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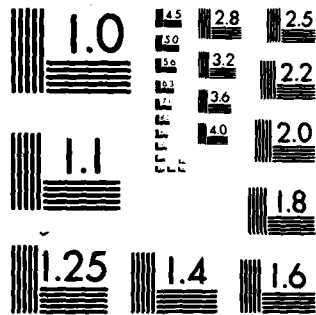
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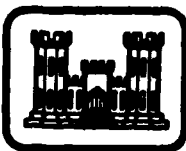
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⑥ MAKING THE FORESTRY RESOURCES ACCESSIBLE IN THE BAYKAL-AMURE-MAGISTRATE REGION

⑩ Ljudmila N. Iljina

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MAKING THE FORESTRY RESOURCES ACCESSIBLE

IN THE BAYKAL-AMURE-MAGISTRATE REGION¹

by

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Although the economical catchment area of the Baykal-Amure-Magistrate (BAM) is completely located within the zone coinciding with the Far North, it covers only its southern marginal part and can thus also be designated the near North. This designation covers precisely the same characteristics as the Far North in respect to natural, social, and economical life conditions as well as the economical pursuits of the population. By comparison, the Near North is not as significantly distant from the areas that have been populated for a longer period of time and are more densely populated; it is also more accessible from the point of view of communications. On the other hand, the natural conditions for human residence and their productive activities are as rough and extreme throughout as they are in the Far North. For this reason, one must regard the problems of natural resources utilization - primarily the forest resources, one of the most important sources of raw material in the BAM - not only with respect to the raw material wood, but one must also consider the social and cultural aspects (Michailow 1976, Iljina 1976).

Identification of the Forest Resources

The staff members of the Department for Economical Evaluation of Natural Resources at the Institute for the Geography of Siberia and the Far East conducted their investigation of the taiga and the mountain taiga complex in the BAM region according to these principles, according to a specially designed program which included the following main points:

- Identification and inventory of the most important useful effects of the forest² in the entire region as well as in a wider area;
- Assessment of the forest resources and their territorial composition and characteristics;
- Consideration of the value of the forest complexes from the standpoints of raw materials as well as environmental and social importance;

1) Translation by M. Stams (Radebeul).

2) Forest resources are understood to include the total complex of efficient utilization of the forest, i.e. aspects of raw materials supply as well as environmental and social aspects of the exploitation.

- Formulation of a series of evaluation maps covering the forest resources;
- Establishment of a utilization system for the forest resources.

The first step towards a generalization of the information concerning the forest resources in the BAM region was the establishment of an inventory of the different types and groups of resources according to components and localization. Subsequently, an economic-geographic interpretation of the material was performed on the basis of a specially designed land-register in the form of matrix-type tables. Tables 1 and 2, for example, form this basis. The legends of the resource and evaluation maps are also based on these matrixes; these maps were first worked out for the total BAM region on a small scale and later on a large scale for single key areas, e.g. the intermountain basins of North Baykal, Upper Angara, Bargusin, Muja and Tschara. The algorithm for producing a series of evaluation maps was published several years ago (Iljina, 1975); in this context, it should only be pointed out that the land-registers for the forest areas consider both the genetic peculiarities and the regional financial specifics related to future exploitation conditions. The former aspect facilitates the determination of limits for regeneration capacity and utilization, which in turn makes it possible to estimate the potential of single or repeated, mutually adjusted or competitive utilization stages; the latter aspect indicates the potential, the necessity, and the financial efficiency of one or the other method of resource utilization, with consideration of whether the characteristics are related to raw materials or not.

Utilization of the Forest Resources

Within the foreseeable future, the technological equipment should make it possible to utilize those forest areas in the BAM region which cover a 400 - 500 km wide tract along the entire border. According to information from the institutes of Planning and Forestry Projects, this would open an area of 700,000 - 800,000 km² to the wood processing industry, i.e. approximately one thirtieth of the area of the USSR. Within this region along the border of the BAM, it was found appropriate to establish 32 state forestry projects (leschoses) which may be grouped into 5 forest utilization zones (Figure 1, Table 1).

