrik. Det är emellertid ett faktum att skogstillståndet i de i bruk varande skogarna (mätt i virkesvolym och virkesförrådets sammansättning) vid tiden för regimskiftet var avsevärt bättre, än det är nu. Först och främst ser man detta på den enorma ökningen av kalavverkningsarealen, och den utsträckning i vilken värdefulla barrträdsbestånd har ersatts av mindre värdefulla lövträdsbestånd.

Det skogliga återbyggnadsarbetet i de gamla virkesproducerande områdena i europeiska Ryssland är en uppgift på lång sikt. Man kan därför räkna med ett permanent virkesunderskott, speciellt av industrivirke, i de tätbefolkade västra och sydvästra delarna av landet under överskådlig framtid. Detta är skälet till att inga nya stora skogsindustrier, baserade på högkvalitativt barrvirke, är planerade inom detta område. De projekterade industrierna bygger i stället på lågkvalitativt lövvirke för produktion av spånplattor och andra liknande produkter.

Det viktiga och aktuella problem för denna region, som måste lösas, är hur man skall använda det råmaterial av dålig kvalitet, som nu finns i oerhörda mängder på grund av tidigare vanskötsel av skogen. Detta är orsaken till att denna region har och under lång tid kommer att få mycket liten betydelse i den internationella handeln. Regionens utbud har dock stor betydelse för den lokala efterfrågan.

2. Regioner med virkesöverskott

Den hela tiden växande efterfrågan på skogsprodukter i Sovjetunionens ekonomi och de krympande virkesresurserna i de gamla bosättningsområdena har nödvändiggjort en överflyttning av skogsindustrin till de mer avlägsna urskogarna i de nordliga delarna av Ryssland och Sibirien. Dessa skogar omfattar approximativt 85 procent av den totala skogsarealen och 90 procent av nuvarande virkesförråd. Avverkningen inom detta område utgör 75 procent av Sovjetunionens totala industrivirke. Endast 20 procent av Sovjetunionens befolkning bor emellertid i detta område.

Vårt huvudsyfte har varit att utreda huruvida virkesresurserna i urskogsområdena är fysiskt och ekonomiskt tillgängliga, och att bestämma i vilken utsträckning de kan tillhandahålla råmaterial till skogsindustrin. Enligt officiell sovjetisk statistik finns det för närvarande omkring 278 millioner hektar av oexploaterad skog, vilket utgör 45 procent av den totala skogsmarksarealen i dessa regioner. Sovjetiska planeringsmyndigheter ämnar lämna dessa urskogor orörda under kommande tjuugoårsperiod, förmodligen på grund av att de betraktas som fysiskt otillgängliga. Den geografiska belägenheten hindrar också exploateringen ur ekonomisk synvinkel under överskådlig tid, eftersom nära två tredjedelar är otillgängligt belägna i östra Sibirien.

Dessutom existerar praktiskt taget inga transportmöjligheter för frakt av dessa skogsprodukter till konsumenter utanför dessa regioner, och efterfrågan inom området är otillräcklig. Majoriteten av de skogar, som för närvarande inte brukas, har även dålig tillväxt och tillhör de kvaliteter, som ej kan betraktas som kommersiella. Etablerandet av skogsindustrier base-

rade på råmaterial från dessa lågproduktiva skogar kan knappast försvaras under nuvarande förhållanden — även om lönsamheten ignoreras.

Den återstående skogsarealen, som antingen redan brukas eller som kommer att öppnas för exploatering under kommande årtionden, är icke dess mindre av anseelig storlek. Den utgör omkring 340 millioner hektar och har ett virkesförråd av 40 miljarder kubikmeter. Det finns skäl att antaga, att omkring hälften av denna volym är ekonomiskt lämpligt virke bestående av barrträdsarter, som tall och gran, vilka kan användas som industriellt rundvirke. Den totala åtkomliga virkesvolymen i överskottsregionerna kan sålunda uppskattas till 20 miljarder kubikmeter.

