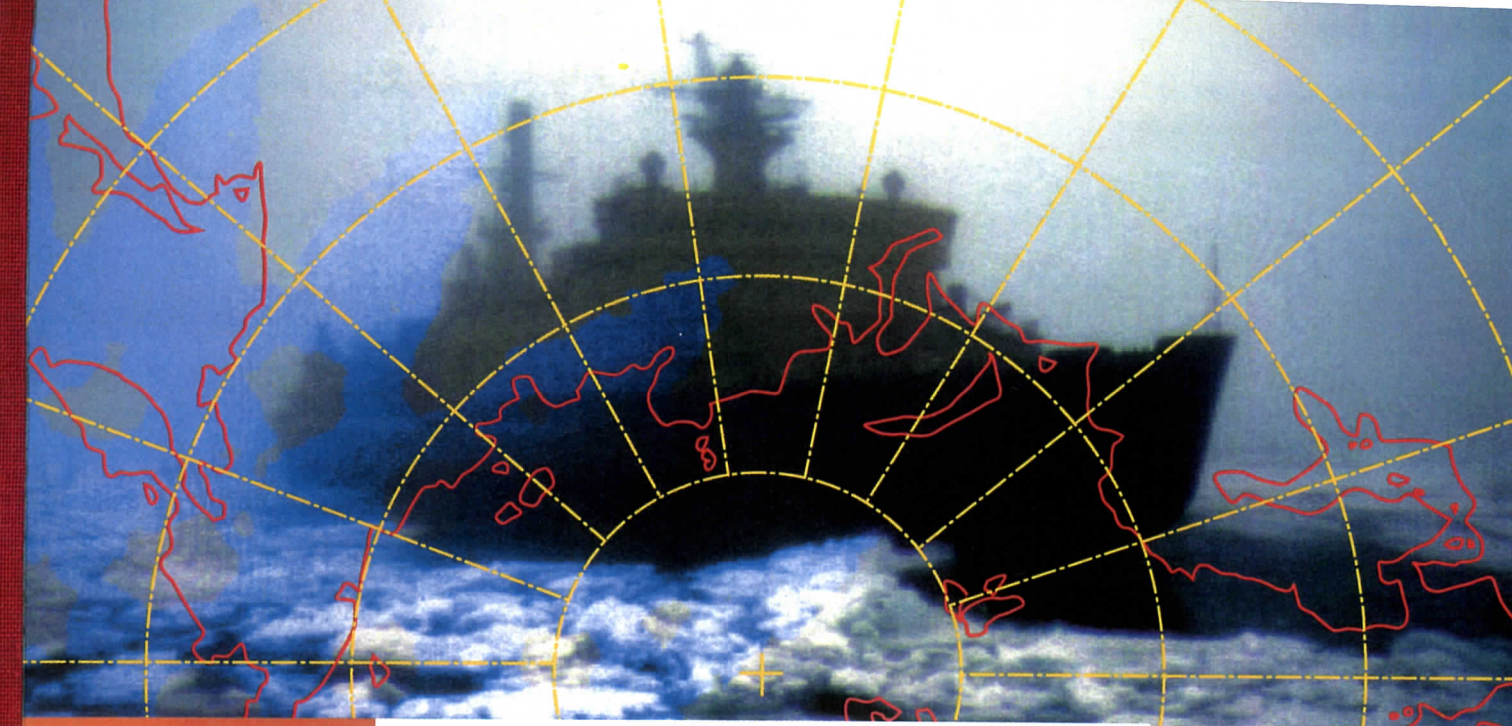
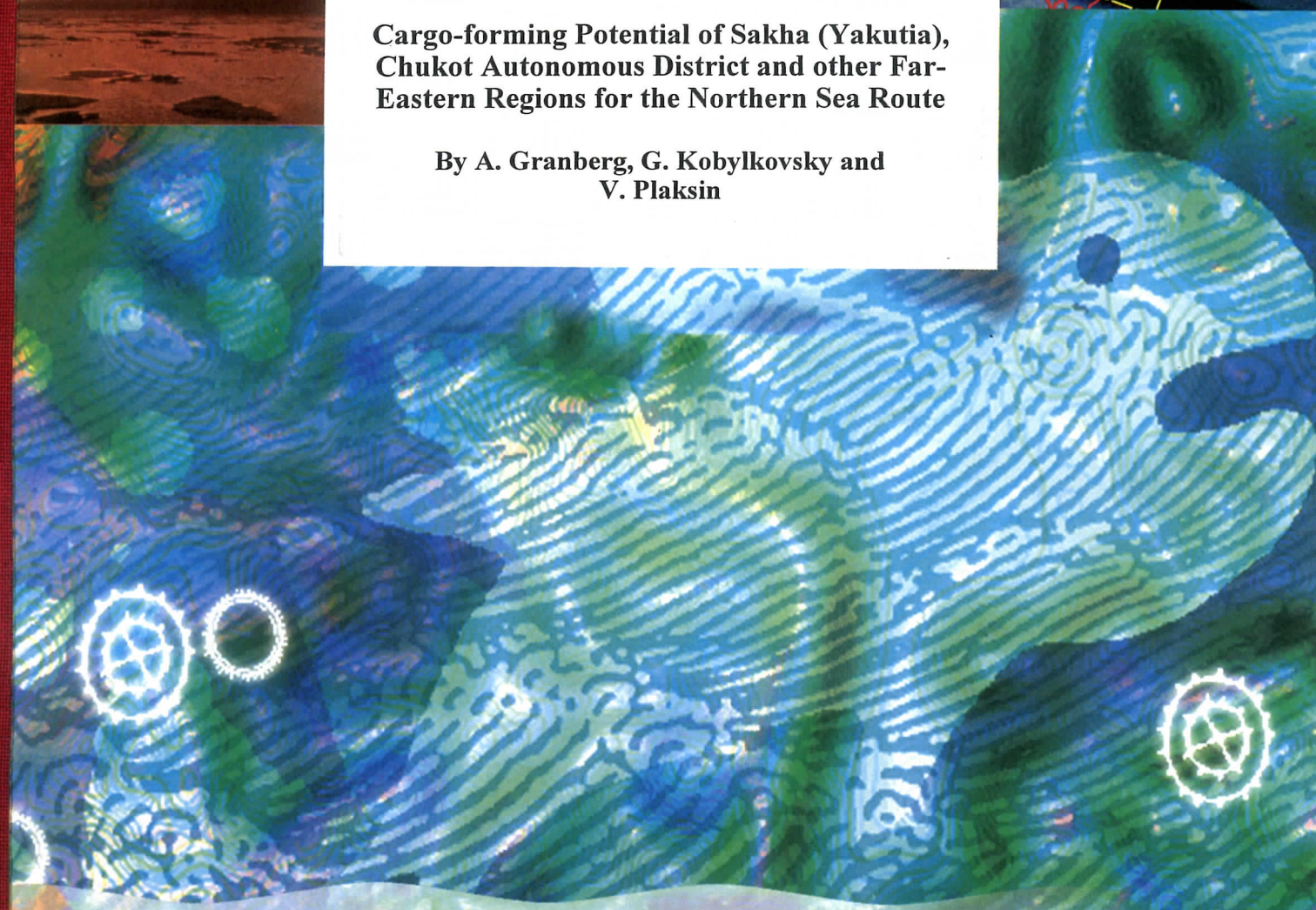


INSROP WORKING PAPER NO. 135 - 1999, III.01.6

Cargo-forming Potential of Sakha (Yakutia), Chukot Autonomous District and other Far-Eastern Regions for the Northern Sea Route

By A. Granberg, G. Kobylkovsky and V. Plaksin



INSROP International Northern Sea Route Programme

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International Northern Sea Route Programme (INSROP)

Central Marine Research & Design Institute, Russia

The Fridtjof Nansen Institute, Norway

Ship & Ocean Foundation, Japan

INSROP WORKING PAPER NO. 135-1999

Sub-Programme III: Trade and Commercial Shipping Aspects

Project III.01.6: The Republic of Sakha, Chukotka and the Russian Far East - Cargo Potential for the NSR

Supervisor: Academician Alexander G. Granberg, SOPS

Title: **Cargo-forming Potential of Sakha(Yakutia), Chukot Autonomous District and other Far-Eastern Regions for the Northern Sea Route**

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Date: 8 February 1999

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What is an INSROP Working Paper and how to handle it:

FOREWORD - INSROP WORKING PAPER

INSROP is a five-year multidisciplinary and multilateral research programme, the main phase of which commenced in June 1993. The three principal cooperating partners are **Central Marine Research & Design Institute (CNIIMF)**, St. Petersburg, Russia; **Ship and Ocean Foundation (SOF)**, Tokyo, Japan; and **Fridtjof Nansen Institute (FNI)**, Lysaker, Norway. The INSROP Secretariat is shared between CNIIMF and FNI and is located at FNI.

INSROP is split into four main projects: 1) Natural Conditions and Ice Navigation; 2) Environmental Factors; 3) Trade and Commercial Shipping Aspects of the NSR; and 4) Political, Legal and Strategic Factors. The aim of INSROP is to build up a knowledge base adequate to provide a foundation for long-term planning and decision-making by state agencies as well as private companies etc., for purposes of promoting rational decisionmaking concerning the use of the Northern Sea Route for transit and regional development.

INSROP is a direct result of the normalization of the international situation and the Murmansk initiatives of the former Soviet Union in 1987, when the readiness of the USSR to open the NSR for international shipping was officially declared. The Murmansk Initiatives enabled the continuation, expansion and intensification of traditional collaboration between the states in the Arctic, including safety and efficiency of shipping. Russia, being the successor state to the USSR, supports the Murmansk Initiatives. The initiatives stimulated contact and cooperation between CNIIMF and FNI in 1988 and resulted in a pilot study of the NSR in 1991. In 1992 SOF entered INSROP as a third partner on an equal basis with CNIIMF and FNI.

The complete series of publications may be obtained from the Fridtjof Nansen Institute.

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CONTENT

1. Introduction

The Eastern section of the Arctic is the most complex link of the Arctic marine transport system (AMTS). It is characterized by more severe ice conditions, shorter navigation period, dispersal of customers along the coast given the volumes of shipments are relatively small. The situation is complicated by the economic crisis, manifested in the most severe forms in the north-eastern regions of the Russian Arctic.

The objective of the present work is to assess the resource and economic base of the Northeast of Russia and on this basis, to give variants of forecast characteristics of transport-economic linkages and cargo flows for the Eastern section of the Northern Sea Route.

Materials of SOPS, Research Centre for Complex Transport Problems of the RF Ministry of Transport, SojuzmorNIIproekt, statistical materials and literature, were used in this work.

The authors of this paper are: A.Granberg (SOPS), G.Kobylkovsky (Research Centre for Complex Transport Problems), V.Plaksin (SojuzmorNIIproekt).

2. Productive forces of the regions, gravitating to the NSR track

2.1. Regions, gravitating to the NSR track

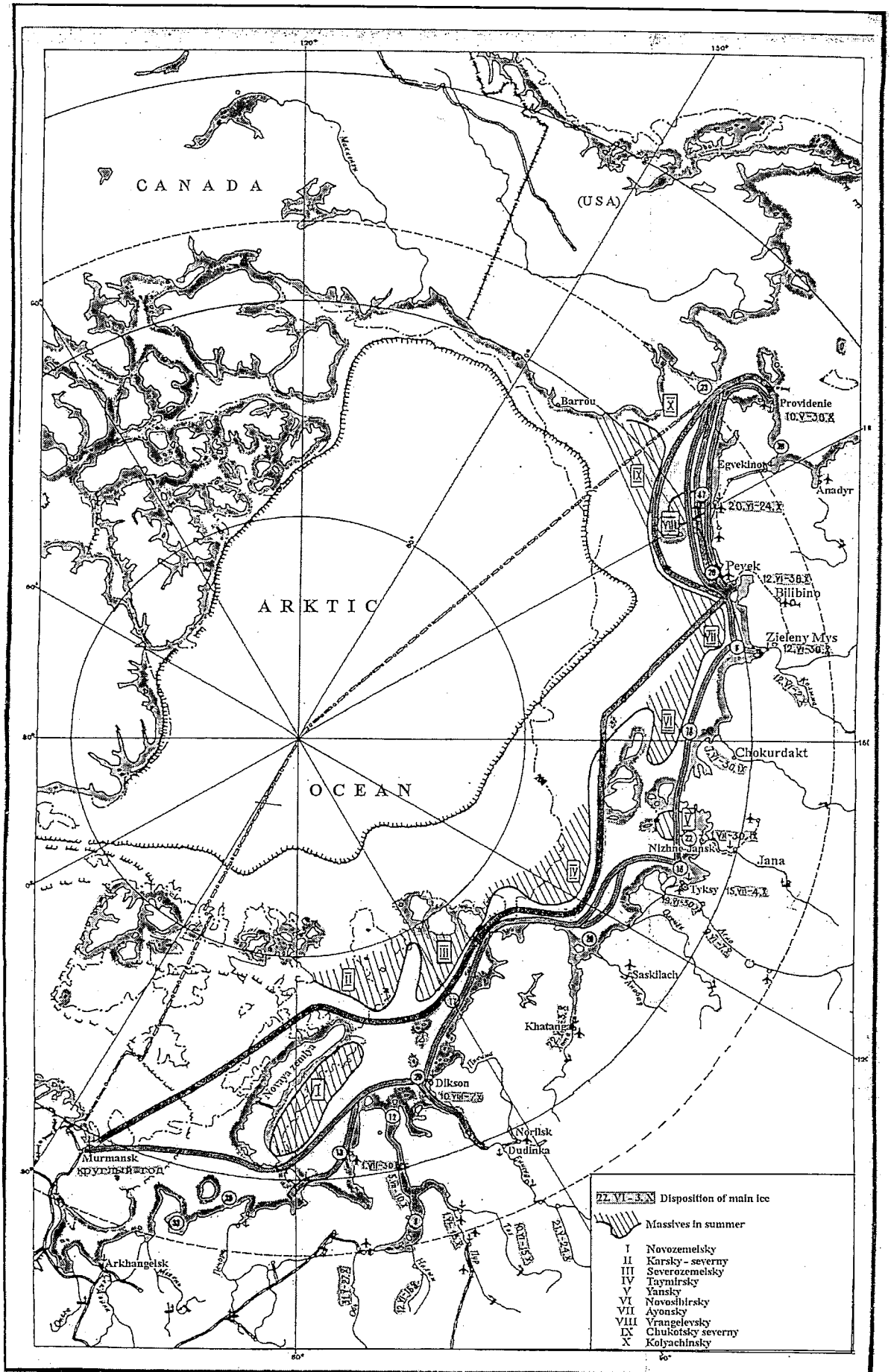
The Arctic marine transport system (AMTS) differs significantly by sections.

The western section is characterized by more favourable navigation conditions. Three of ten insurmountable ice areas are found here (Novaya Zemlya, Kara, Severnaya Zemlya). It accounts for 80% of shipments along the NSR. Oil and gas complexes of Timano-Pechora region, West Siberia, mining and timber complexes of Angara-Yenisei region are within the sphere of its operation. Large basic sea and river ports, connected by the railroads with relatively close developed regions of the country, are concentrated here.