With the current state of knowledge, the network of zones developed through extensive use must be less emphasized in the subgrouping of the forest resources in the BAM region than the Territorial Production Complexes³ (TPC), industrial centers and other core points of future economical zones, and sub-zones with obvious potential for basic changes in the forest exploitation. Wood yield and production of plant by-products will primarily take place in these economic zones; not only the potential and performance level of the forestry will be dependent on these, but also the hunting and fishing as well as tourism organization and other forms of forest utilization. The concrete

3) Recommended as supplementary literature: the contribution by E.A. Medvedkova and K.N. Misevic entitled: "The Opening of the BAM Region, Seen from an Economic and Geographic Standpoint." (PGM 122(1),37-43, 1978).

TABLE 1: Distribution of forest area according to groupings and categories in the forest utilization zones of the BAM region

Leschoses within the forest utilization area	Total area within the BAM region in 1,000 ha	Thereof according to groups			Group I in 1,000 ha	
		Group III in %	Group II in %	Group I in %	Closed and protected forests	Recreation forests
Ust Kut (w. Tajura)	3,379	79.5	-	20.5	274	419
Kuensk	2,391	94.0	-	6.0	120	13
Kasatschinskoje-Lena (incl. magistrate)	3,285	97.2	-	2.8	69	24
Strigalowo (partial)	1,500	99.0	-	1.0	15	-
Katschug (partial)	1,000	99.0	-	1.0	10	-
<u>Total within the Upper Lena zone</u>	11,555	91.5	-	8.1	488	456
North Baikal	1,783	20.0	-	80.0	1,418	4
Kumora	1,528	54.4	34.1	11.5	177	-
Uojan [? - illeg.]	1,455	12.3	67.1	20.6	300	-
W [? - illeg.]	6,308	-	-	-	-	-
Muja	1,635	98.1	-	1.9	32	-
Tschara	5,682	99.5	-	0.5	20	-
Tungokotschen	3,197	96.7	-	3.3	106	-
Turgir-Ojokma (part.)	4,304	99.9	-	0.1	2	-
Bodajbo [? (partial)	2,000	97.5	-	2.5	38	12
Mama (partial)	1,000	96.9	-	3.1	31	-
<u>Total North Baikal</u>	29,387	86.1	6.7	7.2	2,130	16
Timpton	8,660	98.6	-	1.4	125	-
Oljokma	16,242	97.6	-	2.4	391	4
<u>Total, South Yakut parts of BAM</u>	24,902	97.8	-	2.2	516	4
Tygda	4,568	99.8	-	0.2	8	-
Dsheitulak	2,556	97.5	-	2.5	66	4
Masanowo	2,224	92.3	-	7.7	172	-
Seja	9,682	95.8	-	4.2	412	-
Nora	1,423	93.5	-	6.5	93	-
Ekintschan	3,359	95.1	-	4.9	161	-
<u>Total, Central BAM Zone</u>	24,812	97.7	-	2.3	912	-
Urgal	3,712	96.6	-	3.4	122	4
Kur-Urma (partial)	500	93.5	-	6.5	32	-
Angun	2,054	93.4	-	6.6	135	-
Gotjun	1,568	94.0	-	6.0	94	-
Nishnetambowskoje (part.)	500	90.0	-	10.0	50	-
Kerbi	1,985	96.3	-	3.7	73	-
Tachta (partial)	1,000	93.9	-	6.1	61	-
Tschumikan (part.)	3,000	90.6	-	9.4	282	-

TABLE 1 (Cont.)

Leschoses in forest use area	Total area in BAM region in 1,000 ha	Thereof in groups			Group I in 1,000 ha Protected/Recreation	
		III in %	II in %	I in %		
<u>Total, far east portion of BAM</u>	14,319	94.0	-	6.0	848	4
<u>Total, BAM region</u>	105,075	93.8	1.1	6.1	4,894	484

The information used for this table has been taken from "Forestry Zones and Forest Types in the BAM Region" (1976) and the contribution by Iljina (1977).