Denna kubiketersiffra innebär dock inte, att hela förrådet är omedelbart exploaterbart. Enorma vägsträckor måste byggas, tusentals arbetarbostäder måste sättas upp, och en hel mängd tekniska problem av varierande slag måste lösas, innan dessa virkesreserver kan användas. Man kan utgå från att den Sovjetiska staten är i stånd att lösa dessa problem, speciellt med tanke på berörda myndigheters stora erfarenhet av urskogsexploateringar.

Exploateringen är dock inte ett självändamål. Rundvirket måste förädlas och detta ställer i sin tur frågan, om var industrien skall lokaliseras. Hittills har huvuddelen av virket, som kommer ifrån de nya skogsområdena i norr och öster transporterats långa vägar till industrier i andra ekonomiska regioner. Detta är emellertid en abnorm situation och sovjetmyndigheterna betraktar den som en nödlösning, vilken kommer att ändras så snart omständigheterna tillåter detta. Den normala lösningen vore att etablera industrier i de virkesproducerande områdenas omedelbara närhet.

Detta är Sovjetunionens mål och politik för skogssektorns industrialisering, och verkställandet av detta mål har varit en av sovjetstatens viktigaste uppgifter efter andra världskriget.

Hitills har nyetableringen av skogindustrier inte följt planen, och stora skillnader har uppstått mellan planens mål och verkställande. Detta gäller särskilt för de nya massaindustrierna i urskogsområdena. Detta innebär emellertid inte, att svårigheterna inte kan övervinnas. Det är endast en tidsfråga innan stora industrianläggningar kommer i produktion, och dessa kommer att avsevärt öka produktionen av massa och papper inom de närmaste åren. Intill nu har det i viss utsträckning varit en fråga om prioritet, eftersom andra sektorer inom ekonomin tycks ha haft förtursrätt vid fördelningen av tillgångarna. Det finns skäl att anta, att den nya femårsplanen för industriell expansion inom den skogliga sektorn av ekonomin är mer realistisk än föregående ambitiösa planer, vilkas genomförande tog längre tid, än planerna ursprungligen tänkt sig.

3. Virkeskonsumtionens strukturella förändringar i Sovjetunionen

Sovjetunionens konsumtion av trä har i absoluta tal räknat stadigt varit stigande eftersom ekonomin har krävt en ökande mängd av skogsprodukter. Konsumtionen regleras emellertid inte i den sovjetiska typen av ekonomi av den potentiella efterfrågan, utan av de allmänna ekonomiska planerna, som uppgörs periodvis av de statliga myndigheterna. För närvarande avgör den Statliga Planeringskommissionen (*Gosplan*), vilka kvantiteter av skogs-

produkter som kan konsumeras inom landet varje år, och de strukturella förändringar som skall göras för träkonsumtionen i allmänhet. Kommissionen beslutar vidare också om, vilka skogsprodukter som skall ersättas av andra material, som inte baseras på trä.

Sjuårsplanen (1959—1965) och den senaste femårsplanen (1966—1970) föreskriver en reduktion av konsumtionen av trä för olika ändamål. Delvis på grund av en mer långtgående förädling av det industriella rundvirket, och delvis genom att använda substitutprodukter inom områden där trä hittills använts. Som en konsekvens kommer förbrukningen av trä till bostäder och annan byggnadsverksamhet att minska jämfört med andra byggnadsmaterial som stål, tegel och betong. Målsättningen är att i så stor utsträckning som möjligt ersätta sågade trävaror med byggnadsplattor baserade på trä. En sådan strukturell förändring var förut omöjlig, eftersom produktionen av fiber- och spånplattor ej var tillräcklig. Denna brist kommer emellertid att vara avhjälpt under kommande femårsperiod.

Konsumtionen av sågat trä för emballageändamål kommer också att reduceras i framtiden, förutsatt att produktionen av papper och papp kommer att öka enligt planen.

