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for the NSR

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The Angara-Yenisey Region – Cargo Potential for

the NSR?

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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.

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ABSTRACT WORKING PAPER No 157

The Angara – Yenisey Region Cargo Potential for The NSR?

The conception of the paper was based on the preliminary findings of INSROP Phase I subprogramme III, The NSR and the Rivers Ob-Irtysh and Yenisey. Further it was evident that the concentration of metals work and hydroelectric powers along the upper reaches of Yenisey and the Angara, make Eastern Siberia, and in particular Krasnoyarsk Krai, of interest.

Russia is a major non-ferrous metals producer in the world. Aluminium is the most important product accounting for 4,56 % of Russia's export revenue in 1998. Nickel as a commodity account for 1,56 % or USD 1, 097 Billion in 1998. Copper for 1,27 % or 893 Million USD.

Eastern Siberia (ES) dominates aluminium production in Russia, 75 % of the actual output originates in ES. Bratsk in Irkutsk Oblast is the major producer with 884 0000 tonnes, an increase of 5,7 % over 1997. Krasnoyarsk Aluminium is the second largest, 802 000 tonnes followed by the Sayansk works in Khakasia and the amalgamated Siberian-Ural Aluminium (SUAL) company with production facilities in Irkutsk and Perm at about 330 000 tonnes.

Russian export to the Far East of Fabricated metals fell towards 1995 but rose again towards 1997. Russia is both the largest and most stable southbound segment of fabricated metals through the Suez Canal, 7,4 Mt in 1997. In the Far East (FE) China as an importer does not share the stability of Russia as an exporter. From 1994, Chinese imports diminished and by 1997 Taiwan is the most important Far Eastern market, 1,8 million tonnes. Between North West Europe (NWE) exports and FE imports there is an inverse trend from 1994-95 to 97 with increased NWE exports and reduced FE imports. This highlights that South East Asia and the Indian Sub-continent surpassed FE in growth, and also indicate that FE moved through the transition phase. The economies are assumed to have matured and capacity at metals works expanded to capture producer surpluses.

Of the Foreign Investments in Russia in 1998 (January-September annualised) of 12,38 Billion USD, Eastern Siberia was allocated 224 million USD which represent 1,8 % of the total funds allocated to Russia. Considering the abundant natural resources this is both a small percentage and total amount. The combined accounts receivables and payables however, indicate that the industrial concentration in East Siberia is not reflected by the limited foreign investments for 98. East Siberia represented only 1,8 % of the foreign investments in Russia, but represent 7,9 % of total account receivables and 8,52 % of total payables.

The profitability of industrial enterprises in Russia and Eastern Siberia support effects of regional endowments. Located in the interior, enterprises in Eastern Siberia operate at disadvantage versus other regions in Russia in terms of logistics and transportation costs. Regionally in Krasnoyarsk Krai, there are no lines of communication other than the Yenisey River on the North-South axis north of Lesosibirsk / Yeniseysk. This accentuates the need for river transportation, but also clearly separates the region into Arctic and Central Siberian zones in terms of logistics.

The major point however, is that the concentration of other factors; inexpensive energy in the form of hydro-electric power, natural gas and or petroleum products and partly raw material supplies that enable the region to add value from the start of the value chain.

The situation can be described as one of entry barriers initially being high for a western investor. Furthermore uncertainty of control of investments, hence make the risk assessment not matched by the return on capital offered by the Russian counter part in the regional industry. The Russian entity too its part, has rather than to release control of resources, reserves, production facilities and in- and outbound logistics, taken a slow approach to upgrade its potential, being satisfied with the Foreign Exchange revenue generated. The profitability of the Krasnoyarsk Krai does indicate that a substantial resilience exist in the regional economy as it returns significant profits in a period of contraction of the Federal economy, and thus represent a market with purchasing power.