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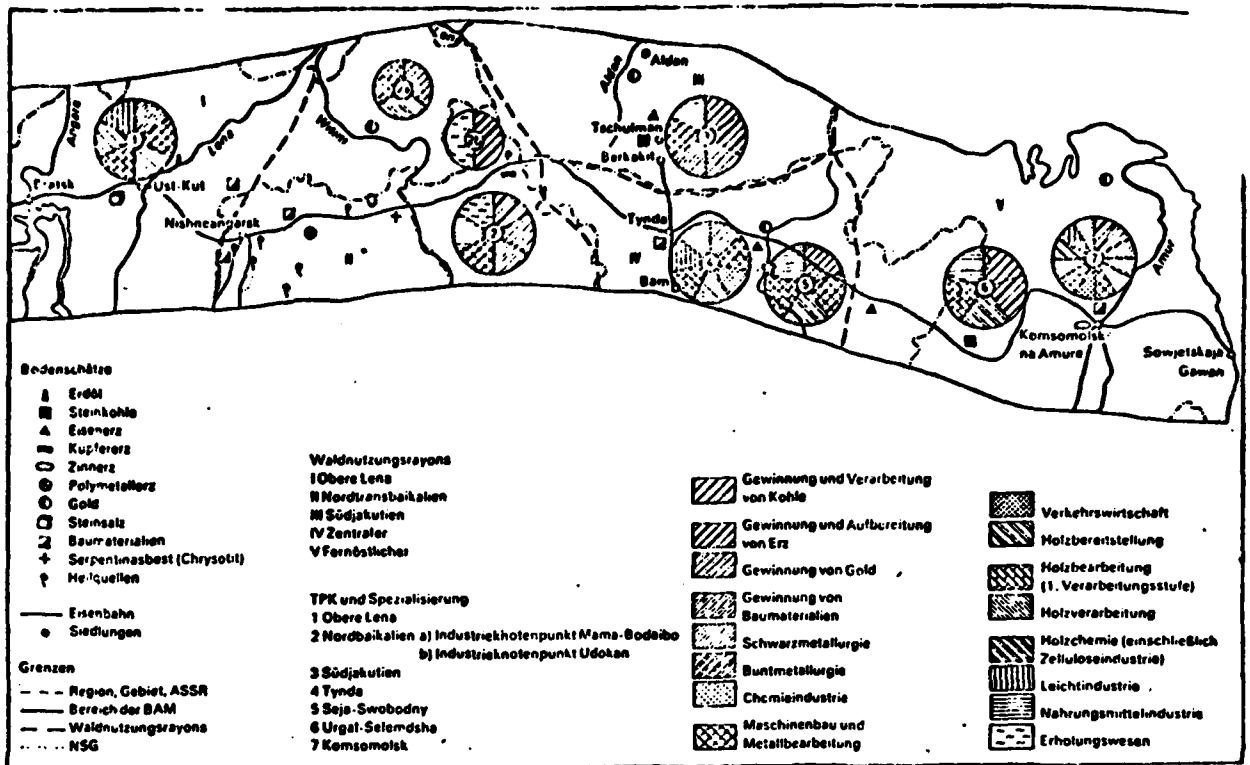
demands on the forest resources and the possibilities of utilizing the natural resources of the territories bordering on the BAM catchment area will also be directly dependent on the development level of the productive forces in each one of these TPCs to be formed (BAM: Problems, Perspectives... 1976).

In close relation to this framework, the evaluation of the forest resources and the design of a logical utilization program must also be implemented. This applies to all zones located in the BAM region: the Upper Lena zone with 2 million hectare, the North Baykal zone with 29 million hectare, the South Yakut zone with 25 million hectare, the Central zone with 25 million hectare, and the Far East zone with 14 million hectare (Table 1, Figure 1).

In the territory of the first mentioned zone, the Upper Lena TPC will be established, which will specialize in the harvesting and processing of wood up to the ultimate stage of chemical and mechanical processing according to the local potential (Figure 1). The forest resources of this zone are thus of particular interest, on one hand as a source of raw material and, on the other hand, as a factor in the shaping of the landscape which would make it possible to maintain the natural environment and the natural conditions at an optimal level even with intensive mechanical, physical, and chemical influences being exercised.

According to indications from the forest administration of Irkutsk, the raw wood resources of the TPC amount to more than 2 billion m³ of wood. In the opinion of those involved in raw wood production, 66.1% of the main body of wood would consist of mature and over-ripe woods which can be included in total felling within the next few years. However, the felling of the so-called over-ripe forests, which on all sides is necessary, might result in a serious disturbance in the existing biogeocenosis of the taiga, which has developed over the ages in the northern areas of Irkutsk. In the taiga, there is no dispensable growth, and if primarily mature and over-ripe forest is felled, this will cause a disturbance in the normal reproduction conditions of the taiga which will remain for several years. In such a situation, even intensive cultivation measures in the harvest areas during the subsequent decades will not lead to the desired reforestation effect. For this reason, this particular condition must be given sufficient attention in the subdivision of the territory into utilization units.