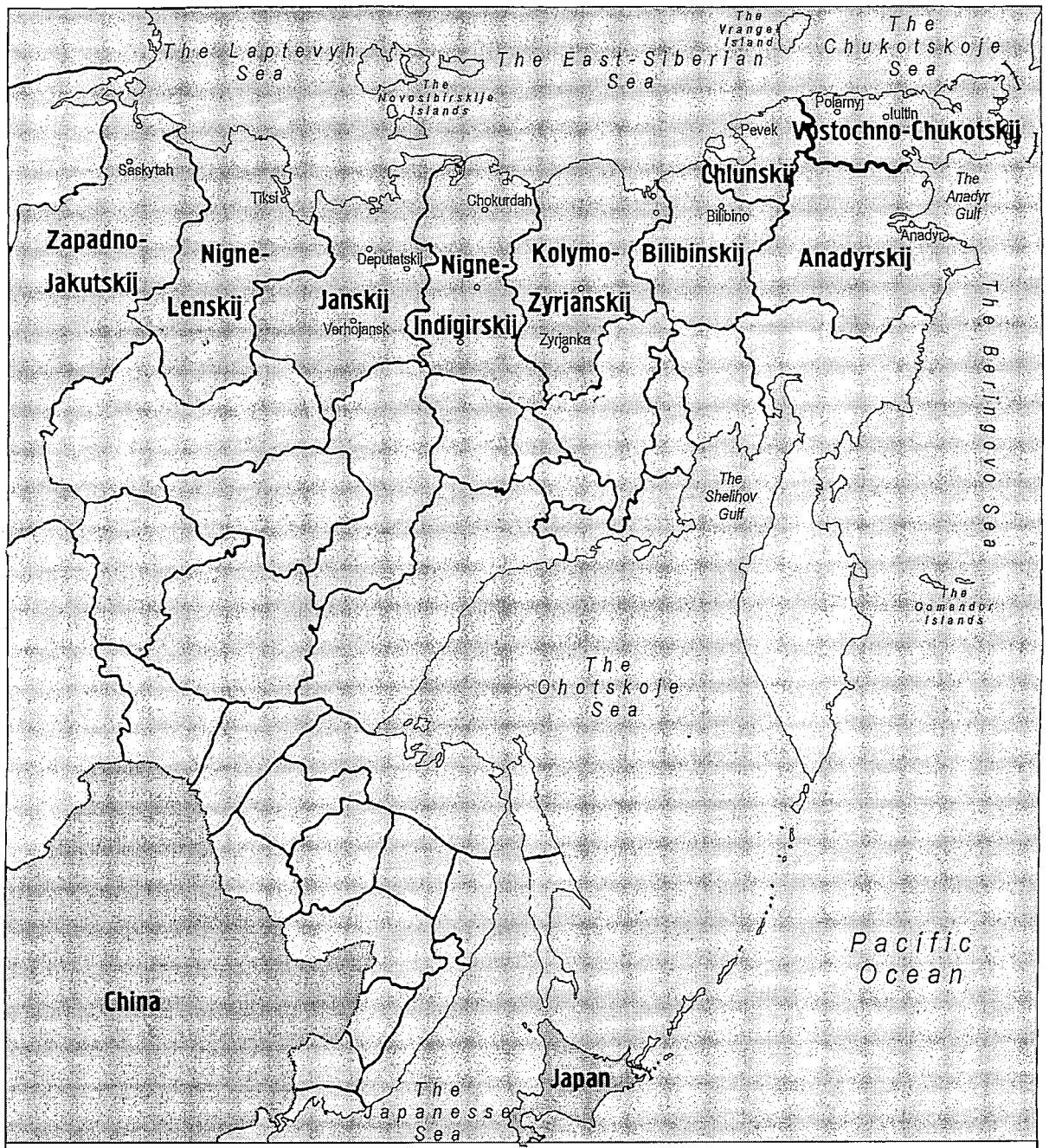
The eastern section of the Arctic (Cape of Cheluskin - Cape of Dezhnev) services the Arctic coast of the eastern part of Krasnoyarsk krai, Sakha (Yakutia), Chukotka. It is the most insurmountable part of the NSR, and the coast is weakly developed in the economic respect. The volumes of shipments here do not exceed 20% of the total volume of Arctic shipments. Basic sea and river ports - Vladivostok, Nakhodka, Vanino, Osetrovo - are rather distant, direct railroad and motor road connection with the developed regions is lacking. The eastern section of the AMTS operation is shown on Fig. 1.

The use of the principle of common transport servicing allows to limit the territory, gravitating to the Northern Sea Route. Economic sub-regions of the Northeast, where all or a part of shipments are carried out with the involvement of the NSR, are included in this territory. Local economic zoning was carried out by the authors on the basis of principles of production specialization and common transport servicing.

Regions of the Northeast, gravitating to the NSR, are shown on Fig. 2.


CANADA
(USA)
ARKTIC
OCEAN
Barrow
Providenie
10.V–30.X
Egvekinot
Anadyr
20.VI–24.X
Pevek
12.VI–30.X
Bilibino
Zeleny Mys
12.VI–30.X
Chokurdakt
Nizhne-Janskoe
Jana
Tyksy
15.VII–4.X
Saskilach
Khatanga
Dikson
10.VIII–7.X
Norilsk
Dudinka
Murmansk
Arkhangelsk
Novaya Zemlya
22.VI–3.X Disposition of main ice
Massives in summer
I Novozemelsky
II Karsky - severny
III Severozemelsky
IV Taymirsky
V Yansky
VI Novosibirsky
VII Ayonsky
VIII Vrangelevsky
IX Chukotsky severny
X Kolyachinsky

Pic. 1



Picture 2. Regions of North-East, graviating to Nord Searoute

conventional signs

—— Boundaries of economic regions ═══ Boundaries of a zone of gravitation NSR

2.2. Natural resources and economic development of the Northeast

The Northeast of Russia is the region of extreme natural conditions. Long winter period, low temperatures (absolute minimum for January in the Northern hemisphere - 71°C was registered in Oimyakon), large areas of solid permafrost, short navigation period in the seas and rivers (80-90 days in the year) in combination with the vast territory and practically lacking surface transport communications (except for motor zimniks), lead to extremely high production costs. The share of transport costs in the cost of the final product in the Northeast makes up 40-60%, while the average value in the country is up to 10%. Costs of the storage of the seasonal cargo stocks are great.

Therefore poor development of transport infrastructure is the main deterrent of production development.

At the same time this region, given weak geological exploration of the territory, is rich in various mineral resources. Among them are diamonds, non-ferrous and valuable metals, rare-earth metals, zeolite, etc., i.e. mineral resources, which are the sources of hard currency resources, or determining the progress in the development of advanced branches of production.

82% of reserves of diamonds fall on the Northeast. Diamonds-bearing province stretches in the west Yakutia from the mid-reaches of the Lena river to the shores of the Arctic Ocean. Reserves of the valuable metals in the Northeast make up 30-35% of Russian reserves. In the areas of the Arctic zone Yano-Kolymsky gold-bearing belt was found (more than 1000 km in length and 200 km in width). The second large gold-bearing belt is Chukot belt. In the zone of these belts large (Kular, Nadezhdinskoye), medium and small gold-placers were found, discovery of main ore deposits is expected.

There are significant reserves of tin and tungsten in the region. Especially we should mention the basin of the Yana river (Deputatsky, Ilintas, Adycha), Nizhnyaya Indigirka, Chaunsky resource area.

Complex composition of ores is a characteristic feature of the ore reserves in the Northeast, as well as relatively close location of gold, silver, tin, mercury, antimony and other components deposits. It could be the basis for increasing production efficiency in the process of organization of complex extraction of mineral products.

Tomtorskoye deposit of metals of the yttrium group (scandium, niobium, yttrium, samarium, europium and some others), located on the boundary of the West Yakutia and Krasnoyarsk krai, is rather perspective. With regard to niobium reserves this deposit is the largest in the world. Metals of this group are used as additives in steel-casting production.

There are large reserves of fuel-power resources in the Northeast. At present over 100 deposits of bituminous and brown coal are known, and total geological reserves are estimated at more than 400 billion t.

The territory of Primorskaya lowland, stretching along the coast of the Arctic Ocean from the mouth of the Khatanga river to the Chaunskaya Bay, of the Anadyr river basin and of the Chukot shelf of the Bering Sea are perspective with regard to oil and gas.

We should also mention local kinds of natural resources, such as reindeer pastures and fish stocks of fresh-water and sea water bodies, which are the sources of life and economic activity for the aboriginal population.

Analysis of the state of the mineral-resource base in the areas of the Arctic zone of the Northeast allows to make the following conclusions:

- the quality of reserves of many mineral deposits is quite adequate to the average quality of the similar raw in the world, and in a number of cases it is higher, in some cases it is the best in the world or unique;
- unfavourable natural-climatic conditions and poor transport infrastructure make the development of many deposits not competitive;
- wide-scale infrastructure preparation of the territory, including the use of the NSR combined with other kinds of transport - river, motor road, pipeline, air - changes the situation radically and creates opportunities for the resources of the Arctic sub-regions of the Northeast to enter domestic and world markets.

Mineral-raw and biological resources of the areas of the Arctic zone are the basis for the economic development. Main production branches - gold and tin-mining, electric power production, coal mining, construction industry, were developing up till 1990, though with decelerated rates.

The most intensive development took place in Yansky industrial unit, where Deputatsky tin-mining enterprise, Kular field, Adychanskaya hydro-electric power station were under construction, moorings of Nizhneyansk, Ust-Kuiga ports were extended, motor road Kuiga - Deputatsky was built; the fleet of the Lena shipping company was replenished with the ships "river-sea" to provide direct cargoes delivery from Osetrovo to Kuiga.

Gold-mining, tin-mining enterprises, power production and transport objects were extended in Chaunsky, Bilibinsky, Shmidtovsky industrial units. Amguemskaya hydro-electric poser station was designed, as well as new port facilities in Pevek and Zeleny Mys. Own fuel-power base was developing owing to the increase of coal production in Zyryansk and Beringovsky.

In 1990s, reduction of non-ferrous metals production occurred everywhere, and at some deposits production has stopped completely (Adychansky field, Joint-stock company "Yanzolovo", "Kularzoloto", fields Nezhdaninsky, Leningradsky, etc.). Construction of Adychanskaya hydro-electric power station was laid up, coal production was reduced. Many settlements were deserted, and their restoration is practically impossible in the future. Changes in main indices for Sakha (Yakutia) and Chukotka on the whole are given in Table 1.

The area of the sub-region of the Arctic zone is 48% of the territory of the Northeast (Sakha (Yakutia), Chukotka, Magadan oblast). In 1991-1996 the share of the population of the Arctic zone decreased from 18 to 16%, and that of industrial production – from 21 to 15%. It shows, that crisis phenomena in the areas of the Arctic zone are manifested more significantly than in the Northeast on the whole.

Table 1.

Dynamics of the indices of the economic development in the Northeast

Indices	Unit of measu-rement	Sakha (Yakutia)				Chukot Autonomous District			
		1985	1990	1995	1996	1985	1990	1995	1996
Population	Th. pers.	1013	1109	1023	1016	155	154	91	85
	%	91.3	100	92.2	91.6	100.6	100	59.1	55.2
Incl. urban	Th. pers.	669	738	658	654	112	111	64	60
	%	90.7	100	89.8	88.7	100.9	100	57.7	54.1
rural	Th. pers.	344	371	365	362	43	43	27	25
	%	92.7	100	99.0	97.6	100	100	62.8	58.8
Industry[1]	billion roubles	3.0	4.0	3.2	1.5	0.7	0.9	0.2	0.1
	%	75.0	100.0	80.0	37.5	77.8	100.0	22.2	11.1
Investments[1]	billion roubles	3.0	4.2	0.5	0.5	0.45	0.56	0.02	0.02
	%	71.4	100	11.9	11.9	80.4	100	3.6	3.6
Electric power	billion kWh	no	8.7	6.9	7.4	no	1.0	0.45	0.43
	%	data	100.0	79.3	85.1	data	100.0	45.0	43.0
Bituminous coal	million t	14.1	17.3	11.9	10.8	1.03	1.3	0.88	0.56
	%	81.5	100.0	68.8	62.4	79.3	100.0	67.7	43.1
Natural gas	million m^3	1.0	1.5	1.65	1.6	-	-	-	-
	%	66.6	100.0	110.0	106.7				
Oil	Th. t	-	no data	166	198	-	-	-	-

[1] In 1990 prices

Sources: Russian Regions, vol. 1, 2, Goskomstat, M., 1997
- Russian Statistical Yearbook, Goskomstat, M., 1997

3. Trends and present state of the Eastern section of the NSR

3.1. Cargo shipments

The NSR is services the coastal zone of the continent, islands and basins of the rivers Anabar, Olenek, Yana, Indigirka, Kolyma. The total traffic from of Sakha (Yakutia) goes to the NSR along the Lena river, mainly by river vessels without re-loading to the sea ships in Tiksi. A part of cargoes is transported outside Sakha (Yakutia) (basin of the river Khatanga and the northern Chukotka) mainly by sea ships with re-loading in Tiksi from river ships.

Shipments by the sea fleet to the ports and points of the eastern section of the NSR are carried out according to the traditional scheme:

- along the Lena river with re-loading to the sea ships in Tiksi - mainly timber, oil products, equipment;
- from the ports of the European North (Murmansk, Arkhangelsk) - oil products by tankers, technical cargoes, food;
- from the main ports of Primorye (Vladivostok, Nakhodka, Vanino, etc.) - oil products by tankers, building materials, technical and technological cargoes, food, coal (from Beringovsk).

Recently the scheme of shipments in the Eastern section has undergone some changes: almost total volume of oil products is delivered from the ports of the European North.

Data on shipments in the Eastern section of the Arctic, excluding transit, are given in tables 2-4, as well as the turnover of the ports in the period 1985-1997.

All shipments, excluding shipments of coal, to the ports and points of the Eastern Chukotka (Provideniye, Egvekinot, Anadyr, Beringovsk, etc.) are carried out via the ports of Primorye, mainly from Vladivostok and Nakhodka. Coal, produced at the Anadyrskoye deposit, is used locally and is delivered to the consumers by the local fleet, partially it is delivered on the sea ships to Egvekinot and other points of the coast of the Anadyr Bay. Coal from Beringovsk deposit, mined close to the sea port Beringovsky, is supplied to the consumers of the Northern (Pevek, Mys Schmidta, etc.) and Eastern Chukotka (Egvekinot, Provideniye, etc.). Significant volumes of coal are delivered from Beringovsk to Kamchatka. Coal from Zyryansk (middle reaches of the Kolyma) is shipped by the river vessels to the consumers in the basins of the rivers Yana and Indigirka, in small volumes it is delivered to Bilibinsky district of Chukot Autonomous District via the port Zeleny Mys, and to Pevek - by sea.

Round timber from Tiksi (maximum 200 Th. t annually) and metal scrap, dispatched in small volumes from all ports of Sakha (Yakutia) and Chukotka, are exported. Domestic shipments from the Arctic and ports of the Eastern Chukotka are also insignificant - metal scrap, empty containers, tin concentrate, produced at the enterprises of Iultin and Chaunsky region.

Periodically food is imported in small volumes (8-12 Th. t) from the USA to Pevek, Mys Schmidta, Tiksi, Provideniye, etc. In some years oil products were imported from the USA for the consumers in Chukotka. Share of import has significantly increased recently.

Table 2

SEA FREIGHT TRANSPORT SAKHA (YAKUTIA) and NORTH CHUKOTCA), 1985 – 1997 YEARS

in thousands metric tons

	1985	1990	1995	1996	1997	Max transportation volume - year
I. Coastal trade from the West of Russia, total	463.5	248.9	68.9	165.2	187.8	468.8 – 1987.
incl. in tanks	236.1	110.4	65.8	158.3	182.2	236.1 – 1985
Includes per Regions						
to Tiksi, total	285.7	168.2	0.5	47.1	117.6	384.0 – 1987
incl. in tanks	131.6	102.2	-	47.1	117.6	189.8 – 1987
to Indigirka, total	30.1	1.1	-	14.2	-	30.1 – 1985
incl. in tanks	28.6	-	-	14.2	-	28.6 – 1985
to Kolyma, total	95.0	38.3	28.6	9.4	14.5	95.0 – 1985
incl. in tanks	60.3	6.2	28.6	9.4	14.5	60.3 – 1985
to Pevek, total	42.3	30.3	37.2	59.3	45.0	59.3 – 1996
incl. in tanks	15.6	-	37.2	56.5	40.6	56.5 – 1996
to Mys Schmidta, total	3.1	2.9	-	31.1	9.5	31.1 – 1996
incl. in tanks	-	-	-	31.1	9.5	31.1 – 1996
to other small ports, total	7.3	8.1	2.6	4.1	1.2	8.1 – 1990
incl. in tanks	-	2.0	-	-	-	3.2 – 1987
II. Coastal trade from the East of Russia, total	1110.7	1135.3	252.5	173.5	144.7	1152.3 – 1989
incl. coal	239.7	272.3	187.1	141.2	127.9	272.3 – 1990
incl. in tanks	419.0	466.9	49.5	24.7	10.1	467.6 – 1991
Includes per Regions						
to Mys Shmidta, total	258.7	239.5	52.4	11.8	9.5	272.3 – 1986
incl. coal	22.8	10.0	-	-	-	27.7 – 1987
incl. in tanks	151.6	145.4	46.4	10.1	8.5	154.6 – 1991
to Pevek, total	427.7	458.7	177.1	126.2	116.8	474.4 – 1988
incl. coal	196.3	238.1	172.1	124.9	114.6	238.1 – 1990
incl. in tanks	102.8	125.8	2.6	-	-	125.8 – 1990
to Kolyma, total	287.7	325.7	3.6	16.7	1.5	331.0 – 1991
incl. in tanks	150.2	181.8	-	14.6	-	200.0 – 1991
to Indigirka, total	7.2	6.6	0.9	1.4	-	7.8 – 1989
to Tiksi-Yana, total	78.5	52.8	0.1	-	-	107.0 – 1986
incl. in tanks	-	-	-	-	-	30.7 – 1986
to other small ports, total	50.9	52.0	18.4	17.4	16.9	52.0 – 1990
incl. coal	20.6	24.2	15.0	16.3	13.3	24.2 – 1990
incl. in tanks	14.4	13.9	0.5	-	1.6	14.4 – 1985
III. Interarctic Coastal trade, total	411.8	136.2	10.8	10.0	36.2	423.9 – 1986
incl. coal	186.5	45.7	2.6	-	31.0	186.5 – 1985
incl. in tanks	58.7	12.2	2.5	4.0	4.8	58.7 – 1985
Tiksi-Khatanga-Anabar, total	23.1	29.7	2.5	-	-	30.2 – 1991
incl. in tanks	19.9	10.5	2.2	-	-	19.9 – 1985
to Tiksi-Yana, total	59.7	-	-	-	-	69.7 – 1987
incl. in tanks	15.4	-	-	-	-	15.4 – 1985
Tiksi-Indidirca, total	10.7	4.4	-	-	-	13.4 – 1986
Tiksi-Kolyma, total	37.6	18.4	0.1	-	-	58.2 – 1987
Tiksi-Pevek, dry cargo, total	23.1	7.2	-	-	-	24.0 – 1986