Genomförandet av den planerade strukturförändringen av träkonsumtionen beror alltså på i hur hög grad man lyckas med utbyggnaden av den skogsindustriella sektorns kapacitet. Det är därför naturligt, att tonvikten lagts på den accelererande expansionstakten inom den träförädlade industrien och man kan utgå från att denna politik kommer att bestå under lång tid.

4. *Framtida export av skogsprodukter*

Trävaruexporten har spelat en stor roll för både Tsar-Ryssland och Sovjetunionen. Exportvolymen har dock varierat åtskilligt under årens lopp. Exporten låg i stort sett helt nere under de två världskrigen, men kom åter i gång efter fientligheternas upphörande. Exportvolymen har sedan stadigt ökat alltsedan mitten av femtiotalet. Man kan sålunda fastslå att Sovjetunionen numera är världens störste exportör av barrträvaror, och att exporten är mycket större än under tsartiden.

Sovjetunionens export har som primärt mål anskaffning av den utländska valuta, man behöver för landets industriella expansion. De ryska sågade trävarornas höga kvalitet har visat sig vara ett utmärkt konkurrensmedel på den västeuropeiska marknaden. Träexportens mål har alltid varit att öka avsättningsvolymen. Skälet till detta är att trä är något som Sovjetunionen kan producera i stora kvantiteter, vilka är konkurrenskraftiga på de viktigaste konsumentländernas marknader. I praktiken har man emellertid inte alltid kunnat utföra denna expansiva exportpolitik. Minskningar av exportvolymen och landets marknadsandel har, om man undantar krigens konsekvenser, huvudsakligen haft inhemska orsaker, som produktionssvårigheter eller ökad efterfrågan på hemmamarknaden. Minskningarna har inte berott på externa förhållanden, som exempelvis försäljningssvårigheter på grund av ökad konkurrens. Detta framgår klart av det faktum att Sovjetunionen hittills alltid har kunnat sälja alla skogsprodukter, man planerat att avsätta på den internationella marknaden. Konkurrenterna har å sin sida för det

mesta fått minska sin marknadsandel på grund av Sovjetunionens effektiva marknadsföring. Priset har varit ett av Sovjetunionens mest använda konkurrensmedel. Skillnaden mellan Sovjetunionens internationella priser och världsmarknadspriserna, vid sidan av de godtyckliga växelkurserna, gör en friare priskonkurrens möjlig. Dessutom är priserna inte korrelerade med produktionskostnaderna, vilket innebär att även olönsamma försäljningar kan genomföras.

Den övre gränsen för trävaruexporten bestäms till stor del av den inhemska efterfrågan. Politiken är tydligen att balansera den egna konsumtionen mot den nödvändiga anskaffningen av utländsk valuta genom export.

Om man förutsätter att den nuvarande handelspolitiken kommer att bibehållas, kan man förvänta sig att den ryska trävaruexporten kommer att fortsätta i samma utsträckning som hittills, men med vissa förändringar av produktsammansättningen.

Exporten av sågade barrträvaror, som hittills har varit den viktigaste skogsexportprodukten, har under senare år utgjort omkring 6 % av sågverksindustriens totala produktion, vilket är en mycket blygsam siffra jämfört med andra större exportländer. Denna siffra ingår emellertid i en ökande trend. Man kan därför utgå ifrån att denna export kommer att behålla sin position i framtiden, även om sågverksindustriens produktion skulle gå ner. Inom några få år kommer sågverksindustriens centrum att vara i Sibirien. Det vore emellertid orealistiskt att tänka sig någon större ökning av exportvolymen från Sibirien, beroende på den korta seglationsperioden i Karahavet.

Exporten av rundvirke kommer förmodligen att fortsätta på nuvarande nivå under den närmaste framtiden, eller eventuellt kommer den att stiga något. Men på lång sikt kommer den gradvis att sjunka, när skogsindustrien undan för undan byggs ut.