FIGURE 1: Forest utilization zones in the BAM region (after Iljina 1978).



Earth resources

- Oil
- Coal
- Iron ore
- Copper ore
- Stannic ore
- Multimetal ores
- Gold
- Rock salt
- Construction materials
- Serpentine asbestos (Chrysotite)

- Railroads
- Settlements

Border lines:

- Region, ASSR
- BAM region
- Forest utilization zones
- NSG

Forest utilization zones

- I Upper Lena
- II North Trans-Baikal
- III South Yakut
- IV Central
- V Far East

TPCs and their specializations

- 1 Upper Lena
- 2 North Baikal
 - a) Mama-Bodaibo industrial center
 - b) Udokan industrial center
- 3 South Yakut
- 4 Tynda
- 5 Seja Swobodny
- 6 Urgal-Selemdsha
- 7 Komsomolsk

Coal mining and processing

Ore mining and processing

Gold mining

Mining of construction materials

Ferrous industry

Non-ferrous industry

Chemical industry

Machine construction and metal processing

Communications industry

Wood preparation

Wood processing (1st stage)

Wood processing

Wood chemistry (incl. cellulose industry)

Light industry

Food industry

Recreational enterprises

The organizational schedule for forest utilization in the Upper Lena TPC (Iljina 1977) considers primarily the interests of wood processing, but it also includes seeding areas as required for a successful and uniform reforestation of the variously aged forests. Furthermore, 5 - 7% of the areas accessible for collection of mushrooms, berries, and other plant products (Figure 2). It would be appropriate to utilize 20 - 30% of the total forest area for recreational areas, including the indicated reseeded areas and that part of the forest which should be categorized as protected forest, e.g. the protective belts for spawning areas along the rivers.

Particular attention is given to the stands with a predominance of the Siberian stone-pine (*Pinus sibirica* Mayr), which occupy more than 1.8 million hectares in the Upper Lena TPC. It is obvious that at least one third of the highly productive stands with wood resources exceeding 250 m³/ha will be felled (Forestry Zone... 1976). However, all stone-pine stands currently categorized as stone-pine cone industry zone will be protected in area of approx. 1.37 million hectares for most effective long-term utilization and thus retained.

The complex economical utilization of the stone-pine stands in the Irkutsk North can be implemented: by tapping the resin, by collection of stone-pine cones and various wild fruits, berries and mushrooms, by collection of medicinal herbs, by hunting, fishing, and partial felling of the stands. Practical experience shows that 1,000 hectares of Siberian stone-pine tapped for resin yield over 60 tons of resin under the conditions of the Irkutsk North, corresponding to a value of 60,000 rubels. Depending on cyclical fluctuations every 3 or 4 years, it is also possible to prepare 150 - 300 tons of stone-pine seeds per year. To this should be added the by-products of the forest utilization, such as berries, medicinal herbs, technical raw materials, etc.

Such a complex, industrially functioning forestry operation can yield pelts, game, and fruit to a value of at least 250,000 rubels per season. Thus, a correctly managed cultivation of the stone-pine forests makes an annual income possible which exceeds several times that of the wood which can only be harvested once. A utilization model for natural resources is created in the stone-pine stands of the taiga, and thanks to this, experience will also be gained for a rational opening of all forest resources in the entire BAM region.



FIGURE 2:
Pine forest with rich under-
vegetation in the Kirenga
catchment area in the Irkutsk
region.