Table 2 (continued)

	1985	1990	1995	1996	1997	Max transportation volume - year
Tiksi-Mys Shmidta, total	20.3	8.4	-	-	-	20.3 – 1985
Tiksi-other sm. ports total.	42.5	12.1	0.4	6.1	-	42.5 – 1985
incl. in tanks	23.4	2.4	0.4	0.1	-	23.4 – 1985
Kolyma-Pevek, coal	50.7	45.9	-	-	31.0	58.8 – 1986
Kolyma-Indigirca, coal	17.3	-	-	-	-	22.7 – 1986
Kolyma-Yana, coal	118.5	-	-	-	-	118.5 – 1985
Between other small ports of Russian East Arctic, total	8.3	10.1	7.7	3.9	5.2	30.4 – 1987
incl. in tanks	-	-	-	3.9	4.8	–
IV. Coastal trade to the ports of Russia, total	39.8	68.4	21.1	5.9	10.8	77.0 – 1991
incl. to Russian Far East	35.0	66.4	8.6	4.4	6.3	72.1 – 1991
V. Exportation, total	112.2	189.7	19.6	-	10.0	252.9 – 1989
incl. coal from Kolyma	-	25.9	-	-	-	35.5 – 1989
incl. timber from Tiksi	89.9	147.6	19.6	-	4.7	195.6 – 1989
incl. metal scrap	22.3	16.2	-	-	5.3	22.3 – 1985
VI. Importation, total	-	-	20.4	6.2	34.3	34.3 – 1997
incl. in tanks	-	-	16.0	-	27.2	27.2 – 1997
incl. imports to Pevek	-	-	0.9	2.2	8.4	8.4 – 1997
incl. imports to Mys Shmidta	-	-	19.5	-	25.9	25.9 – 1997
incl. imports to Tiksi	-	-	-	4.0	-	4.0 – 1995
Total NSR Freight Transport	2138.0	1778.5	393.3	403.8	423.8	–
incl. coal	426.2	343.9	189.7	141.2	158.7	–
incl. in tanks	713.8	589.5	133.8	187.0	224.3	–

Table 3

SEA FREIGHT TURNOVER OF SAKHA (YAKUTIA)
AND NORTH CHUKOTCA
1985-1997 YEARS

Ports, sort of cargo	1985	1990	1995	1996	1997
1. Tiksi, total	714,2	484,0	68,8	36,4	43,0
incl. timber	231,1	226,3	19,3	-	4,7
incl. in tanks	129,2	16,4	6,2	9,5	8,6
2. Zieleny Mys, total	551,3	430,5	38,0	26,6	39,0
incl. coal	185,3	55,3	-	-	-
incl. in tanks	210,5	218,0	28,6	24,0	14,5
3. Pevek, total	568,0	590,1	222,3	190,6	205,8
incl. coal	246,3	284,0	172,1	124,9	145,6
incl. in tanks	118,4	125,8	39,4	56,5	40,6
4. Mys Shmidta, total	298,1	270,8	77,9	43,9	46,9
incl. coal	22,8	10,0	-	-	-
incl. in tanks	151,6	145,4	60,4	41,2	32,5

Table 4

SEA FREIGHT TURNOVER OF EAST CHUKOTCA, 1985 - 1997

in thousands metric tons

	1985			1990			1995			1996			1997		
	to port	from port	total	to port	from port	total	to port	from port	total	to port	from port	total	to port	from port	total
1. Beringovsk, total	579,7	49,6	629,3	660,9	63,7	724,6	506,2	22,0	528,2	297,0	3,0	300,0	281,0	6,0	287,0
incl. coal	573,5	-	573,5	642,5	5,3	647,8	481,5	-	481,5	297,0	-	297,0	281,0	-	281,0
incl. in tanks	-	4,0	4,0	-	9,0	9,0	-	4,0	4,0	-	1,0	1,0	-	2,0	2,0
2. Anadyr, total	105,9	350,2	456,1	190,3	275,9	466,2	178,0	216,0	394,0	98,0	163,0	261,0	116,0	40,0	156,0
incl. coal	81,9	5,9	87,8	156,7	4,6	161,3	150,0	-	150,0	85,0	-	85,0	116,0	-	116,0
incl. in tanks	-	146,4	146,4	-	137,0	137,0	-	42,0	42,0	-	36,0	36,0	-	16,0	16,0
3. Egvekinot, total	18,1	292,0	310,1	20,3	306,3	326,6	5,0	196,8	201,8	-	25,0	25,0	-	33,0	33,0
incl. coal	0,1	176,6	176,7	-	243,4	243,4	-	160,9	160,9	-	18,0	18,0	-	29,0	29,0
incl. in tanks	-	27,4	27,4	-	19,8	19,8	-	12,5	12,5	-	1,0	1,0	-	1,0	1,0
4. Providenie,	21,8	162,4	184,2	59,3	154,5	213,8	8,0	61,6	69,6	-	24,5	24,5	0,5	35,6	36,1
incl. coal	4,8	36,7	41,5	8,6	50,0	58,6	-	39,2	39,2	-	12,	12,0	-	23,7	23,7
incl. in tanks	-	36,6	36,6	-	32,8	32,8	-	10,4	10,4	-	4,0	4,0	-	9,3	9,3
5. Other small ports of East Chukotca, total	10,0	100,0	110,0	16,5	229,5	246,0	4,0	72,7	76,7	0,3	39,5	39,8	1,4	28,1	29,5
incl. coal	-	55,2	55,2	-	85,5	85,5	-	33,5	33,5	-	22,0	22,0	-	16,0	16,0
incl. in tanks	-	1,6	1,6	-	3,6	3,6	-	-	-	-	1,8	1,8	-	1,1	1,1

The volumes of Arctic shipments of the Republic of Sakha (Yakutia) and Chukotka increased till 1988, when the maximum volume of cargoes - 4405 Th. t, 2346.3 Th. t along the NSR, including direct deliveries from the West and East, export, intra-Arctic domestic shipments, was shipped along the NSR and to the ports of the Eastern Chukotka. In 1988 oil products, shipped by tankers - 30.7%, coal - 17.8%, timber (export from Tiksi) - 8.1% predominated in cargo shipments along the NSR, building materials, machines, equipment, food were transported in significant volumes as well. In 1990 the volumes of cargo shipments in the Eastern section decreased to 1778.5 Th. t, and in 1995 they decreased more than 4 times and stabilized at the level of 400 Th. t (1997 - 423.8 Th. t).

In recent 10 years the structure of cargo traffic on the NSR has changed significantly - share of oil products increased (1997 - 224.3 Th. t - 52.9%), as well as that of coal (1997 - 158.9 Th. t - 37.5%), building materials, machines and equipment are practically not shipped. Food is mainly imported from the USA, in some years round timber and metal scrap were exported from Tiksi (in 1997 - 4.7 and 5.3 Th. t correspondingly).

In the past 7-8 years shipments to the ports of the Anadyr Bay decreased almost 10 times on the average (Table 4).

3.2. Sea ports

There are 8 sea ports in Sakha (Yakutia) and Chukotka: Tiksi, Zeleny Mys, Pevek, Mys Schmidta, Provideniye, Egvekinot, Anadyr and Beringovsk. Besides, there are not less than 30 sea points, where unloading from the sea ships is carried out to the shore, lacking facilities. Handling of the sea ships is also carried out on the roadsteads of the rivers Yana and Indigirka; freight operations are implemented with the help of river ships, which deliver cargoes to the points of river basins.

Sea ports of the region under consideration have their own characteristic features:

- seasonal operation from 80 to 150 days on the NSR and 130-230 days in the Anadyr Bay;
- ports operation is complicated by ice phenomena in the beginning of the navigation period and in the end of it;
- the majority of ports handle mainly arriving cargoes, and only Beringovsk is specialized in re-loading coal to be dispatched.

Data on freight turnover of each port for the period 1985-1997 are given in Tables 3, 4.

Tiksi - is located in the bay with the same name in the Laptev sea, in the south-eastern part of the Bulunkan Bay, 45 km from the Lena river delta. Depths in the eastern and central parts of the bay make up from 7.5 to 9.8 m, in the western - 5.7 m. The depth of the natural fairway, leading to the port (its length is 9.7 km) is 9 m at the inlet, and it decreases gradually towards the shore to 6.5-5.5 m. There are two roadsteads in the port - inner and outer; partial unloading of ships is carried out in the outer harbour (5-7 miles from the shore). It makes it possible for the ships to pass to

the inner harbour with the depths up to 5 m. Duration of the navigation is 95-105 days (VII-IX).

Tiksi is the re-loading point for the cargoes, delivered on sea ships from the ports of the North and Far East, destined for the points of the rivers Yana, Lena and for local organizations. Round timber for export, shipped along the NSR to Japan ports, is re-loaded from the river ships or rafts on sea ships in this port.

Cargo shipments from the Lena river to the points of the rivers Olenek, Yana and Indigirka are carried out by river ships without re-loading in Tiksi.

Railroad from BAM to Yakutsk (AYaM) will bring some changes into the existing scheme of shipments in the north of Sakha (Yakutia) after putting it into operation (it will happen after 2000). A significant part of shipments to the northern areas of the republic will be carried out along this new railroad with further re-loading in Yakutsk on the river ships of mixed navigation, which will deliver cargoes to the consumers in numerous points of the sea coast and river basins. Such a scheme will allow to lessen the distance, to which cargoes imported from the South-Eastern Asia are transported, by 2000 km, and the distance, to which timber is exported from Sakha (Yakutia) – by almost 6000 km.

There are two piers in the port with capacity to handle 0.15 million t of cargoes and with depths 5.8 m. Besides, there are some re-loading complexes, which were constructed earlier and now they are idle because there are no cargoes. There are several facilities for servicing river ships of local and subsidiary fleets.

Due to shallow water of the moorings a significant part of cargoes is handled at the roadsteads. Ships are serviced with the help of ship's cargo facilities and floating cranes. There is an excessive amount of lifting-transport equipment in the port Tiksi, and the major part of this equipment has become physically and morally obsolete and is idle.

In the period since the end of 80s the cargo turnover of the port decreased more than 15 times. In 1997 only 43.0 Th. t of cargoes was handled, and according to the preliminary information this volume was even smaller in 1998.

Zeleny Mys is the port on the right bank of the Kolyma river, located 80 miles from the mouth of the river. Its destination is re-loading and storage of cargoes, shipped by sea for the consumers of Bilibinsky district of Chukot Autonomous District and other points of the Kolyma river basin (Sakha (Yakutia).

Dry cargoes are handled at 6 moorings of bankhead construction with total length 607 m. The port disposes a sufficient park of re-loading equipment, storage areas, port fleet.

The scheme and conditions of work of the port are complex for a number of reasons, first of all because of insufficient depth (4.3 m) of the river sandbar, which makes it impossible for large-capacity transport sea vessels to call at the port. Cargoes, delivered on these vessels, are re-loaded on the roadstead (sandbar of the Kolyma river – roadstead Anabarchik) or in the port Pevek on the ships with the draught not more than 4.2 m. The latter deliver cargoes to the port Zeleny Mys or (river ships) directly to the consumers in the ports of the middle reaches of the Kolyma. About 70% of cargoes

shipped to Kolyma by sea are destined for the enterprises and population of Bilibinsky district of Chukot Autonomous District. All cargoes for Bilibino are re-loaded from sea ships to the shore in the port Zeleny Mys and then delivered to consumers.

Delivery of re-loaded cargoes from the port Pevek to the port Zeleny Mys is carried out by sea ships because of severe hydrometeorological conditions.

Navigation period on the Kolyma river does not exceed 80-90 days; it is limited by the flash flood and drifting of ice in spring (VI-VII) and river freezing in the first decade of October.

Freight turnover of the port decreased 10 times in the period since 1990 and made up 39.0 Th. t in 1997, including 14.5 Th. t of oil products shipped by tankers.

Pevek is the main port of the Northern Chukotka. It is conveniently located in the Chaunskaya Bay of the East-Siberian sea, well protected by the isles Ayon, Bolshoy and Maly Rautan from the north. Roadstead depths are 14-19 m, approach – 25 m, mooring depths – from 7.85 to 10.25 m.

Duration of the navigation period is normally 120-130 days (VII-X), in some years it is 150 days. Sailing to Pevek is possible all year round with the help of powerful ice-breakers.

Modern re-loading complexes were created in 1963-1969. They include a mooring wall 500 m in length and one subsidiary mooring 20 m in length. Installed capacity of re-loading complexes is 0.95 million t, actual use – 0.66 million t, given the freight turnover is maximum (1989). Presently, the freight turnover decreased to 0.15 mill. t.

The sea port Pevek is the constituent part of the transport junction of the Northern Chukotka. The port has communication with the airport Apapelkhino (11 km) and settlements of Chaunsky district (Valkumei, Komsomolsky, Krasnoarmeisky, Yuzhny, etc.) provided by the net of highways, functioning all year round. In the winter period zimnik is functioning from Pevek across Chaunskaya Bay and across the settlements of Chaunsky district. Small volumes (10-20 Th. t) of cargoes are delivered to industrial enterprises and population of the Bilibino group of mines.

An oil base with large park of reservoirs and a metallic mooring for servicing large-capacity sea tankers is located in direct vicinity of the port.

Pevek is the most important link of the Arctic marine transport system (AMTS). Beside re-loading complexes, equipped with machines and storage facilities, bases for the service of sea transport vessels and ice-breakers are located here (bunkering operations, supply, urgent repair operations).

The port is specialized in handling cargoes, shipped on sea vessels from the ports of Primorye, European North, Tiksi, and others to the enterprises of mining industry of Chaunsky district and the town of Pevek, as well as in re-loading and storing cargoes for enterprises and settlements of the lower and middle reaches of the Kolyma river.

Small volumes of tin concentrate, metal scrap, empty containers and other cargoes are shipped via Pevek to the ports of Primorye. There is a transport line functioning between the ports Zeleny Mys and Pevek, along which coal is shipped from Zyryanka. Coal accounts for over 50% of the port freight turnover.

The port Pevek is now in a very hard crisis situation. The freight turnover

decreased 4 times and continues to decline.

Mys Schmidta is located on the coast of the Chukchi sea in the south-eastern part of the Long Strait. Its destination – re-loading of cargoes, delivered on sea ships for the enterprises of mining industry, non-ferrous metallurgy of Schmidtovsky district. The area of the port comprises 3 shallow creeks: Eastern, Northern and Western. Freight operations are carried out on the roadstead of the Eastern creek, 5-6 cables from the shore.

Total duration of the navigation period is 85-100 days (VII-IX). The first half of the navigation period, when blocked and drifting ice protects the creek from the wash, is most favourable.

Unloading is carried out on the port ships, which unload cargoes at the moorings (there are several moorings in the Eastern and Western creeks).

Unloading of tankers is also carried out on the roadstead with the use of small-capacity tankers of "Partizansk" type.

The port comprises the port point Ryveem, located 110 km to the west from Mys Schmidta. Cargoes for Polyarninsky metal works are unloaded here. Cargoes are unloaded on self-propelled ships, which are unloaded at two moorings in the artificial reservoir (90 x 160 m) with the approach canal 240 m in length.

Arriving cargoes make up 98% of the freight turnover of the port. Coal and oil products on tankers make up 85% of arriving cargoes.

In the period of maximum freight turnover (1989) the port was sufficiently equipped with modern port ships and re-loading facilities (pneumatic wheel and crawled cranes with lifting power from 6 to 25 t, excavators, bulldozers, automatic loaders).

Industrial enterprises of Schmidtovsky district stopped or almost stopped their production activity, and for this reason the freight turnover of the port decreased. The port is now in a dilapidated state because it is inoperative and climatic conditions are severe. Significant part of port ships and re-loading facilities is lost.