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1 Introduction

The conception of the paper was based on the preliminary findings of INSROP Phase I subprogramme III, The Northern Sea Route and the Rivers Ob-Irtysh and Yenisey. Further it was evident that the concentration of metals work and hydroelectric powers along the upper reaches of Yenisey and the Angara, make Eastern Siberia, and in particular Krasnoyarsk Krai, of interest to be evaluated for the Northern Sea Route Programme. The Yenisey River and Trans-Siberian Railway as the two major logistic arteries meet at Krasnoyarsk, which is the major city in both Krasnoyarsk Krai and in the area of Eastern Siberia. Other regions in the Yenisey – Angara proximity are Irkutsk, Chita, Buryatia and territory of Tuva. This conforms to the larger Administrative area East Siberia which forms a separate unity in the Russian Federation, and thus reflected in annual statistics and aggregated information from Central Russian Government sources.

The second factor to support focus on this administrative area was the findings of the INSROP Phase I Transit Study, which indicated that besides mineral fertilizers, fabricated metals was the major southbound cargo segment through Suez. There thus existed a geographic cluster of factor endowments, and at least three separate alternative transport solutions related to the NSR. In terms of the competitiveness and relevance for transit shipments, it would be necessary to evaluate aggregated major fabricated metals shipments from North West Europe to the Far East Southbound through Suez for the period.

In general terms the cargo generating region North West Europe (NWE) was defined to be, Norway, Sweden, Finland, Denmark, Russia, the Baltic's, Germany, Benelux, Great Britain, Ireland & France. The Far East (FE) was defined to be South Korea, China including Hong Kong, Japan, and Taiwan. Based on the preliminary study it was clear that factor deficiency affect Far East Asia more than Northwest Europe, and that bulk cargoes moved mainly along the west – east axis to FE. Main exports from Northwest Europe were related to factor abundance in energy and minerals, primarily different metals, ores and fertilizers. These segments originated mainly in either Norway or Russia. Metals exports from Belgium, Netherlands and Germany were also significant. Continental European cargoes were related to agricultural production, and consequently a cargo segment indirectly affected by fertilizers. High quality paper and forest products originated in Scandinavia.

2 RUSSIAN EXPORT TO THE FAR EAST 1994 - INSROP I RESULTS

Table 1: Southbound Suez Volumes 1994, Bulk Cargoes, NWE Export ('000									
	Total	NWE	Percent	Russian	Percent of	NSR			
Product	Volumes	Export	of Total	Export	NWE total	Relevant			
Fabricated Metals	32 094	16 437	51 %	7 780	47 %	Yes			
Mineral Fertilisers	13 769	7 693	56 %	4 727	61 %	Yes			
Cereals	11 213	4 688	42 %	0	0 %	Yes			
Oil Products	9 288	2 218	24 %	178	8 %	Doubtful			
Chemical Products	6 362	1 705	27 %	327	19 %	No			
Cement	4 200	491	12 %	321	65 %	No			
Metals & Ores	1 708	1 135	66 %	0	0 %	Yes			
Sugar	1 280	993	78 %	0	0 %	No			
Sum	79 914	35 360	44 %	13 333	38 %				

Source: Suez Canal Yearbook 1994

From the table 1 above, restricted to the west - east trade for 1994, Russia accounted for 38 % of total NWE export, the table 2 below indicates that China accounted for 54 % of Far East import. Relating to what in shipping statistics is referred to as "the minor bulk" cargoes and other relevant cargo segments, Suez Canal Statistics proved that there was one dominant country in each region.

Table 2 : Southbound Suez Volumes 1994, Bulk Cargoes, Far East Imports ('000 Tonnes)								
~	Total	Far East	Percent	Chinese	Percent of	NSR		
Product	Volumes	Import	of Total	Import	Far East	Relevant		
Fabricated Metals	32 094	. 13 745	43 %	5 860	43 %	Yes		
Mineral Fertilisers	13 769	5 837	42 %	5 306	91 %	Yes		
Cereals	11 213	848	8 %	461	54 %	Yes		
Oil Products	9 288	1 415	15 %	220	16 %	Doubtful		
Chemical Products	6 362	414	7 %	248	60 %	No		
Cement	4 200	0	0 %	0	0 %	No		
Metals & Ores	1 708	326	19 %	191	59 %	Yes		
Sugar	1 280	0	0 %	0	0 %	No		
Sum	79 914	22 585	28 %	12 286	54 %	, D		