(Photo: B.A. Bogojawlenski)

The operations located in the Burjat and Tschita North, namely the Udokan ore processing combine and the Norht Byakal TPC will specialize in the extraction of copper ore, asbestos, manganese, graphite, iron ore, and other earth resources. For this purpose clearing work, construction of processing plants, as well as the construction of an access road network and other facilities will be necessary (see Figure 1). Furthermore, the landscape within a radius of some kilometers from the industrial center will be subjected to intensive chemical emission influence; the centers proper will furthermore be subjected to mechanical pressure. For these reasons, the following actions will be required: solidification of the slopes in the vicinity of the extraction operations as well as settlements and roads, reinforcement of hillsides, dams, and all other anthropogenic facilities, maintaining the cleanness of the air space from mechanical and chemical pollutants (by means of partially limiting the emissions at certain locations), creation of optimal systems for self-purification of streams, foundation of new cities and worker settlements, supplying the population with local vitamin products, creating a network of tourism and recreation facilities to accommodate some ten thousands of workers and their families for vacations each month. The Norrth Baykal landscape can of course fulfill all these functions only on the condition that the vegetation will not be irreversibly destroyed on those surfaces which are not immediately utilized for construction purposes. Thus, not only the forests classified as group I and II, but also parts of the group III forests must be protected (Table 1).

Furthermore, it must be kept in mind that the proportion of forests in North Baykal does not exceed 40 - 45% and that these forests have a low utilization level with wood supplies ranging between 50 and 120 m³ per hectare. It is therefore not appropriate to consider them as a wood supply. Rather, in this area the biotic resources are primarily of value from the standpoint of utilization without gaining raw materials. This type of utilization will guarantee the longest-lasting optimum interaction between the subsystems "population - economy - environment". So, for instance, forest felling in the permafrost areas lead to the release of swamp development processes at the upper reaches of the rivers, to development of scree, and to an increase in the erosion and landslide processes on steep slopes, all of these processes which are dangerous, particularly in the intermountain basins which possess a unique variety of contrasting landscape types (Figure 3). The proposed utilization program for the natural resources in the North Baykal area thus purposely eliminates wood exploitation. After completion of construction work, wood cutting will be completely abandoned as a major activity along the roadbeds (Table 2). It can already be anticipated how much more profitable the introduction of a multi-use program will be in this territory, where the utilization activities will consist of activities mutually adjusted to each other and supplementing each other (Table 2).

In South Yakut and in the region of the Tynda TPC, many types of forest utilization can be developed (Figure 1). In fact, the stands in a major portion of the territory consist of mountainous and light forests of low productivity, particularly where the predominant tree is the Daurian larch tree (*Larix dahurica* Turcz.), occupying more than 90% of the wooded areas. On the other hand, there are productive stands with average wood resources of 120 m³/ha in the Dsheltulak leschose (Forestry zones... 1976).

TABLE 2: Rational organization of forest utilization in North Baikal, BAM region (excerpt)

Index of the total table	Forest utilization (according to specializations)	Total area in the economic association (in hectares)	Total number employees in specializations (persons/year)	Estimated amount of income from the undertakings (million rubel/year)
1.0	Reindeer breeding	3.0 - 3.5 mill.	400 - 450	1.5 - 2.0
2.0	Hunting			
2.1.	Pelts and meat of big game	approx. 3 mill.	1,200 - 1,600	3.4
2.2.	Breeding for pelt production	approx. 1,000	approx. 2.	0.8 - 0.9
2.3.	Preparation of useful plants	5,000	100 - 200	0.3
2.4.	Resin production	1,000 - 1,500	25 - 30	0.1
3.0	Fishing	100,000	120 - 140	0.8 - 1.0
4.0	Recreation	Annually visited area	Number of visitors per year	Income from exploitation
4.1	Sport hunting	350,000 - 450,000	10,000 - 12,000	approx. 1.0
4.2	Visits to national parks and recreation areas	250,000 - 300,000	10,000 - 15,000	0.1 - 0.2
4.3	Tourism	approx. 100,000	No indication	No indication
4.4	Spas	approx. 100,000	4,000 - 5,000	approx. 0.5



FIGURE 3:
The "Sands" in the Schara basin, Tschit region.
(Photo: A.W. Kiritschenko)

Although the industrial center of Tynda, which specializes in the processing industry, will not cause any intensive change in the natural processes over vast areas, the annual extraction of dozens of millions of tons of coal in Tschulman and of iron ore in Tajeshnoje may still lead to a destruction of the biogeocenosis within a radius of 20 - 30 km from the technological installations (Iljina 1977). It should be particularly noted that there is permafrost in almost the entire area of South Yakut. Industrial processing of wood can not be regarded as rational in this zone, considering the risks of thermokarst and landslide process as well as all types of erosion, which should be seen in conjunction with the necessity of maintaining an optimal status of the air space and the surface waters. Consequently, the needs of the developing industrial and the future TPC for wood must be met by bringing in wood from more southerly forest operations (Lespromchoses) located in the central zone of the BAM catchment area (Figure 1). The mutual exchange of wood, coal, and ore between the TPCs will be accomplished via a meridional section of the BAM region from Bam via Tynda to Berkakit (Figure 4).