Provideniye is located in a well protected deep bay of the same name in the southern part of the Chukchi Peninsula. Its destination is re-loading of cargoes delivered on sea ships for meeting needs of the enterprises, organizations, settlements of Providensky district. Navigation period is limited to 200-230 days (V-XI). Round-year sailing of ice-breaking transport vessels supported by ice-breakers is possible.

There are three re-loading complexes in the port – N1 for bulk cargoes, its length is 120 m, depth – 9 m; N 2 – for general cargoes, its length is 102 m, depth – 8.5 m; N 3 – for bulk and timber cargoes, its length is 140 m, depth – 7.5 m; N 5 – oil pier with the length 15.5 m, depth – 6.5 m, and two piers 23.0 m each and depths – 2-3 m for servicing subsidiary and passenger fleet. All mooring facilities are in unsatisfactory condition.

There are ship-repairing shops, bunkering oil base, and diesel-electric station.

Re-loading equipment (bridge and self-propelled cranes, automatic loaders, bulldozers) supply the present freight turnover. But the state of machines and

mechanisms, as well as of storage facilities and shops is unsatisfactory.

Freight turnover of the port was maximum in 1990 and made up 213.8 Th. t, including 154.5 Th. t of arriving cargoes, of them coal - 50.5 Th. t and oil products on tankers – 32.8 Th. t. In 1997 the port freight turnover is 37.1 Th. t, including coal – 23.7 Th. t and oil products – 9.3 Th. t. In the future, the role of the port Provideniye as the basic port, providing deliveries to the points of Providensky district, will be restored.

Egvekinot is situated in the apex of the Krest Bay (in the north of the Anadyr Bay). Its destination is re-loading of cargoes, required to meet needs of enterprises, organizations and settlements of Iultinsky district.

The port has a pier of 145.0 m length (moorings 1, 2). The depth at the cordon is 9.5 m. Mooring 1 is used for servicing ships with oil products and coal. Mooring 2 – ships with general cargoes and timber.

Duration of the navigation period is 165-170 days (VI-XI). Transport ships can call at the port in any season due to powerful support of ice-breakers.

There is a motor road with gravel covering from Egvekinot to Iultin, and motor zimnik – to the Arctic coast. The state of this road does not meet even very elementary requirements. The problem of building a regular motor road from the port Egvekinot to Mys Schmidta was discussed not once. Evidently, the project will not be implemented in the near future.

In 1989 freight turnover of the port was maximum and made up 353.4 Th. t, including 330.0 Th. t of arriving cargoes; 100.0 Th. t of general cargoes; 225.0 Th. t of coal; 28.0 Th. t of wet cargoes. By 1997 freight turnover decreased 10 times and made up 33.0 Th. t, including 29.0 Th. t of coal. Egvekinot handles mainly arriving cargoes.

Anadyr is the largest port of the Eastern Chukotka. It is situated in the apex of the Anadyr estuary. Its destination is re-loading of cargoes for enterprises, organizations and settlements of the Anadyr river basin and the Anadyr Bay coast.

Navigation period is 125-130 days (VII-X).

Depths of the bar at the estuary inlet are limited to 7 m.

Complex ice conditions in the winter period in combination with the limited depths of the bar make it impossible for the sea ships to sail to the Anadyr port in the period from November till May.

The port Anadyr has communication with the base ports of Primorye, as far as delivery of general cargoes and oil products is concerned. The port is also suitable for servicing ships of the port fleet, including small-capacity ships, providing delivery of supply cargoes, arriving on sea ships from Primorye, to the consumers in numerous points of the Anadyr river basin. Shipments of coal, building materials, produced at the deposits in the upper reaches of the river, are shipped in the opposite direction to the port Anadyr. Significant part of coal is shipped via the port Anadyr on sea ships to Egvekinot and other points of the north-western coast of the bay.

In 80s the freight turnover of the port Anadyr was stable and remained within the limits of 450-465 Th. t. In 1990 it was maximum and reached 466.2 Th. t, including

275.9 Th. t of arriving cargoes (general cargoes – 131.3 Th. t, wet cargoes – 137.0 Th. t); 190.3 Th. t of dispatched cargoes, including 156.7 Th. t of coal. Hundreds of Th. t of cargoes are dispatched on the ships of the port fleet annually, including coal. Volume of shipments of cargoes from Anadyr to the ports of Primorye is not large – 20-30 Th. t (empty containers and other cargoes).

The freight turnover of the port has been decreasing since 1991. According to incomplete information it was only 156.0 Th. t in 1997, including coal (dispatch) – 116.0 Th. t.

The volume of arriving oil products was 16.0 Th. t.

The port comprises two loading-unloading areas (LUA-1, LUA-2), located correspondingly on the right and left sides of the Anadyr estuary. There are about 1000 m of mooring facilities of different specialization and technical characteristics in the port. The port is suitable for servicing modern sea vessels with the draught up to 7.0 m. A number of shallow-water moorings is used to service the port fleet.

The port Anadyr is sufficiently equipped with the re-loading equipment.

Beringovsk is situated in the apex of the Ugolnaya Bay in the south-west of the Anadyr Bay. Its destination is dispatch of bituminous coal, produced at the mine "Beringovskaya", and handling of cargoes, delivered for the enterprises, organizations and population of the Bering Bay. Navigation period is 190 days (VII-XII).

Sea transport vessels are serviced at the roadstead (2 miles from the shore) with the support of the port ships. There is an artificial reservoir, protected by the breakwater, created to service the ships of the port fleet. Loading of the port ships (self-propelled and non-self-propelled) with coal is carried out with the help of conveyers. Coal is transported to the port storage area in the same way.

General cargoes are unloaded from the scow to the mooring or trucks by cranes and transported to the storehouse.

Oil products are unloaded from tankers with the help of the scow, and then are pumped out to the reservoirs on the shore.

The volumes of coal, dispatched for the consumers of the Arctic and East Chukotka, as well as Kamchatka, are decreasing at present. In 1997 the freight turnover decreased more than 2 times in comparison with 1980, when 642.5 Th. t of coal was dispatched (total freight turnover – 724.6 Th. t), and made up 287.0 Th. t, including dispatched coal – 281.0 Th. t.

Trans-shipment of cargoes for consumers of Sakha (Yakutia) and Chukotka from the railroad transport to the sea ships via base sea ports of Primorye.

Oil products are handled at the specialized re-loading complexes of the port Nakhodka. Port facilities of other departments in Vladivostok and other ports are used in case of necessity.

Re-loading of dry cargoes is carried out at the port facilities of the ports Vanino, Vladivostok and Nakhodka. Distribution of the Arctic cargoes between these ports is explained by the specialization of these ports, facilities of the portside storage bases, where cargoes are concentrated in advance, and by a number of other reasons. Traditionally, timber, chemical, supply cargoes, including packed oil products, are re-

loaded in the port Vanino. Building and technical cargoes are shipped via the port Nakhodka. Food, consumer goods, partially machines and equipment are shipped via the port Vladivostok. But there is no strict distribution of cargoes between the ports. In some cases small volumes of Arctic cargoes are handled at the facilities of the ports Vostochny and Posyet.

The above mentioned sea ports of Primorye were created and developed in view of handling Arctic cargoes. But, as far as the share of the latter in the freight turnover of these ports is insignificant, and taking into account large reserve capacity of port facilities in the region, as it is seen from Table 5, there are no reasons to apprehend the deficit in port facilities in the perspective period under consideration.

In contrast to the Arctic ports, re-loading complexes of Primorye suffered from the economic crisis to a smaller extent. In 90s construction of a number of new objects was completed in the ports Vladivostok and Nakhodka, reconstruction of individual complexes is going on.

Domestic cargoes, first of all seasonal cargoes to the Arctic and points of the East Chukotka, being extremely important from the national point of view, are handled at the port facilities out of turn.

Table 5

Characteristic of main re-loading complexes of the Primorye sea ports
(as of 1.01.98)

	Unit of measurement	Availability of re-loading complexes	Actual use
Vladivostok			
Number of moorings	number	14	14
Length	long metre	2881	2881
Installed capacity	million t	5686	3263
Nakhodka			
Number of moorings	number	18	14
Length	long metre	2950	2950
Installed capacity	million t	7.237	4.957
Nakhodka, oil products			
Number of moorings	number	5	5
Length	long metre	844	844
Installed capacity	million t	5.100	5.100
Vanino			
Number of moorings	number	15	15
Length	long metre	2302	2302
Installed capacity	million t	12.215	4.540

Table 5 (continued)

Vostochny			
Number of moorings	number	13	13
Length	long metre	3193	3193
Installed capacity	million t	15.700	9.075
Posyet			
Number of moorings	number	3	3
Length	long metre	435	435
Installed capacity	million t	0.280	0.278
Primorye, total			
Number of moorings	number	68	68
Length	long metre	12605	12605
Installed capacity	million t	46.218	27.213

4. Forecasts of the economic development of regions, gravitating to the NSR track

General economic situation in Russia gives no hopes for the revival of the economic growth in the regions under consideration within the end of this century. At the best it will be possible to stop production decline in basic sectors and population outflow (especially from Chukotka) in 1999-2000.

While forecasting the economic development of the regions under consideration for the period 2000-2015 a number of documents were used. Among them are the Programme of social-economic development of the areas of the Extreme North (1994), Programme of social-economic development of the Far East and Trans-Baikal region (1996), Programme of social-economic development of the Republic of Sakha (Yakutia) - 1995, draft Programme of social-economic development of Siberia (1998).

The forecast of quantitative indices is based on the two different scenarios of social-economic development:

- Pessimistic scenario. Outflow of the population and industrial production decline will continue till 2000. Stabilization of the economic situation is expected in the period 2001-2005 with further slow growth by 2015.

- Optimistic scenario. Stabilization of the situation is expected by 2000. More intensive involvement of the Arctic zone resources in the sphere of interests of the Asia-Pacific countries is supposed. Probably, diamonds mining will be developed in the region of the Anabar shield, production of oil and gas on the Bering sea shelf, restoration of the complexes of non-ferrous metallurgy in the Yana and Chaunsky sub-regions.

Along with home capitals (Joint-stock company "Almazy Rossii - Sakha", Joint-stock company "Zoloto Yakutii") attraction of investments from the APR is expected. It is supposed, that along with increasing personnel, working in shifts and expeditions, the number of permanent population will start to restore.

The forecast of production growth rates according to two basic and one intermediary scenarios is given in Table 6.

Table 6

Forecast of production growth in the eastern regions, gravitating to the NSR (%)

Scenarios	2000	2005	2010	2015
1. Pessimistic	100	100-105	110-115	120-125
2. Average	100	110-115	130-160	160-210
3. Optimistic	100	120-125	150-200	200-300

Taking into consideration close correlation dependence, existing between macroeconomic indices of the regions (gross domestic product, volumes of industrial, agricultural output) and transport operation these indices has formed the base of cargo shipments forecast.

Possible directions of the development of 9 regions, gravitating to the Eastern section of the NSR are given below.

1. Arctic area of West-Yakutian sub-region comprises Olenek and Anabar administrative districts of Yakutia. Its territory is 111 Th. km^2, population - 5.0 Th. Transport servicing is carried out mainly by seasonal kinds of transport: sea and river vessels of mixed navigation in the Laptev sea from Tiksi to the Khatanga Bay, by small river ships along the rivers Olenek and Anabar, by motor zimnik from Aikhal to Saskylakh, by planes of local air lines.

Development perspectives are connected with the development of diamond-placers, Tomtor niobium deposit, production of oil and gas is possible.

2. Nizhne-Lensky sub-region comprises Bulunsky and Zhigansky administrative districts of Yakutia. Its territory is 361.5 Th. km^2, population - 18.9 Th.

The basis of production specialization is transport- distribution functions, carried out via the sea port Tiksi by the Arctic State Marine Shipping Company and the Joint river shipping company of the Lena river. There is an airport of federal significance in Tiksi, carrying out flights along the high-latitudinal route.

There are prerequisites for the development of reindeer breeding, fishing in the region. Organization of production of bitumen, reserves of which are very large, as well as oil and gas production are possible in the future.

3. Yansky sub-region comprises the territories of Ust-Yansky and Verkhoyansky administrative districts of Yakutia, located in the basin of the Yana river. The territory of this sub-region is 310.7 Th. km^2, population - 40.0 Th. Until recently it was one of the most intensively developing regions of gold-mining and tin-mining industry. Deposits of mineral resources are characterized by the presence of various elements, and their complex extraction could make it possible to increase efficiency of their development. Lack of commercial reserves of power resources (except for hydro-electric power resources) is a negative point. It caused the necessity to deliver bituminous coal from the central regions of Yakutia (Dzhebariki-Khan, Sangary).

Transport servicing is carried out along the Yana river from its mouth to Batagai, and its depths allow to use the ships of mixed navigation without re-loading at the mouth sand-bar, which sail from the Lena river to Ust-Kuiga. There are some regular motor roads and motor zimniks. Organization of regular motor road communication from Khandynga to Verkhoyansky industrial unit is expedient. Airport Deputatsky is suitable for landing of heavy aircrafts.

Development perspectives are connected with the restoration and development of gold and tin-mining in Kular and Deputatsky areas, involvement of Agypkinskoye copper-tungsten deposit, etc.

4. Nizhne-Indigirsky sub-region comprises Momsky, Allaikhovsky, and Abyisky administrative districts of Yakutia. Its territory is 280.1 Th. km^2, population - 11.1 Th. There is a large airport Chokurdakh - one of the main airports of the high-latitudinal route. In the future it is possible to extend Kolymskaya motor road from the south to Ust-Nera.

Prospectives for the region are connected with the restoration and development of gold, silver, antimony and other non-ferrous metals mining. Because of rapids on the Indigirka river transport servicing is carried out by sea ships up to the sand-bar of the Indigirka with re-loading to small river ships and further delivery of cargoes to settlements.

5. Kolymo-Zyryansky sub-region comprises Verkhnekolymsky, Srednekolymsky, and Nizhnekolymsky administrative districts of Yakutia. Its territory is 361.5 Th. km^2, population - 28.7 Th.

Main economic sector is bituminous coal production in the region of Zyryanka (160 Th. t). Coal of Zyryanka meets power needs of Bilibinsky and Chaunsky sub-regions, Chukot Autonomous District. Provision of Nizhne-Indigirsky and Yansky sub-regions (loading of return empty trips along the section Tiksi - Pevek). The main transport way is the Kolyma river, its lower reaches are suitable for small sea vessels, calling at the port Zeleny Mys, where coal is re-loaded from the river ships to the sea ships, cargoes are delivered to Chukotka along the motor road Zeleny Mys - Bilibino. Main airport, servicing the high-latitudinal route, is located in the settlement Chersky.

There are large reserves of high-quality gypsum, polymetals in the region. It is rather prospective with regard to oil and gas.

6. Bilibinsky sub-region occupies the territory of Bilibinsky administrative district of Chukot Autonomous District, its territory is 174.7 Th. km^2, population - 17 Th.

Main branch of economy is mining of gold-placers in the basins of the rivers Anui and Omolon. Power needs are met to a significant extent by Bilibinskaya nuclear power station, allowing to reduce expensive delivery of coal and liquid fuel. Nevertheless, needs of the population and small boiler-houses are met partially by deliveries of bituminous coal from Zyryanka. Transport communications are provided mainly by motor transport along the motor road Zeleny Mys - Bilibino, motor zimnik Pevek - Bilibino. Airport Bilibino is suitable for heavy aircrafts.

A project on turning motor zimnik Pevek - Bilibino into the motor road functioning all year round in the future is considered.

7. Chaunsky sub-region occupies the territory of Chaunsky administrative district of Chukotka (77.9 Th. km^2, population - 19.9 Th.). It is also one of the main tin and gold-mining regions of the country. Supply cargoes are shipped via port Pevek and delivered by the network of motor roads and motor zimniks. In the future it is possible to deliver cargoes along the route of Chukot highway Egvekinot - Iultin – Mys Schmidta - Pevek - Bilibino. Airport Pevek is suitable for heavy aircrafts.

Development prospectives are connected with the development of Pyrkakaisky tin deposit and some others. It is feasible to organize extraction of mercury, other accompanying mineral components.

8. East-Chukot sub-region (Iultinsky, Chukot, Providensky administrative districts of Chukotka) occupies the territory 171.3 Th. km^2, population - 35.2 Th.

Recently non-ferrous metallurgy was developed here (Iultinsky tin-tungsten mining enterprise, gold-mining in the area of Mys Schmidta). Sea ports and port points (Provideniye, Egvekinot, Mys Schmidta, etc.), motor roads and motor zimniks, network of airports of local airlines (LAL) form the base of the transport system.