En exportökning av trämassa och på sådan baserade produkter såväl som byggnadsplattor av olika slag kan förväntas inom den närmaste framtiden. Intill nu har den försenade expansionen av industrikapaciteten förhindrat den planerade produktionsökningen och följaktligen även en ökad exportvolym. Man kan utgå ifrån att landet kommer att undanröja dessa produktionshinder och att man således kommer att kunna utnyttja sin potentiella konkurrenskraft även på massa-, pappers- och playwoodmarknaderna samt på marknaden för åtskilliga andra träbaserade produkter.

5. Den centrala planekonomin som konkurrensmedel på den internationella trävarumarknaden

Det Sovjetiska centrala planeringssystemet har inte varit kapabelt att överbrygga klyftan mellan de divergerande intressen, som finns mellan skogsindustrin och träkonsumenterna å ena sidan och behovet av skogsvård å den andra. Denna konflikt mellan produktionsfunktionen och skyddfunktionen existerade såväl i Tsar-Ryssland som under nuvarande regim. Det förhållandet att staten äger produktionsmedlen, inkluderande skogen, eliminerar inte denna konflikt. De två politiska periodernas skogsbrukssystem liknar varandra mer än vad sovjetmyndigheterna vill tillstå.

Principen om ett uthålligt skogsbruk spelade den ledande rollen i Tsar-

Rysslands skogsvetenskap och praktiska handlande. Samma princip är i viss utsträckning ledmotivet inom skogsbruket även i Sovjetunionen, trots att principen helt har övergivits under vissa perioder och försök har gjorts för att rättfärdiga detta på ideologiska grunder. Om man bortser från den moderna tekniken och den mekanisering av arbetsoperationerna, som följt i dess spår, kan man i det administrativa maskineriet och i skogsbrukets organisation i övrigt finna ett mönster, som direkt visar att det nya systemet är en direkt kopia av det gamla. Sättet att föra ut dessa principer till verkligheten är dock i den sovjetiska planekonomin helt skild från de sätt, som brukas i en kapitalistisk ekonomi, och det kan inte bevisas, att det sovjetiska systemet för skogsbrukets del är bättre. För den primära skogsproduktionens del finns det tecken i det förgångna, som tyder på att det sovjetiska systemet är underlägset, vilket på lång sikt kan få svårartade konsekvenser för hela skogssektorns potentiella konkurrenskraft.

Den sovjetiska handeln med skogsprodukter erhåller stora fördelar genom sin monopolställning över de okoordinerade utbudena från de kapitalistiska länderna. Existensen av ett sådant kraftfullt ekonomiskt vapen, vilket de kapitalistiska staterna ej kan använda sig av i konsekvens med deras marknadsekonomi, gör det möjligt för Sovjetunionen att eliminera de flesta av konkurrenterna på den internationella marknaden. För tillfället agerar Sovjetunionen som en diskriminerande monopolist och sätter lägre priser på marknader med elastisk efterfrågan och där konkurrensen är stark, eftersom lägre priser leder till ökad försäljningsvolym. Denna politik används systematiskt, när försäljningen sker till de traditionella importländerna i väster. I motsats till detta sätts högre priser, när försäljningen sker till länder inom sovjetblocket, där marknaden erbjuder en oelastisk efterfrågan.

Som sammanfattning kan sägas att Sovjetunionens potentiella konkurrenskraft på den internationella trävarumarknaden inte bara beror på landets virkesresurser och industrikapacitet, utan i hög grad också på landets monopolstatus och handelspolitik. Detta bör vara en viktig angelägenhet för de många länder och sammanslutningar, som är sysselsatta med långsiktiga utredningar, där utvecklingen av den internationella handeln med skogsprodukter ingår som en viktig faktor.

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¹ Place of publication is given for books together with the date of the edition referred to in this work. For publishing data about journals see under Abbreviations, page 16. Inverted commas are used to indicate articles published in journals, sections of compendiums, etc.

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