Source: Suez Canal Yearbook 1994

From a Russian competitive viewpoint, the NSR as a transit route was stated to compete internally for cargoes being moved through both the Baltics & Black Sea ports. As can be

seen in the table above, Russia defined as a NWE country accounted for about 38 % of overall NWE export through Suez. In the main segments, fabricated metals and mineral fertilizers, Russia accounted for respectively 47 % and 61 % of the NWE exports. On the assumption that these cargoes mainly moved out of the Black Sea ports, opening the NSR would first of all increase competition between Russian ports and shipping companies. Expansion in the northern ports would be at the expense of cargoes through Novorossiysk and Ukrainian ports etc. This is important as the Black Sea cargoes would not be subject to the same potential cost and time advantages of the NSR as NWE - Baltic cargoes. Internal Russian location and transportation costs thus to a large degree were assumed to determine the future of NSR carried bulk volumes. That highlighted the complexity, but also simplified the issue regarding bulk cargoes:

Russia has both the incentive to, and disadvantage of, developing the NSR.

The Russian fertilizer segment is dealt with separately in INSROP Project III.01.4. The segment of fabricated metals is covered in this paper as refers to the overall significance of the non-ferrous metals industry in East Siberia versus the Federation total.

¹ Major Bulk Cargoes is generally referred to as Crude Oil, Iron Ore, Coal & Grain.

3 Suez Canal Statistics Export of Fabricated Metals 1986 -

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	TABLE 3: NORTH WEST EUR	OPE EXPO	RT OF FA	BRICATED	METALS	(000' TOI	NNES)	
	1986	1987	1992	1993	1994	1995	1996	1997
Russia	809	619	2 498	7 065	7 780	6 467		7 439
Belgium	480	734	1 701	3 842	2 486	2 136		2 834
Poland								2 072
Ukraina	•				1 372			1 298
Germany	716	844	656	1 772	1 472	1 098		1 100
UK	715	941	1 325	1 705	1 033	728		931
Latvia						163		928
Holland	649	989	1 356	2 405	1 576	870		845
Norway	376	491	778	650		743		
Sweden				223				
Finland				283	496	216		
France	207	338		589	222	247		
Others	5 116	5 391	8 930	20 874	15 657	11 149	. 0	8 859
Total	9 068	10 347	17 244	39 408	32,094	23 817		26 306

Source: Suez Canal Authority Annual Yearbook 1987-97

From table 3 and the graph below we can observe the general overall trend for southbound exports of fabricated metals. There is a strong growth from 1986 throughout the break-up of the Soviet Union, and in particular growth between 1992 and 1994. Volumes fell towards 1995 but rose again towards 1997. The overall pattern is reflected in FSU – Russian export volumes, and Russia is both the largest and most stable southbound segment of fabricated metals 7,4 Mt in 1997.

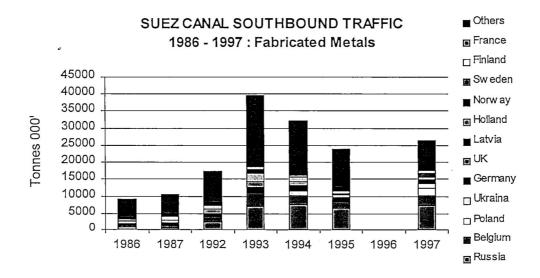
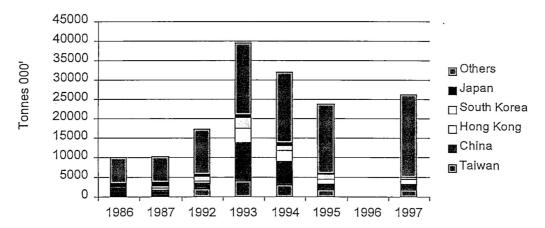