If the volumes of traffic are sufficient, organization of the year round navigation is possible in the port of Egvekinot. The route of the hypothetical Trans-continental railroad (design with the tunnel through the Bering Strait) lies across the territory of this sub-region.

Production specialization of the region should be maintained in the future.

9. Anadyrsky sub-region occupies the territory of Anadyrsky and Beringovsky administrative districts of Chukotka. Its area is 297.6 Th. km^2, population - 34.1 Th.

Main sector of economy is fuel industry. The sub-region is the coal base of Chukotka. Coal of Beringovskoye and Anadyrskoye deposits is produced by open-cut mining. Reserves are sufficient to provide any required volume of production. Coal of Beringovskoye deposit is used in all sub-regions of Chukotka (except for Bilibinsky), on the eastern coast of Kamchatka.

The basins of the rivers Anadyr, Velikaya, the Bering Sea shelf are most perspective with regard to oil and gas among the Arctic regions of the Northeast.

Transport system of the sub-region is oriented to the use of the sea routes (ports of Anadyr, Beringovsky), the Anadyr river (navigation to the port Markovo), air transport (federal airport Anadyr, a number of airports of local airlines).

5. Perspectives of transport services in the Arctic zone of the Northeast

5.1. Scenarios of transport services in the regions

The choice of rational scenarios of transport services in the Arctic areas of the Far East was based on technical-economic calculations, made by the Research Centre of Integrated Transport Problems for the Programme of social-economic development of the Far East and Trans-Baikal region, and on the adjusted rational schemes of cargo deliveries to the Arctic regions of the Far East.

Calculations were made for each sub-region, serviced by the transport network of the Russian Northeast.

Yansky sub-region (calculation centres – Kular, Deputatsky, Batagai).

1. Railroad-river-motor road scenario – the use of mixed vessels (MV) with re-loading in Osetrovo (after the completion of railroad construction – in Yakutsk) up to Kular, Ust-Kuiga, Batagai – transportation by river transport and to Deputatsky – by motor transport;

2. Railroad-sea-river scenario – shipping cargo by sea vessels from Murmansk, Arkhangelsk up to the Yana river bar, re-loading on river transport, transportation to Kular, Ust-Kuiga, Batagai and further – delivery by motor transport to consumers;

3. The same scenario with re-loading in the ports of the Far East (Nakhodka, Vanino).

4. Railroad-river-motor road scenario via Osetrovo (Yakutsk) to Khandyga and further – transportation by motor transport to consumers (Batagai, Deputatsky).

Nizhne-Lensky sub-region (calculation centre – Tiksi).

1. Railroad-river scenario.

Transportation by railroad from all regions of Russia to Osetrovo (Yakutsk) and further – on river vessels to Tiksi.

2. Railroad-sea scenario from the West (re-loading in Arkhangelsk, Murmansk, and then – on sea vessels to Tiksi).

3. Railroad-sea scenario from the East (re-loading from railroad transport on sea ships in Vanino, Nakhodka, then – to Tiksi).

Arctic part of the south-western sub-region of Yakutia (calculation centres – Saskylakh, Olenek).

1. Railroad-river scenario with re-loading on river ships in Osetrovo (Yakutsk), further – on mixed vessels (MV) to the bars of the rivers Olenek, Anabar, delivery to the destination points on river ships.

2. Railroad-river-motor road scenario – re-loading on river ships in Osetrovo, further – on river ships to the port Lensk, then – by motor transport by the motor road Lensk-Mirny-Aikhal and motor zimniks Aikhal-Olenek, Aikhal-Anabar.

Nizhne-Indigirsky sub-region (calculation centres – Chokurdakh, Moma).

1. Railroad-river scenario – re-loading of cargoes in Osetrovo (Yakutsk), then on MV to the Indigirka river bar and on common river vessels to Chokurdakh and Moma.

2. By marine transport from the West to the Indigirka river bar with re-loading on river ships and delivery to Chokurdakh and Moma.

3. The same, re-loading of cargoes from railroad transport to the sea ships in Vanino, Nakhodka. By marine transport from the East and then according to the

second scenario.

Nizhne-Kolymsky sub-region (calculation centres – Zyryanka, Zeleny Mys).

1. Railroad-river scenario via Osetrovo (Yakutsk) with the use of MV on the section to Zeleny Mys and river vessels to Zyryanka.

2. Railroad-water scenario via Osetrovo (Yakutsk) with the use of river transport on the sections Osetrovo (Yakutsk) – Tiksi and Zeleny Mys – Zyryanka and of marine transport on the section Tiksi – Zeleny Mys.

3. The same, with re-loading of cargoes from railroad transport to marine transport in the ports Murmansk, Arkhangelsk.

4. The same, with re-loading of cargoes in the ports Vanino, Nakhodka.

Chaunsky sub-region (calculation centre Pevek).

1. Railroad-sea scenario with cargoes re-loading on sea ships in the ports Vanino, Nakhodka.

2. The same, with cargoes re-loading in the ports Murmansk, Arkhangelsk.

3. Railroad-river scenario with cargoes re-loading in Osetrovo (Yakutsk) and use of MV on the section Osetrovo (Yakutsk) – Pevek.

4. Railroad-sea-motor road scenario (if it is feasible to build East-Chukot main highway by stages in the future and to organize round-year navigation in the port Egvekinot), motor road Egvekinot-Iultin-Polyarny-Pevek.

Bilibinsky sub-region (calculation centre Bilibino).

1. Railroad-sea-motor road scenario – cargoes transportation via ports Vanino, Zeleny Mys, Pevek and further – by motor transport along the motor road Pevek-Bilibino.

2. The same, with re-loading cargoes from railroad to marine transport in the ports Arkhangelsk, Murmansk.

3. Railroad-river-motor road scenario with re-loading of cargoes in Osetrovo (Yakutsk) and use of MV on the section Osetrovo (Yakutsk) – Zeleny Mys, Pevek, and further – by motor transport to Bilibino.

4. Railroad-sea-motor road scenario with re-loading in the ports Vanino and Egvekinot, and further – by motor transport to Bilibino.

East-Chukot sub-region (calculation centres – Iultin, Polyarny).

1. Railroad-sea-motor road scenario, implying cargoes shipments by railroad and sea transport, re-loading of cargoes in the sea ports Vanino, Nakhodka, transportation by sea to the ports Egvekinot, Mys Schmidta and further – by motor transport to Iultin, Polyarny.

2. The same, with cargoes re-loading in the ports Arkhangelsk, Murmansk.

3. Scenario, envisaging organization of round-year navigation in the port Egvekinot and building of hard road Egvekinot-Iultin-Polyarny-Mys Schmidta with further extension to Pevek-Bilibino and Zeleny Mys.

The results of technical-economic calculations on the scenarios of cargo deliveries to Bilibinsky sub-region are given in Table 7. They are given as an example of selection of a rational scenario of transport servicing.

Table 7

TRANSPORTATION OF CARGO TO BILIBINO REGION

[1] of variant	Scheme of transportation points of transfer	Distance of cargo transportation, km				Transportation expenses, $/metric ton					Notes
		Total	Including			Total	Including				
			Railway	Sea, river	Motor cars		Railway	Sea [1]	River	Motor cars	
1	2	3	4	5	6	7	8	9	10	11	12
General cargo (in 20 t containers)											
1 à	railway-sea-motor car; Vanino, Pevek	10159	4500	5293	362	361.8	65.5	165.1/40.8	-	131.2	Transportation expenses (TE) for river vessels are calculated as 0,25 of middle TE for sea vessels.
1 b	railway-sea-motor car; Vanino, Zeleny Mys	10487	4500	5717	270	339.2	65.5	176.0/40.8	-	97.7	
2 à	railway-sea-motor car; Murmansk, Pevek	10246	4500	5384	362	360.8	65.5	164.1/37.5	-	131.2	
2 b	railway-sea-motor car; Murmansk, Zeleny Mys	9583	4500	4813	270	313.9	65.5	150.7/37.5	-	97.7	

Notes:

1. The numerator – total expenses, including shipment and disembarkation, the denominator – expenses for ice-breakers convoy.

Table 7 (continued)

1	2	3	4	5	6	7	8	9	10	11	12
3 à	railway-river-motor car; Murmansk, Zeleny Mys	10165	4500	5395	270	359.0	65.5	-	195.8 217.4	97.7	TE[1] for variants 1a, 1b (if the East-Chukotca railway will be build) are calculated as TE[2]/1,35 (TE[2] transportation expenses for existing scheme of transportation, which includes motor-cars transportation by winter roads)
3 b	railway-river-motor car; Yakutsk, Zeleny Mys	8186	7500	3416	270	298.7	65.5	-	133.5 165.8	97.7	
4	railway-sea-motor car; Vanino, Egvekinot	9886	4500	4035	1351	526.7	65.5	104.7/9.9	-	356.5	
Oil											
1 à	railway-sea-motor car; Vanino, Pevek	10159	4500	5293	362	215.0	29.0	47.2/11.4	-	138.8	
1 b	railway-sea-motor car; Vanino, Zeleny Mys	10487	4500	5717	270	217.9	29.0	50.1/11.4	-	100.7	
2 à	railway-sea-motor car; Murmansk, Pevek	10246	4500	5384	362	218.4	29.0	48.6/11.2	-	138.8	

2. The disembarkation – expenses for river-sea type vessels; expenses for icebreakers convoy by NSR are given as $28.6 per ton for general cargo and $8.26 per ton for oil

Table 7 (continued)

1	2	3	4	5	6	7	8	9	10	11	12
2 b	railway-sea-motor car; Murmansk, Zeleny Mys	9583	4500	4813	270	174.3	29.0	44.6/11.2	-	100.7	
3 à	railway-river-motor car; Osetrovo, Zeleny Mys	10165	4500	5395	270	177.5	29.0	-	47.8 62.1	100.7	
3 b	railway-river-motor car; Yakutsk, Zeleny Mys	8186	4500	3416	270	160.0	29.0	-	31.0 40.3	100.7	
4	railway-sea-motor car; Vanino, Egvekinot	9886	4500	4035	1351	436.0	29.0	28.5/0.5	-	379.0	

assessment of comparison and choice of rational scheme of transport services in the sub-region under consideration were carried out on the basis of tariffs, as of 1.01.1998, for the average distance of cargoes transportation by railroad transport – 4.5 Th. km (general cargoes, transported in containers with carrying capacity 20 t, and oil products).

5.2. Perspectives for development of the transport service systems

The following factors will influence the choice of the system of transport servicing of the Arctic zone of the northeast in the future till 2010-2015:

- sharp decrease of the shipments volumes along the NSR after 1990;
- aggravation of the economic situation in the region, caused by significant decline of industrial output, partial or complete closing of enterprises;
- possible scenarios of overcoming the crisis in the country and in the region.

Decrease of shipments volumes along the NSR created a difficult situation in transport servicing of the Arctic zone regions in the northeast. On the one hand, there appeared reserves in capacity of the NSR (especially of the port-wharf facilities), on the other hand, wear of transport vessels and ice-breakers is increasing, and after 2005 the process of their writing-off will sharply accelerate. It will limit the volumes of shipments.

Measures, envisaged within the Federal target programme "Revival of the Russian Merchant Fleet", do not secure complete and timely solution of the problem of the Arctic transport and ice-breaking fleet renovation because of insufficient financing.

For all these reasons it is necessary to carry out an integrated assessment of the rational use of the NSR in transport servicing of the eastern sector of the Arctic (in co-ordination with the development of other kinds of transport).

Radical improvement of the transport service system in Sakha (Yakutia) and other northern regions of the Far East is conditioned by the construction of Amur-Yakutsk mainline.

The extension of the railroad to the deep-water section of the Lena river near Yakutsk will make it possible to reduce the distance of the river ships trips by 4 Th. km in comparison with the existing route from Osetrovo, to increase by more than one third the productivity of ships in the short navigation period in the arctic sub-regions. Conditions will be created for the use of mixed vessels of "river-sea" type without way adding to the load. It will allow to reduce transport costs.

The problem of construction of Chukot highway (Egvekinot-Mys Schmidta-Polyarny-Pevek-Bilibino-Zeleny Mys)[2], with the length – 1350 km, and organization of the year-round navigation in the port Egvekinot was discussed not once with regard to the improvement of transport servicing of the districts of Chukot Autonomous District. The drawback of these measures is that they are highly capital-intensive. Therefore, we consider them only as a possible variant within the optimistic scenario of overcoming the economic crisis in the region.

The following rational schemes of cargoes delivery to the individual sub-regions

[2] In 1995-1996 Administration of Chukot Autonomous District financed spreading of the earth bed of the road on the section Pevek-Bilibino.

of the Arctic zone of the northeast were determined in the result of the carried out technical-economic comparison.

For the group of Arctic sub-regions of Sakha (Yakutia) (Nizhne-Lensky, Anabarsky, Yansky, Nizhne-Indigirsky, Kolymo-Zyryansky) and Bilibinsky sub-region of Magadan oblast it is expedient to carry out shipments of all cargoes, transported from the regions of the Ural and Siberia, by railroad and river transport with re-loading in the port Osetrovo and Yakutsk (after the completion of the railroad construction).

Delivery of cargoes to these regions by the sea transport along the NSR should be regarded as a reserve variant, when dry years or disruption of navigation on the Lena river occur. Besides, traditional cargo shipments from the west, from the regions of the European part, and from the east – Far-Eastern cargoes, should be carried out by the sea transport in the future.

For Bilibinsky sub-region it is expedient to carry out shipments of general cargoes by railroad-river-motor transport means along the Lena direction with re-loading in Osetrovo (Yakutsk) and Zeleny Mys. The use of the existing railroad-river-sea-motor road scheme with re-loading in Osetrovo and further re-loading in Tiksi from river to sea vessels and delivery to Pevek by the sea transport is considered to be low-efficient because of high cost price of these shipments, including ice-breaking services. The efficiency of the NSR use depends on the tariffs.

Railroad-river-motor road scheme with re-loading in the ports Yakutsk and Zeleny Mys is the most economical variant of transport servicing of Bilibinsky sub-region with regard to transportation of general cargoes. But the realization of this variant will depend to a great extent on the financial situation of the Lena river shipping company, because replenishment of the fleet with mixed vessels requires significant investments.

According to the results of calculations, it is expedient to transport oil cargoes to Bilibinsky sub-region by railroad-sea transport means with re-loading in Nakhodka, until the construction of the railroad to Yakutsk is completed. When the railroad starts functioning, all shipments of wet cargoes should be carried out on MV along the Lena river.

Transportation of cargoes from all regions to the east of Povolzhye by railroad-sea-motor transport means with re-loading in the ports Vanino (general cargoes) and Nakhodka (wet cargoes) is expedient for the group of sub-regions of Chukot Autonomous District (Chaunsky, East-Chukot, Anadyrsky). It is also expedient for these sub-regions to transport cargoes from the European regions along the NSR via the ports Murmansk, Arkhangelsk.

The described rational schemes of transport servicing of the Arctic regions of the Russian Northeast formed the basis of the substantiation of the traffic along the NSR for the period till 2015.

There is no doubt, that in the long-term perspective the NSR will remain an important transport communication for the Russian Arctic regions. The following problems are most important:

- the increase of the efficiency of transport operation in the Arctic;
- the replenishment of the transport and ice-breaking fleet;
- operation of the sea transport under conditions of prolonged and round-year navigation.

The feasibility of construction of a transcontinental railroad (TCRR, 3840 km) for the purposes of mainly international transit shipments across the Russian territory, carried out between the developed regions of the USA and Canada and rapidly developing APR countries (China, Japan, South Korea, etc.), is considered in the long-term prospective. The cost of this mainline construction is estimated at several tens of billion dollars, including $ 16.5-26.5 billion – for the construction of a tunnel under the Bering Strait.

Construction of this TCRR will promote the economic development of Chukotka, Sakha (Yakutia) and other regions of the Russian North, and to use more fully the capacities of railway mainlines (Baikal-Amur, Aldan-Yakutian) on the mixed international routes. Major part of cargoes, transported now to the regions of Chukotka, Indigirka, Nizhnyaya Kolyma along the Lena river and the NSR, will be switched to this railroad.

For the purposes of this project implementation an international corporation "Transcontinental" was created, a concept containing main technical parameters of this mainline was developed. A number of international organizations and Russian regions showed interest in this project. But final decision on the construction of this mainline requires the adoption of an agreement at the inter-governmental level (between Russia, USA and APR countries concerned).

5.3. Sea ports

Construction of new ports in the Russian Northeast is not supposed in the considered prospective. But all operating ports require serious reconstruction and re-equipment. In the process of freight turnover increase in each port reconstruction of individual re-loading complexes should be carried out in a regular succession.