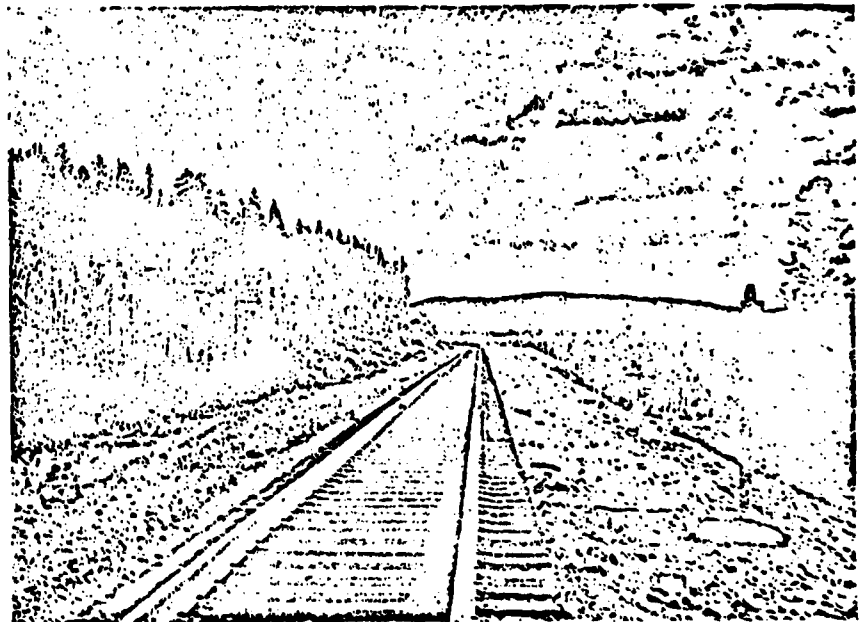


FIGURE 4:
Landscape in the meridional section of the BAM region
(Photo: I.P. Kawerin)

In the activity range of the future Seja-Swobodny TPC east of the Selemsha catchment area, there are relatively easily accessible forests stands which are suitable for wood production (Figure 1 and Table 1). In the forests to be exploited here, the experts indicate the total resources as being approximately 1 billion m³ (Forestry zones... 1976). In this zone, the developmental prospects of the forestry operations are significant, even though it must be kept in mind that the swamp formation and the forest fires which influence the vegetation cover, are of major importance. The latter, occurring repeatedly, cause a natural transformation of the larch-tree and other coniferous stands into secondary birch stands, and, generally, they promote the swamp formation process. In the long

range projections of the capacity of the lespromchoses and the wood processing combines, this process must be considered, since birch has already displaced the coniferous forests in an area of more than 2 million hectares. According to information from the forestry administration of Amur, the reoccurring forest fires and the approx. 2.3 million hectares of significant young growth will require supplemental investments in the wood preparation program (Protection problems... 1977).

Reforestation projects will also play an important role, as is also the case in the neighboring Far East portion of the BAM catchment area, not only in the plains for purposes of protecting agricultural operations, but also along the railroad, which would increase the Group I area of protected forests (Table 1).

For the growing Urgal-Seledsha TPC and Komsomolsk-na-Amure TPC which already have a relatively well developed productive and social infrastructure, it is anticipated that the forest stands will more intensively be used for lumber production (Figure 1). For this purpose, 10 new lespromchoses will be created in addition to the 6 already functioning. The volume of cellulose production will be significantly increased in the cellulose-paper combine (CPC) of Komsomolsk-na-Amure (BAM: Problems, Perspectives... 1976; Iljina 1977). For the raw wood preparation operations, these changes will introduce the same tasks and alternatives which have been cited already in the analysis of the forestry and wood industry prospects of the Upper Lena TPC.