TABLE 4: FABRICATED METALS - FAR EAST IMPORT 1986 - 1997 (000' TONNES)									
	1986	1987	1992	1993	1994	1995	1996	1997	
Taiwan		246	1 964	3 913	3 075	1 734		1 823	
China	2 635	1 596	1 466	9 863	5 860	1 570		1 429	
Hong Kong	117	306	609	3 735	2 722	1 294		1 147	
South Korea	a	592	1 182	2 663	1 458	1 179		711	
Japan	704	969	470	796	630	263			
Others	6 433	6 638	11 553	18 438	18 349	17 777	0	21 196	
Total	9 068	10 347	17 244	39 408	32 094	23 817		26 306	

Source: Suez Canal Authority Annual Yearbook 1987-97

On the import side in the Far East, The major point is the extreme growth of Chinese imports by 1993-94, which correspond to the growth in the Chinese economy. It also reflects the at the time large-scale access to, and exports of, significant volumes of FSU metals and "scrap metals" at discount prices. However, China as an importer does not share the stability of Russia as an exporter. From 1994, Chinese imports diminished and by 1997 Taiwan is the most important Far Eastern market, 1,8 million tonnes. Taiwan, China and South Korea appear to have normalised imports and settled in volumes between 1995 and 1997. Between NWE exports and FE imports there is an inverse trend from 1994-95 to 97 with increased NWE exports and reduced FE imports.



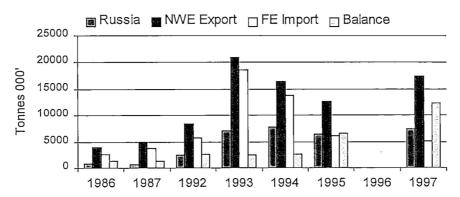


This highlights that South East Asia and the Indian Sub-continent surpassed FE in growth, and also indicate that FE moved through the transition phase. The economies are assumed to have matured and capacity at metals works expanded to capture producer surpluses.

TABLE 5	1986	1987	1992	1993	1994	1995	1996	1997
NWE Export	3 952	4 956	8 314	20 970	16 437	12 668	***	17 447
FE Import	2 635	3 709	5 691	18 534	13 745	6 040		5 110
Balance	1 317	1 247	2 623	2 436	2 692	6 628		12 337

Source : Suez Canal Authority Annual Yearbook 1987-97

SUEZ CANAL SOUTHBOUND 1986 - 97 Fabricated Metals NWE - FE Balance



4 EASTERN SIBERIA GENERAL BACKGROUND

4.1 KRASNOYARSK KRAI

Area

2 339 700 square km

Population

3 048 000

Administrative Center

Krasnoyarsk

Krasnoyarsk Krai is located in the central part of Siberia, in the basin of the Yenisei River. The Krai comprises the Taymyr (Dolga-Nenetskij) and Evenk Autonomous Okrugs. Its borders the Republic of Sakha and Irkutsk Oblast in the east, the Republic of Tuva, Altai Krai, and Kemerovo Oblast in the south, the Tomsk and Tyumen Oblasts in the west. The territory of Krasnoyarsk Krai accounts for 13,7% of the total territory of the Russian Federation.

There are 15 cities under regional authority, one city under the authority of autonomous oblast, 7 municipal towns, 48 rural and 43 urban settlements in the region. The most important towns of the Krai are Krasnoyarsk, Norilsk, Kansk, Achinsk, Minusinsk, Yeniseisk, Sosnovoborsk, Lesosibirsk, Sharypovo, Divnogorsk, Nazarovo, Igarka and Borodino.

The most important Rivers are the Yenisei as one of the world's largest rivers and its tributaries: the Angara, the Podkamennaya (lower) Tungusska and the Nizhnyaya (upper) Tungusska. It starts in the Sayan Mountains at the geographical centre of Asia, where the Big and the Small Yenisei rivers join. From the junction to the mouth of the river is 3 487 kilometres. The total length of the river is 4 092 kilometres. The width of the river at its lower length is about 12 kilometres; at its discharge into the Kara Sea it widens to 40 to 50 kilometres.