The general concept of the sea ports development in the Northeast envisages:

- significant acceleration of intensity of fleet handling, lessening of the time of cargoes handling on the basis of the introduction of modern technical means and technologies;
- securing, that main parameters of port facilities under reconstruction meet requirements of safe calling at, mooring and servicing of the ships, as well as all elements of port economy develop harmonically with due regard to their specialization.

The base ports of Primorye, communicating with the ports of the Far East (Vladivostok, Nakhodka, Vanino, Vostochny), will be studied in the future with the account of Arctic cargoes handling, but as long as the share of the latter is insignificant in the majority of ports, the envisaged technical and technological decisions may be related to the specific Arctic traffic only conventionally.

Operating base sea ports of Primorye will develop mainly due to modernization of the existing re-loading complexes. It is envisaged to create a new port in Zarubino. Several special deep-water complexes will be created here. New construction and modernization of the existing port facilities in the south of the Far East is based on the forecast estimate of perspective traffic, including international transit cargoes.

6. Prospective goods traffic on the Eastern section of the NSR

The forecast is based on scenarios of the economic development in the corresponding regions, as well as on the materials on the analysis of cargo shipments development in the past 10-15 years, taking into account the development of productive forces. It is assumed, that:

a) Russian economy will become stable before 2001;

b) growth rates of the output of mining industry, non-ferrous metallurgy, timber-industrial complex and other branches in the region under consideration will be not high;

c) construction of the railroad to Yakutsk from BAM will be finished beyond 2000.

The following steps are envisaged as far as specific directions of shipments are concerned:

- Resumption of export of timber by sea from Sakha (Yakutia) along the Lena river via the port Tiksi, import of oil products;
- export of coal from Kolyma will be resumed;
- supply of technical and other cargoes for the remained, and then revived enterprises of Sakha (Yakutian) and Chukot mining industry, as well as of food, industrial goods, equipment and other cargoes necessary to maintain life activity in the settlements, including needs of the aboriginal population, scientific objects, geological organizations and social objects, will become more intensive.

Significant change in the existing scheme of shipments in the Eastern Arctic is forecasted due to the construction of the railroad to Yakutsk. It will make it possible to increase goods traffic to the Arctic coast of Sakha (Yakutia) Republic, Krasnoyarsk krai, Chukotka along the route BAM-AYaM-Lena. The variant implying shipments of transit cargoes in the opposite direction: ports of the European North – NSR – Lena – AYaM – BAM – ports of Primorye, lessening the distance of trips by 2000 km, seems to be rather interesting. New opportunities for the transportation of raw resources from Sakha (Yakutia) to other Russian regions and for export will emerge. Realization of the new transport pattern will allow to release a significant part of the tonnage of expensive Arctic transport fleet and ice-breaking means.

The present state of the material and technical base of the marine transport becomes a hampering factor in increasing the volume of cargo shipments. Operating special transport vessels are becoming old and are written off, while new ones are not built. The potential of the tonnage operating in the Arctic is decreasing every year. The same situation is forming with regard to the ice-breaking fleet.

Data of the forecast assessment of the sea goods traffic for the period till 2015 is given in tables 8 and 9 and on figures 3-8 according to scenarios I and II, materials on freight turnovers of the ports – in tables 10-11.

Scenario I is based on the conditions of the pessimistic forecast of the economic development of Russia and its northern areas. Freight base in scenario II was formed with the account of the realization of the programmes of the economic development of Russia, made for individual regions in the middle of 90s. It is based on high growth rates in the mining industry of Sakha (Yakutian) and Chukot regions, depending on the marine transport.

Table 8

PROGNOSIS SEA FREIGHT TRANSPORT SAKHA (YAKUTIA) and NORTH CHUKOTCA, 2000 – 2015 YEARS

in thousands metric tons

	2000	2005		2010		2015	
		Var. I	Var. II	Var. I	Var. II	Var. I	Var. II
I. Coastal trade from the West of Russia, total	190	179	278	200	333	212	365
incl. in tanks	170	125	207	135	220	135	237
Includes per Regions							
to Tiksi, total	120	120	150	130	165	135	170
incl. in tanks	120	110	150	120	150	120	150
to Indigirka, total	15	15	25	18	25	18	30
incl. in tanks	15	15	25	15	20	15	22
to Kolyma, total	17	15	55	18	75	20	90
incl. in tanks	15	-	30	-	45	-	60
to Pevek, total	30	20	30	25	45	30	50
incl. in tanks	20	-	-	-	-	-	-
to Mys Shmidta, total	3	3	4	3	5	3	5
incl. in tanks	-	-	-	-	-	-	-
to other small ports, total	5	6	12	6	14	6	15
incl. in tanks	-	-	2	-	5	-	5
II. Coastal trade from the East of Russia, total	275	450	545	560	705	675	835
incl. coal	155	222	235	225	270	240	270
incl. in tanks	70	162	212	240	308	320	395
Includes per Regions							
to Mys Shmidta, total	40	55	82	68	108	110	150
incl. coal	5	10	12	15	15	13	15
incl. in tanks	20	40	50	43	70	80	110
to Pevek, total	170	265	310	310	375	345	405
incl. coal	125	180	200	190	230	205	230
incl. in tanks	25	65	80	90	110	105	125
to Kolyma, total	30	75	95	125	155	155	205
incl. in tanks	20	50	75	100	120	125	140
to Indigirka, total	5	5	5	7	10	10	15
to Tiksi-Yana, total	-	-	-	-	-	-	-
incl. in tanks	-	-	-	-	-	-	-
to other small ports, total	35	50	53	50	57	55	60
incl. coal	25	22	23	22	25	22	25
incl. in tanks	5	7	7	7	8	10	10
III. Interarctic Coastal trade, total	60	125	153	140	187	155	225
incl. coal	30	50	50	50	50	50	50
incl. in tanks	10	13	20	15	25	17	35
Tiksi-Khatanga-Anabar, total	10	15	18	17	25	20	30
incl. in tanks	5	5	6	6	10	7	15
to Tiksi-Yana, total	-	-	-	-	-	-	-
incl. in tanks	-	-	-	-	-	-	-
Tiksi-Indidirca, total	-	-	-	-	-	-	-

Table 8 (continued)

	2000	2005		2010		2015	
		Var. I	Var. II	Var. I	Var. II	Var. I	Var. II
Tiksi-Kolyma, total	5	20	30	25	35	30	45
Tiksi-Pevek, dry cargo, total	5	15	20	20	30	25	40
Tiksi-Mys Schmidta, total	-	5	10	8	12	8	15
Tiksi-other sm. ports total.	5	5	10	5	15	5	15
incl. in tanks	2	2	4	2	5	2	5
Kolyma-Pevek, coal	30	50	50	50	50	50	50
Kolyma-Indigirca, coal	-	-	-	-	-	-	
Kolyma-Yana, coal	-	-	-	-	-	-	-
Between other small ports of Russian East Arctic, total	5	12	15	15	20	17	30
incl. in tanks	-	6	7	7	10	8	15
IV. Coastal trade to the ports of Russia, total	10	18	25	25	30	33	40
incl. to Russian Far East	5	10	15	15	20	20	30
V. Exportation, total	25	65	128	120	190	140	207
incl. coal from Kolyma	-	-	50	-	60	-	70
incl. timber from Tiksi	15	50	50	100	100	-	100
incl. metal scrap	10	15	28	20	30	25	37
VI. Importation, total	10	53	66	65	85	80	98
incl. in tanks	-	40	50	50	60	60	70
incl. imports to Pevek	4	4	5	5	10	8	12
incl. imports to Mys Shmidta	1	1	1	2	3	3	5
incl. imports to Tiksi	5	8	10	8	12	9	15
Total NSR Freight Transport	570	890	1195	1110	1530	1180	1807
incl. coal	175	272	335	275	380	290	390
incl. in tanks	200	340	480	440	613	532	670

Table 9

PROGNOSIS SEA FREIGHT TRANSPORTS OF EAST CHUKOTCA, 2000 – 2015

in thousands metric tons

	2000	2005		2010		2015	
		Var. I	Var. II	Var. I	Var. II	Var. I	Var. II
1 General cargo from the ports of Primorie							
1. To Beringovsk	13	15	23	18	30	23	40
2. To Anadyr	30	40	45	70	85	90	105
3. To Egvekinot	10	20	25	23	37	30	45
4. To Providenie	20	28	35	30	45	40	55
5. To other small ports of the region	15	20	30	25	35	30	40
Total	88	123	158	166	232	213	285
2. General cargo from the ports of East Chukotca							
	40	52	62	80	105	100	130
3 Oil in tanks from the of Primorie							
1. To Beringovsk	2	5	7	6	10	7	10
2. To Anadyr	20	30	30	45	60	60	95
3. To Egvekinot	5	5	10	7	13	10	15
4. To Providenie	10	12	15	15	20	20	30
5. To other small ports of the region	5	5	5	5	5	10	10
Total	42	57	67	78	108	107	160

Table 9 (continued)

	2000	2005		2010		2015	
		I	II	I	II	I	II
4. Coal from Beringovsk							
1. To Egvekinot	35	45	50	60	120	75	145
2. To Providenie	20	30	35	35	40	40	45
3. To other small ports of the region	45	50	95	70	110	75	115
4. To ports of North Chukotca	155	222	235	225	270	240	270
5. To ports of Kamchatka	105	118	165	120	170	170	215
Total	360	465	580	510	710	600	790
5. Coal from Anadyr							
1. To Egvekinot	25	33	45	40	80	60	100
2. To other small ports of the region	20	20	20	30	50	30	60
Total	45	53	65	70	130	90	160
Total Sea Freight Transports of East Chukotca							
	575	750	932	904	1285	1110	1525

Notes:
1. Sea transportations of coal from Beringovsk to North Chukotca are included in Table 4.
2. The exportation from East Chukotca and Sea Freight Transports between ports of East Chukotca are included