It can even be assumed that, in combination with the exploitation of natural resources in the far eastern portion of the BAM catchment area, the national kolchoses specializing in hunting and reindeer breeding will play an important role in combination with the wood utilization. Furthermore, in the area adjacent to the magistrate, it would be rational to develop a network of specialized operations for preparation and processing of vegetation-based raw materials, e.g. a variety of medicinal herbs and technical raw materials (some 500 varieties, according to Schreter, 1975), collection of valuable fruits and berries (more than 70 varieties) and the cones of the Korea pine (*Pinus koraiensis* S. and Z.)⁴. All abovementioned secondary forest uses will be combined with the wood exploitation, which is the main specialization.

The study of specialized literature on the far eastern portion of the BAM catchment area allows identification of a number of peculiarities in the reforestation process. The basic ones are the following:

1. After felling and after forest fires, the reestablishment of larch-trees is somewhat delayed on the warmer south slopes.
 2. The Ajan spruce (*Picea jezoensis* Carr.) is displaced by birch on 90% of the area, more rarely by larch-trees. For this reason, artificial reforestation
-
- 4) The seeds of the stone-pine and some other *Pinus* varieties as well as of the cited Korean spruce consist of small, angular nuts, so-called stone nuts, which are contained in cones of 6 - 8 cm in length.

must be introduced

3. The reforestation processes in the river valleys are very slow due to the dense grass cover and the underbrush. For this reason, it is appropriate not to bring the felling closer than approx. 300 - 500 m from the river beds (Iljina, 1977).

Conclusion

In summary, it can be stated that in spite of the variety and the generally strong susceptibility of the biosphere, it is possible to rationally exploit the forests of the BAM catchment area. This requires careful identification of all utilization effects on the taiga and mountainous taiga complex. A sensible adjustment of the various utilization methods to the existing natural and economic conditions guarantees optional functioning of the TPCs, their complex development, and their completion in accordance with the concept of the Territorial Production Complexes.

Literature

- BAM: Problems, Perspectives ... Moscow, 1976 (Russian).
- Forestry zones and forest types in the BAM region. Krasnojarsk, 1976 (Russian).
- Iljina, L.N.: Small scale evaluation maps of the vegetation resources in areas to be opened for the first time. In: Dokl. I. Geography of Siberia and the Far East, No. 47, Novosibirsk, 1975, pp. 63-72 (Russian)
- Iljina, L.N.: The potential for a rational exploitation of the biotic resources in the BAM region. In: Natural Conditions and Environmental Protection in the BAM Region. Irkutsk, 1977 (Russian)
- Michailow, J.P., and Iljina, L.N.: Economic-geographic Research on the Biotypes in the BAM Region. In: Geographic Research in the BAM Region, Irkutsk, 1976, pp. 37-46 (Russian).
- Environmental Protection Problems in the BAM Region. Blagoveschtschensk, 1977 (Russian).
- Schreter, A.I.: Medicinal herb flora of the Soviet Far East. Moscow, 1975 (Russian).

Supplementary Literature:

- Lange, K.: Construction of the Century: the BAM. In: Die Wirtschaft, 1, 1978, p. 32.
- Liebmann, C. CH.: The Baykal-Amur-Magistrate Railroad (BAM). Trackbed placement and economical inroads along a Soviet railroad. In: Die Erde, 109 (1978) 2, pp. 206-228.
- Medvedkova, E.A., and Misevič, K.N.: The opening of the BAM region, seen from an economic and geographic standpoint. In: Peterm. Geogr. Mitt., 122 (1978) 1, pp. 37-43

Pinneker, E.K., and Pisarski, B.I.: Vital hydrogeological problems in the construction of the Baykal-Amur-Magistrate (BAM). in: Zeitschr. f. angewandte Geologie, 23 (1977) 10, pp. 528-532

Seifert, H.: The BAM and its importance for the economic exploitation of Siberia. In: DDR-Verkehr, 10 (1977) 10, pp. 432-436

Seifert, H.: The BAM and its importance for the economical exploitation of the treasure chambers of the Soviet Union. In: DDR-Verkehr, 11 (1978), 1, pp. 26-28

Sobolev, J.: The creation of an industrial belt along the BAM. A gigantic program. In: Presse der Sowietunion, 1/1979, pp. 21-24