The Yenisey and its numerous tributaries, in addition to other rivers, furnish natural water transportation arteries. Those other rivers include the Pyassina, Taimyra, and Khatanga, which empty into the Kara Sea and the Laptevs' Sea,as well as the Chulym and Kesh-Ket rivers in the south-west. The stream speed varies from 3-5 m/sec to 10-12 m/sec. In the lower range of the Yenisey river are the ports of Igarka and Dudinka that are equipped for serving both river- and ocean-class vessels. Practically all Krasnoyarsk timber is transshipped for export from these ports.

There are no lines of communication other than the Yenisey River on the North-South axis north of Lesosibirsk / Yeniseysk. This accentuates the need for river transportation, but also clearly separates the region into Arctic and Central Siberian zones in terms of logistics. For a further breakdown of the River Fleet and its use, see INSROP Working Paper no 44 (Ramsland 94).

The navigation season, which lasts from May 15 through first of November, is the most significant constraint for North – South transportation in the Krai. This do not however impede exports from the Taimyr – Norilsk –Dudinka, which are accessible by the NSR, potentially on year around basis by use of ice classified tonnage by way of the Kara Sea.

The Krasnoyarsk Krai is one of the richest raw materials areas of Russia. Among its most important natural resources are coniferous forests, hydro-energy, oil, gas, coal, iron-, non-ferrous and poli-metallic ores, non-metallic minerals.

4.2 IRKUTSK OBLAST

Area 767 900 square km

Population 2 804 500 Administrative Center Irkutsk

Irkutsk Oblast is located in the southern part of East Siberia and adjoins Lake Baikal. On the south and Southwest it borders the Republics of Buryatia and Tuva, on the west - Krasnoyarsk Krai, on the Northeast - the Republic of Sakha and on the east - Chita Oblast. The region is located on the Southeast of the Central Siberian Plateau edged with the Eastern Sayansk and the Baikal chains. Forests cover four-fifths of the region's area.

The largest cities are Irkutsk, Bratsk, Angarsk, Ust-Ilimsk, Usalye-Sibirskoye. The share of urban population is 79,4%.

The climate of the region is continental. Snow cover lasts 160 - 170 days a year. The river network belongs to the basins of the Yenisei (the Angara, the Nizhnyaya Tungusska) and the Lena. The largest rivers are the Angara, the Irkut, the Kitoy, the Belaya, the Uda, the Biryusa and the Vitim. The region is rich in natural resources, and hold among others 50 % of the world reserves of tantalum and niobium, deposits of oil and gas, 9 billion cubic metres of coniferous timber reserves, gold, precious and semi-precious stones, deposits of various

minerals and energy resources (hydro-electric) of significance.

Priority industries include mining (coal, iron ore, gold, mica, gypsum, talc, salt), energy complex, production of aluminium, petro-chemistry, machine building, building materials industry. Timber and wood-processing industries as well as pulp and paper production are of growing importance.

4.3 THE REPUBLIC OF TUVA

Area

170 500 square km

Population

308 000

Administrative Center

Kyzyl

The Republic of Tuva is situated in the south of East Siberia, in the upper reaches of the Yenisei River. It borders Mongolia in the Southeast, Altai Krai in the west, Krasnoyarsk Krai in the Northwest and the north, Irkutsk Oblast in the Northeast, and the Republic of Buryatia in the east.

The territory is mountainous and forests cover almost a half of its territory. The estimated timber reserves exceed 1 billion cubic metres. The region has harsh climatic conditions. Winter is frosty and windless, summer is moderately warm in the mountains and hot in the valleys. The main rivers are the Ulug-Khem (the Verkhniy Yenisei), the Biy-Khem and Ka-Khem, which are the Yenisei tributaries. There are about 50 thermal carbonate springs in the region. Besides forest products, other natural resources are moderate. The most important mineral resources include non-ferrous and rare metals ores, coking coal, asbestos, iron ore, gold and mercury.