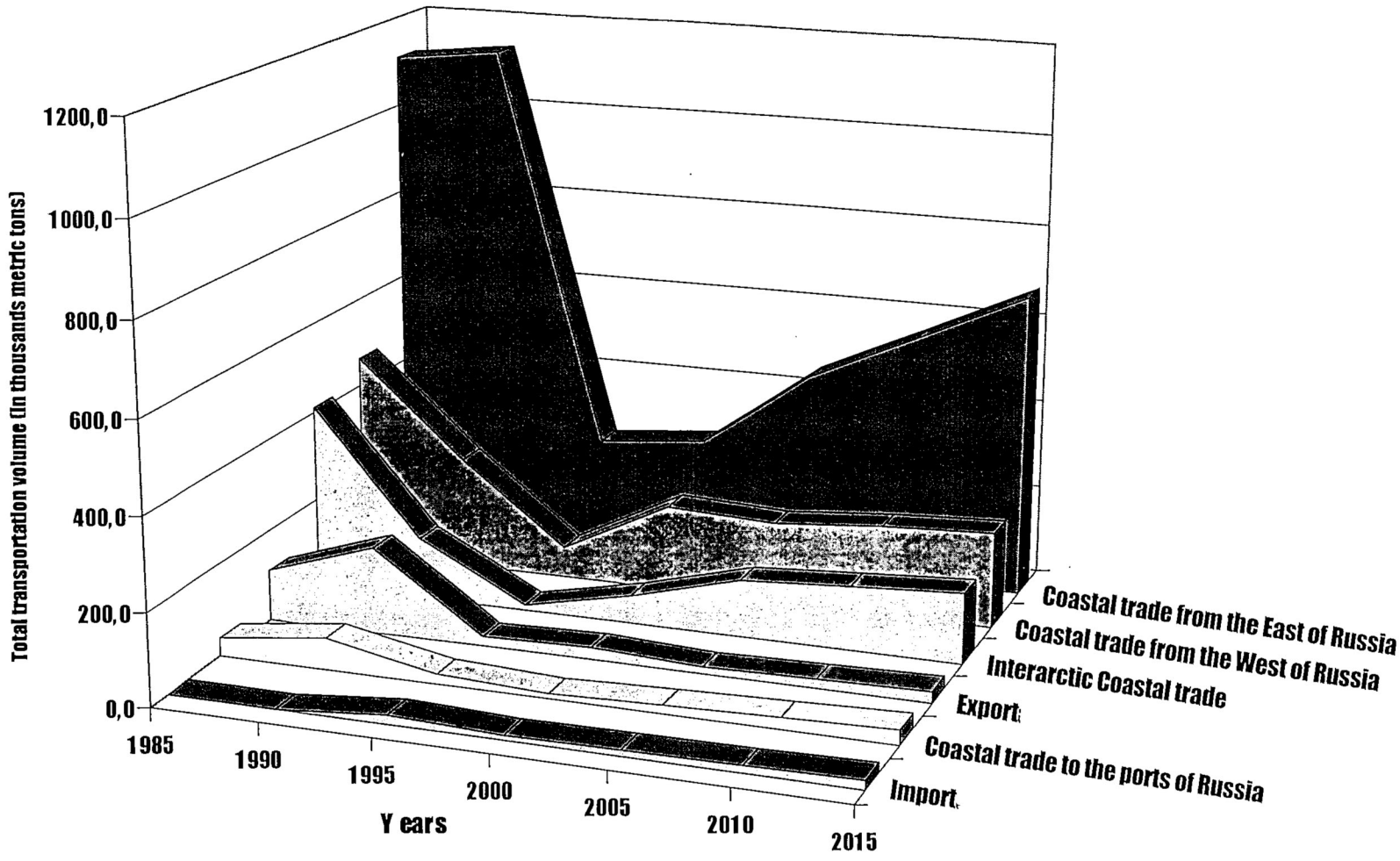


Fig.3 TRANSPORT IN RUSSIAN EAST ARCTIC (SAKHA (YAKUTIA) and NORTH CHUKOTCA), var. I

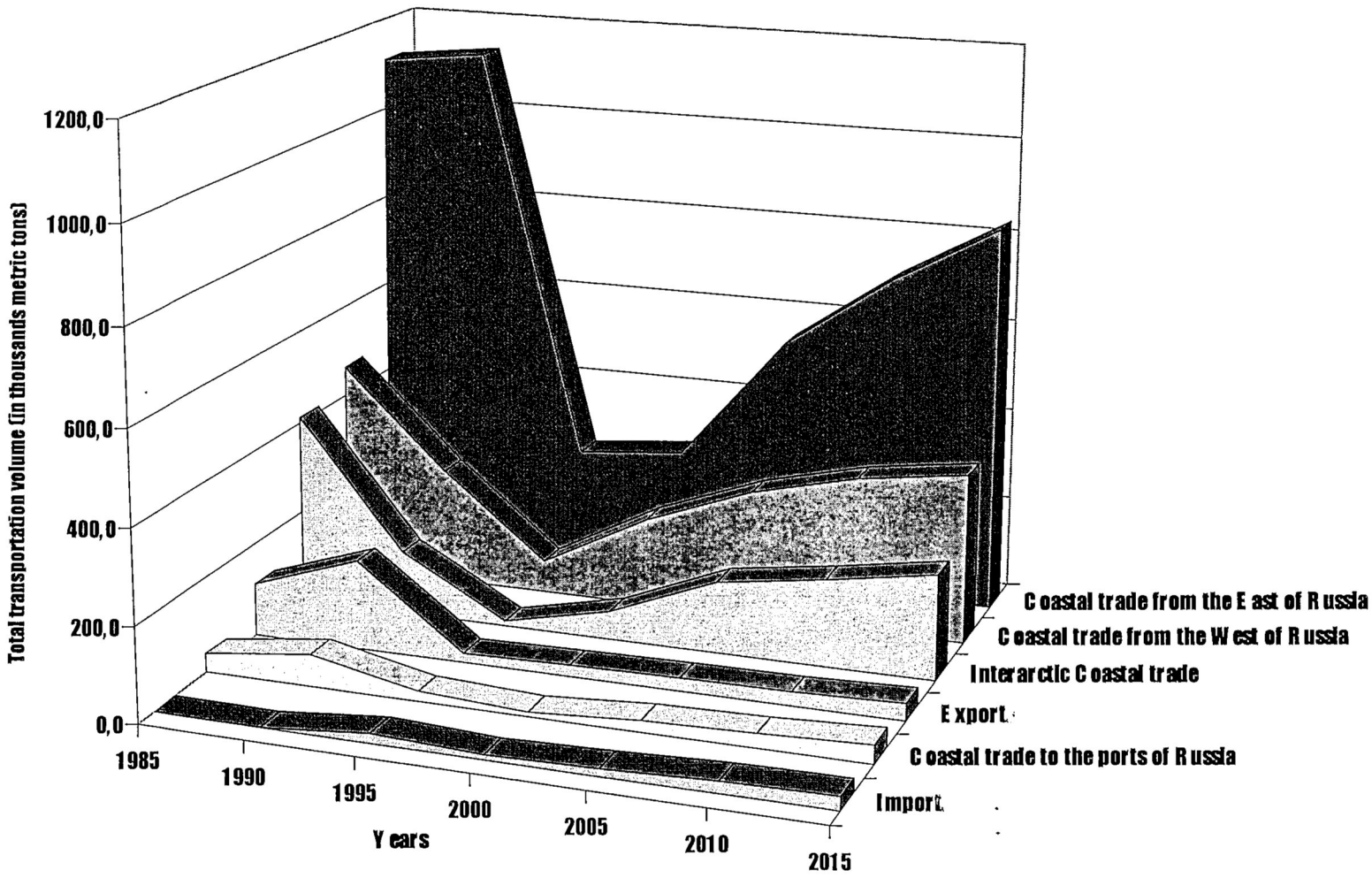


Fig.4. TRANSPORT IN RUSSIAN EAST ARCTIC (SAKHA (YAKUTIA) and NORTH CHUKOTCA), var. II

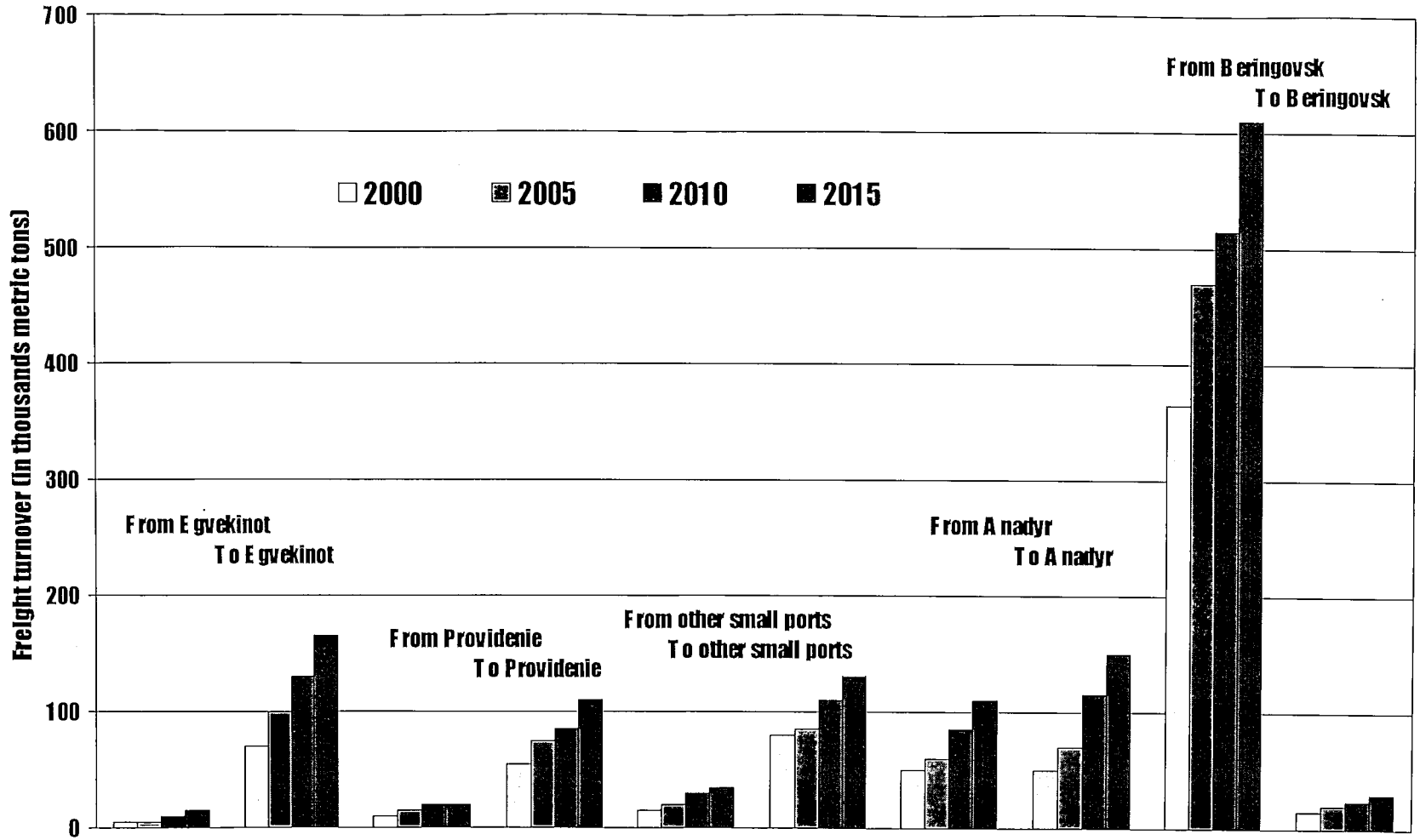


Fig. 5. TURNOVER OF EAST CHUKOTCA PORTS (PROGNOSIS, var. I)

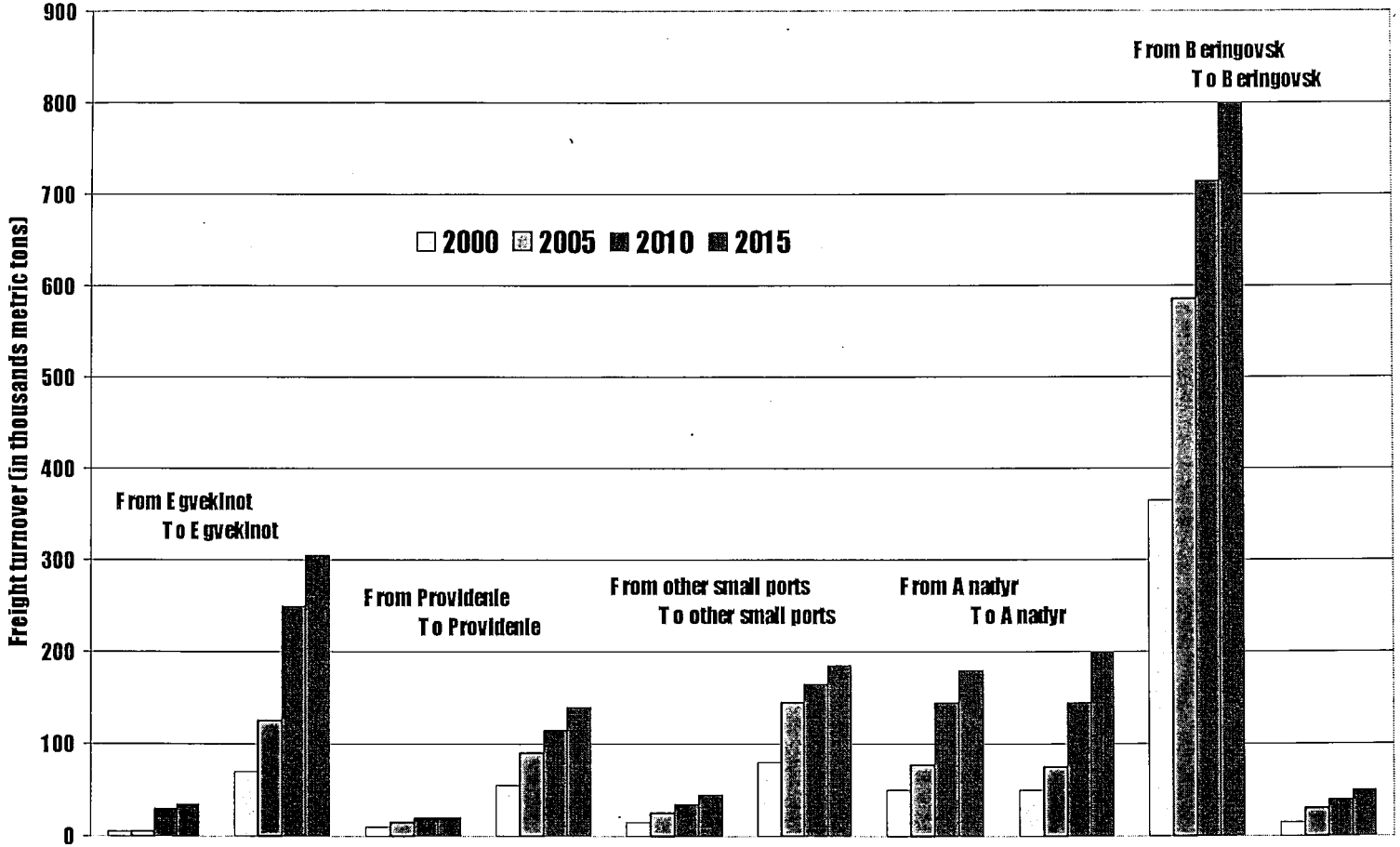


Fig.6. TURNOVER OF EAST CHUKOTCA PORTS (PROGNOSIS, var. II)

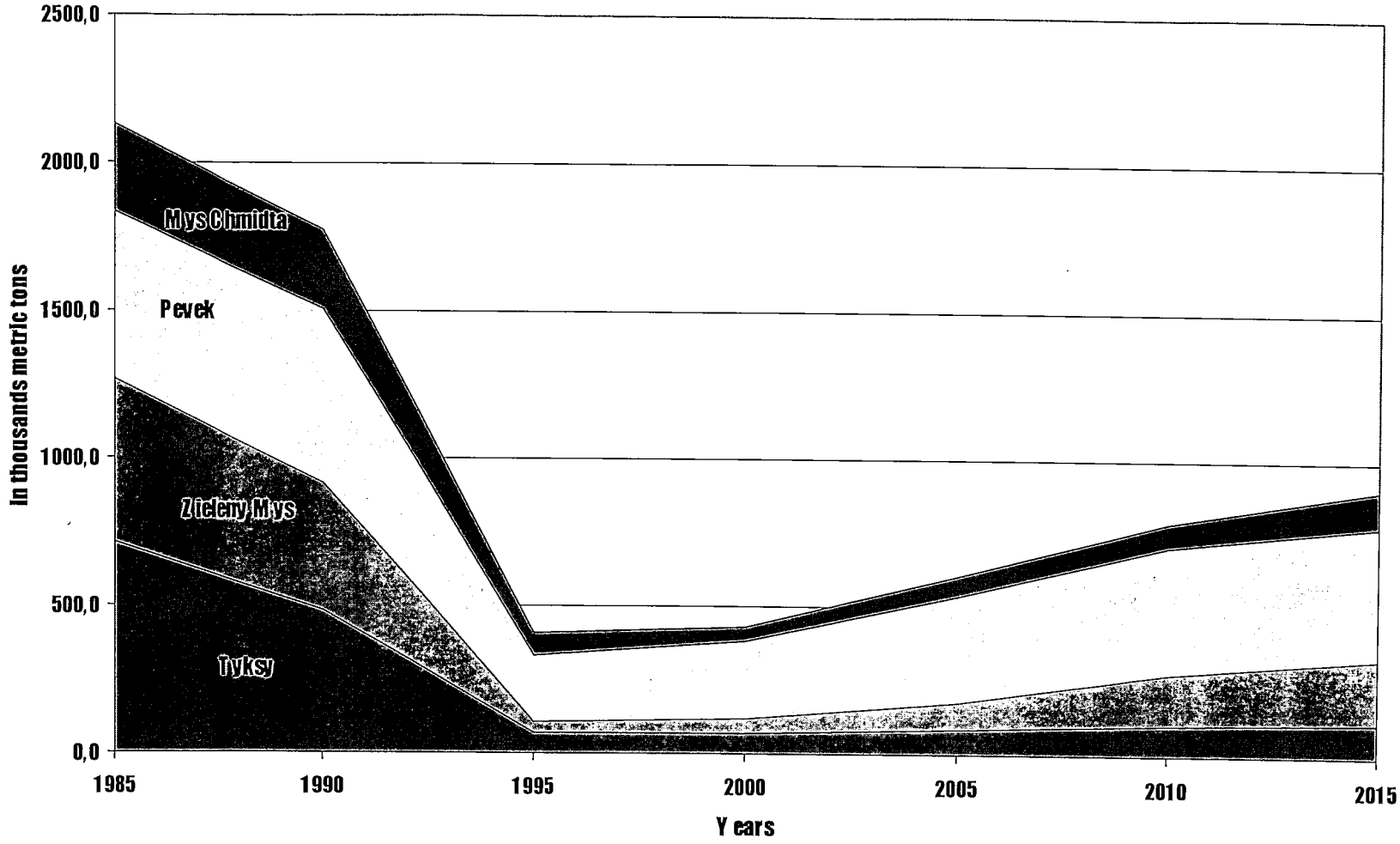


Fig.7. TURNOVER OF SAKHA (YAKUTIA) and NORTH CHUKOTCA, var. I

Fig.8. TURNOVER OF SAKHA (YAKUTIA) and NORTH CHUKOTCA, var. II

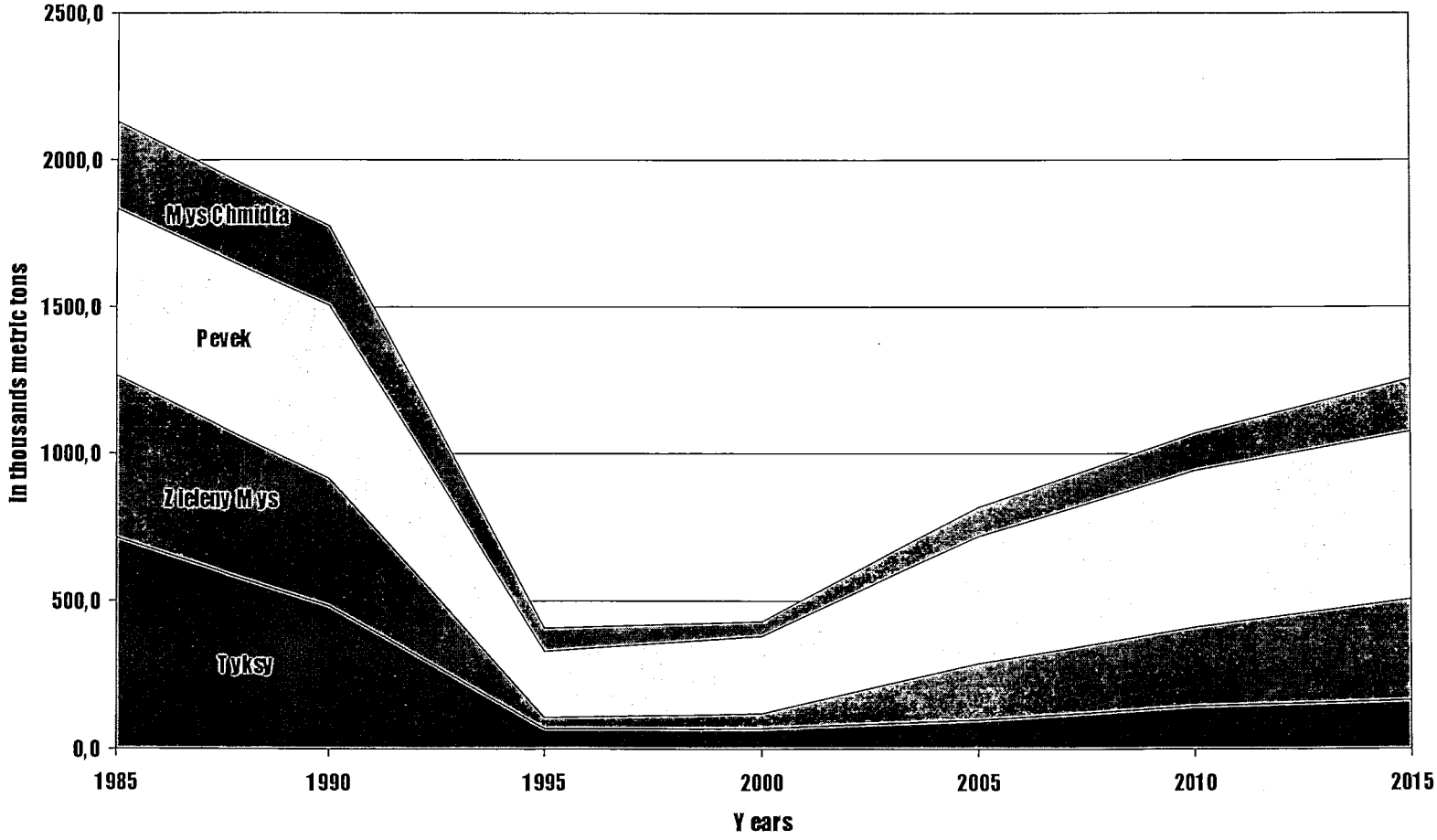


Table 10

PROGNOSIS SEA FREIGHT TURNOVER OF SAKHA (YAKUTIA) AND NORTH CHUKOTCA, 2000 – 2015 YEARS

in thousands metric tons

Ports, sorts of cargo	2000	2005		2010		2015	
		Var. I	Var.II	Var.I	Var. II	Var. I	Var. II
1. Tiksi, total,	70,0	135,0	148,0	205,0	245,0	115,0	265,0
Incl. timber	25,0	55,0	60,0	115,0	123,0	25,0	130,0
Incl. in tanks	15,0	18,0	20,0	20,0	25,0	20,0	30,0
2. Zieleny Mys, total	50,0	90,0	240,0	170,0	315,0	215,0	410,0
incl. coal	-	-	50,0	-	60,0	-	70,0
incl. in tanks	35,0	60,0	105,0	100,0	165,0	125,0	200,0
3. Pevek, total	260,0	400,0	480,0	480,0	580,0	510,0	640,0
incl. coal	155,0	230,0	250,0	240,0	280,0	255,0	280,0
incl. in tanks	45,0	105,0	130,0	140,0	160,0	165,0	195,0
4. Mys Shmidta, total	50,0	70,0	100,0	85,0	130,0	125,0	180,0
incl. coal	5,0	10,0	12,0	13,0	15,0	13,0	15,0
incl. in tanks	20,0	40,0	50,0	43,0	70,0	80,0	110,0
Total		695,0	968,0	940,0	1270,0	965,0	1495,0

Table 11

PROGNOSIS SEA FREIGHT TURNOVER OF EAST CHUKOTCA PORTS, 2000 – 2015 YEARS

in thousands metric tons

	From ports							To ports						
	2000	2005		2010		2015		2000	2005		2010		2015	
		I	II	I	II	I	II		I	II	I	II	I	II
1. Beringovsk, total,	365	470	585	515	715	610	800	15	20	30	24	40	30	50
Incl. coal	360	465	580	510	710	600	790	-	-	-	-	-	-	-
incl. In tanks	-	-	-	-	-	-	-	2	5	7	6	10	7	10
2. Anadyr, total,	50	60	77	85	145	110	180	50	70	75	115	145	150	200
Incl. coal	45	53	65	70	130	90	160	-	-	-	-	-	-	-
incl. In tanks	-	-	-	-	-	-	-	20	30	30	45	60	60	95
3. Egvekinot, total	5	5	5	10	30	15	35	70	100	125	130	250	165	305
incl. coal	-	-	-	-	-	-	-	55	75	90	100	200	125	245
incl. in tanks	-	-	-	-	-	-	-	5	5	10	7	13	10	15
4. Providenie, total,	10	15	15	20	20	20	20	55	75	90	85	115	110	140
incl. coal	-	-	-	-	-	-	-	20	30	35	35	40	40	45
incl. in tanks	-	-	-	-	-	-	-	10	12	15	15	20	20	30
5. Other small ports of East Chukotca, total	15	20	25	30	35	35	45	80	85	145	110	165	135	185
incl. coal	-	-	--	-	-	-	-	50	55	105	75	115	85	125
incl. in tanks	-	-	-	-	-	-	-	5	5	5	5	5	10	10
Total	445	570	707	660	945	790	1080	270	350	465	465	715	590	880

It is seen from the tables, that the forecasted volume of sea shipments will be significantly lower by the end of the forecasted period than the maximum volume achieved in the past years (depending on the forecast variant):

- for direct deliveries from the East – 1.4-1.7 times;
- for intra-Arctic domestic shipments – 1.9-2.7 times;
- for export – 1.2-10 times;
- increase of the volume of shipments 2.3-2.9 times if forecasted for import;
- for the NSR on the whole – 1.2-1.8 times.

The forecasted freight turnover is expected to be lower 1.2-1.7 times as compared to the maximum achieved volume in the past – 4 million t.

Beginning from 2000 gradual growth of shipments and freight turnover of the ports is forecasted in accordance with the rates of production potential growth given in Table 6 of section 4.

As long as no significant changes are expected in the volumes and geography of shipments, a conclusion can be made, that the coastal infrastructure will not require any serious capital investments in new construction.

As far as the transport and ice-breaking fleets are concerned, meeting of urgent need in their modernization and radical improvement will require large costs in the forecast period.

7. Conclusion

The following conclusions and proposals could be made on the basis of the study.

1. Long-term practice has shown that the NSR plays an important role in transport servicing of the Arctic regions of Sakha (Yakutia) and Chukotka. Yansky (Kular, Deputatsky), Nizhne-Lensky (Tiksi), South-Western (Saskylakh, Olenek), Nizhne-Indigirsky (Chokurdakh), Nizhne-Kolymsky (Zyryanka, Zeleny Mys), Chaunsky (Pevek), Bilibinsky (Bilibino), East-Chukot (Iultin, Polyarny) economic sub-regions of Sakha (Yakutia) and Chukotka completely or partially gravitate to the NSR. The area of the Arctic zone makes up 48% of the territory of the Russian Northeast.

Activity of enterprises of mining industry using rich natural resources of gold, tin, coal, natural gas, etc. creates the base for the operation of marine transport in the Eastern sector of the Arctic. But because of the economic crisis in Russia the volumes of cargo shipments along the eastern section of the NSR decreased 4.2 times (from 1.78 to 0.4 million t) in 1990-1997.

2. The present state of material and technical base of marine transport in the Eastern sector of the Arctic is unsatisfactory, especially with regard to the fleet. Transport vessels and ice-breakers become old and are written off. The majority of sea ports in the Arctic require reconstruction.

3. The forecast of shipments along the NSR up till 2015 was developed in accordance with the perspectives of the development of other kinds of transport for two scenarios of overcoming the economic crisis in the region: pessimistic (first variant) and optimistic (second variant).

It is assumed that under the first variant cargo shipments along the NSR in the Eastern sector of the Arctic will decrease till 2000 and then they will stabilize and increase by 2015 almost 2 times (from 0.57 million t in 2000 to 1.18 million t in 2015).

Under the second variant the rates of increase of shipments along the NSR will be higher by 2015 than in 2000 (3.2 times, 1.89 million t) due to the increase of production of the natural resources of Sakha (Yakutia) and Chukotka (development of gold-mining in the area of the Anabar shield, Tomur deposit of niobium, oil and gas fields on the Bering sea shelf, etc.) and involvement of these resources in the sphere of interests of the APR countries.

4. The envisaged programme of the development of productive forces of Sakha (Yakutia) and Chukotka will require the improvement of the system of transport servicing of the region in the period till 2015.

In the result of the study the following rational schemes of transport supply of the regions of the Eastern sector of the Arctic were adopted. In the economic sub-regions of Sakha (Yakutia) – Nizhne-Lensky, Anabarsky, Yansky, Nizhne-Indigirsky, Kolymo-Zyryansky and Bilibinsky sub-regions major transportation of all cargoes should be carried out by railroad-river transport means with re-loading of cargoes in the port Osetrovo (Yakutsk – after the completion of railroad construction) and delivery to the individual sub-regions along the NSR on mixed vessels. Sea cargo shipments to these regions along the NSR should be regarded as an alternative in case of disruption of navigation (in dry years) on the Lena river. Oil products should be shipped to these regions also along the Lena river. Besides, traditional shipments along the NSR from the European Russia to Tiksi, the Indigirka river bar, and other regions

of the Arctic zone should remain.

In the sub-regions of Chukotka (Chaunsky, Bilibinsky, East-Chukot) cargo shipments should be carried out partially by railroad-sea transport means with re-loading in the sea ports Vanino and Nakhodka, and in winter period – via the port Egvekinot using the existing motor roads on the sections Egvekinot-Iultin-Polyarny-Mys Schmidta-Pevek-Zeleny Mys (after the completion of construction of the East-Chukot mainline in the period till 2015 according to the maximum variant). The main conclusion is that the NSR will keep the leading role in transport servicing of the Arctic regions of Sakha (Yakutia) and Chukotka.

5. Transport servicing of the region under consideration will improve after the completion of construction of Amur-Yakutian railroad (AYaM), providing direct access to Yakutsk. This construction can be realized not earlier than by 2005. AYaM will provide the creation of re-loading base in Yakutsk in addition to the port Osetrovo, access to the deep-water sections of the Lena river; will allow to lessen the distance of the river vessels trips to the regions of the Extreme North by more than 4000 km, and will allow to use mixed ships ("river-sea") on the Lena direction.

When the railroad to Yakutsk is built, cargo shipments to the Arctic regions of the Extreme North along the Lena will be carried out with re-loading in the port Yakutsk.

The variant implying the use of this direction for the transportation of export-import and transit cargoes in the direction European North – South-Asia countries, lessening the distance of trips by 2000 km, should be considered and developed.

6. The creation of a transcontinental railroad, intended for the realization of the international and internal Russian linkages along the route USA (Cape Walen) – Yakutsk – AYaM and further to the west, east and south, is considered as a possible variant of transport servicing of the North in the period beyond 2015.

In the long-term the implementation of this project, apart from the creation of stimuli for the economic development in the Russian regions of the Northeast, will make it possible to integrate main rail and water ways of Russia (including the NSR) in the system of transport communications. But taking into account high cost of construction, realization of this project depends to a great extent on the participation of the states concerned, in particular, of APR countries and the USA.

REFERENCES

1. Federal target Programme of economic and social development of the Far East and Trans-Baikal region for 1996-2005, M., 1996.
2. Main principles of the concept of the project on the creation of the system of transport-power communications America-Eurasia with the tunnel across the Bering Strait. International Corporation "Transcontinental". M., 1995 (vv. 1, 2).
3. Federal target Programme of the economic and social development of the Far East and Trans-Baikal region for 1996-2005.
4. Programme of social-economic development of Sakha (Yakutia), 1995.
5. Programme of social-economic development of the Extreme North, 1994.
6. Programme of social-economic development of Siberia, 1998.
7. International Northern Sea Route Programme (INSROP), 1995, III.01.1. A.Granberg. The Significance of the Northern Sea Route for Regional Development in Arctic Areas of Russia.
8. International Northern Sea Route Programme. INSROP-74-1997. III.02.3. A.Granberg. Selected Studies in Regional Economic Development along the Northern Sea Route.
9. INSROP Working Paper – 87-1997. III.02.2. N.Isakov, G.Serebryansky, A.Parfenov, T.Patrakova, N.Sadofieva. Regional Ports Development along the NSR.
10. A.Granberg. The Use of the Northern Sea Route: Trends and Prospects. "Rossiysky ekonomichesky zhurnal", N 5-7, 1997.
11. Summarizing the results of the marine transport operation in the Arctic. Sojuzmorniiproekt, 1997.

14 January 1999

Review of Professor Alexander Granberg's paper
"Cargo-Forming Potential of the Republic of Sakha, Chukot Autonomous District and Other Far-Eastern Regions for the Northern Sea Route"

Review by Prof. Victor Fischer, University of Alaska

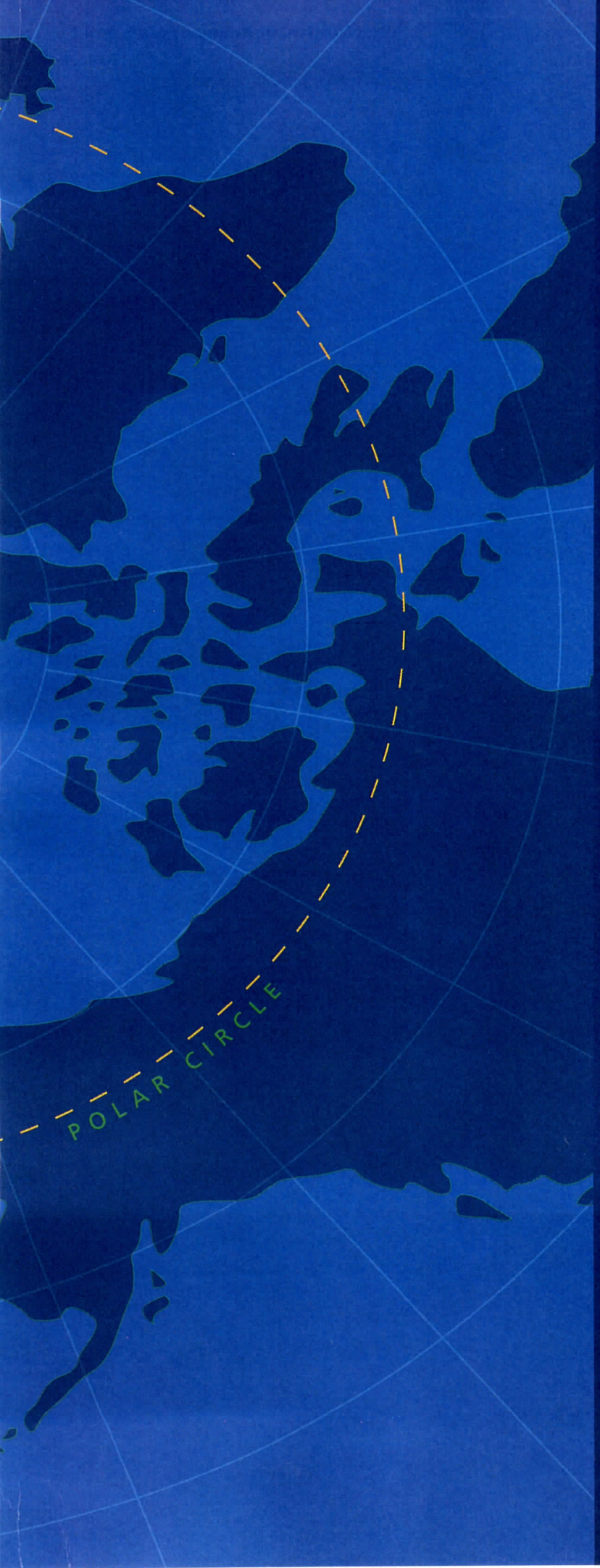
The study by Prof. Granberg and his Council for the Study of Productive Forces (SOPS) is extremely thorough and informative. The data and analyses should provide an excellent foundation for planning and future work on Arctic areas of the Russian Far East.

The paper reviews the extensive resource potentials of northeast Russia (gold, diamonds and other minerals, coal, oil and gas, reindeer, fisheries), development so far hindered by unfavorable climate and poor transportation. A review of resources and transportation in nine sub-regions is followed by a thorough analysis of existing cargo movements. Meticulous descriptions are provided of cargo handling facilities and cargo volumes for the major ports in the region. (The critical impacts of Russia's economic and political changes is demonstrated time and again by drastic declines in freight movement; e.g., a ten-fold decline in Provideniye.)

Prospective transport scenarios are presented for each sub-region, covering the utilization of the various modes (rail, river, sea, road) and the interconnections between them. Based on their data and analyses, Granberg and his team project the most logical scheme for serving each sub-region in the future, including utilization of the Northern Sea Route and railroad extension to Yakutsk. These schemes lead, in turn, to the conclusion of continued importance of the NSR to the northeastern region and provide the basis for extensive and very specific forecasts of future freight movement.

An important aspect of the paper is a set of scenarios for the economic growth of northeast Russia for the years 2,005, 2,010, and 2,015. It is interesting to note that despite recent trends in Russia and particularly this region, the economists look forward to moderate growth under the "pessimistic" scenario, to 120-125 percent in 2,015 based on the year 2,000. The "optimistic" projection extends that to 200-300 percent, which in part includes construction of a Europe-Asia-North America transcontinental railroad, a development considered highly unlikely by this reviewer.

All in all, this work is outstanding in its scope and detail. A large array of tables and graphs provides strong support for a tightly written paper.



The three main cooperating institutions of INSROP

Ship & Ocean Foundation (SOF), Tokyo, Japan.

SOF was established in 1975 as a non-profit organization to advance modernization and rationalization of Japan's shipbuilding and related industries, and to give assistance to non-profit organizations associated with these industries. SOF is provided with operation funds by the Sasakawa Foundation, the world's largest foundation operated with revenue from motorboat racing. An integral part of SOF, the Tsukuba Institute, carries out experimental research into ocean environment protection and ocean development.

Central Marine Research & Design Institute (CNIIMF), St. Petersburg, Russia.

CNIIMF was founded in 1929. The institute's research focus is applied and technological with four main goals: the improvment of merchant fleet efficiency; shipping safety; technical development of the merchant fleet; and design support for future fleet development. CNIIMF was a Russian state institution up to 1993, when it was converted into a stock-holding company.

The Fridtjof Nansen Institute (FNI), Lysaker, Norway.

FNI was founded in 1958 and is based at Polhøgda, the home of Fridtjof Nansen, famous Norwegian polar explorer, scientist, humanist and statesman. The institute spesializes in applied social science research, with special focus on international resource and environmental management. In addition to INSROP, the research is organized in six integrated programmes. Typical of FNI research is a multi-disciplinary approach, entailing extensive cooperation with other research institutions both at home and abroad. The INSROP Secretariat is located at FNI.