4.4 THE REPUBLIC OF BURYATIA

Area

351 300 square km

Population

1 042 000

Administrative Center

Ulan - Ude

The Republic of Buryatiya is located in the south of East Siberia, in the Trans-Baikal region. Buryatiya borders Mongolia in the south, the Republic of Tuva in the west, the Irkutsk Oblast in the northwest and north and Chita Oblast in the east. The republic is mountainous with long calm winters with much snow, whereas the summer is short and warm.

The largest rivers are the Selenga, the Barguzin, the Verkhnyaya Angara (which flows into

Lake Baikal), the Uda, and the Vitim which is a tributary of the Lena. Lake Baikal is located in the western part of Buryatia. Natural resources present are tungsten, molybdenum, gold, bauxite, brown and coking coal, iron ores and granite. Tungsten and molybdenum are extracted and concentrated at the Dzhidinsk integrated works, the gold province stretches along the Vitim River. Industries of some significance include metalworking, forestry, woodworking, food industry and extraction of minerals. The Republic has a well-developed railway transport as the Trans-Siberian Railway and the Baikal-Amur Mainline (BAM) pass through the republic.

4.5 THE REPUBLIC OF KHAKASIA

Area Population 62 000 square km

Population

586 000

Administrative Center

Abakan

The Republic of Khakasia is located in the southern part of East Siberia. To the south it borders the Republic of Tuva, to the north and east - Krasnoyarsk Krai, to the west - Kemerovo Oblast and Altai Krai. It is subdivided into a flat northern part and a mountainous southern part that is rich in woods. The winter is cold, the summer is warm in the mountains and hot in the plains. The most important rivers are the Yenisei, the Abakan and the Chulym. The region has some natural resources. Mineral resources developed include black coal, iron ore, molybdenum and limestone.

5 EASTERN SIBERIA - ECONOMY AND FOREIGN INVESTMENTS.

Foreign Investments in Russia in 1998 (January-September annualised) accrued to 12,38 Billion USD. Of these funds Eastern Siberia was allocated 224 million USD which represent 1,8 % of the total funds allocated to Russia. Considering the abundant natural resources this is both a small percentage and total amount. At face value, this can among others be ascribed to its geographic location with long supply chains both for import of equipment, and for exports of the finished product, which are restrictive in itself.

Secondly, the industry in Eastern Siberia has developed into a regional cluster close to what in western industrialised countries can be referred to as comparative advantage on geographic specific natural abundance. However, since the break-up of the FSU, there has also been widespread consolidation in the Russian industry sector with the formation of vertically integrated companies. Chapter 2 clearly document that accessible export markets and demand exist in the Far East, South East Asia and the Indian Sub-continent for fabricated metals.

The situation can thus be described as one of entry barriers initially being high for a western investor. Furthermore uncertainty of control of this investment, hence make the risk assessment not been matched by the return on capital offered by the Russian counter part. The Russian entity too its part has rather than to release control of resources, reserves, production facilities and in- and outbound logistics, taken a slow approach to upgrade its potential, being satisfied with the Foreign Exchange revenue generated.

Table 6 : Foreign Investments in East Siberia 1998 (Jan - Sept Annualised) USD Bln									
		Of W							
	Total	% of Total	Direct	Portfolio	Other				
Russia	12 381 467	100.0 %	2 684 800	256 000	9 440 667				
East Siberia	224 249	1,8 %	75 999		148 251				
Irkutsk Region	159 291	1,3 %	59 301		99 989				
Chita Region	33 415	0,3 %	35		33 380				
Buryatia	18 632	0,2 %	3 751		14 881				
Krasnoyarsk Territory	10 225	0,1 %	10 225						
Tuva	2 687	0,0 %	2 687						

Source: Russian State Custom Statistics 1998

The degrees of concentration within the key Russian non-energy sectors, the sector solvency, liquidity and government dependency, are indicated by the overdue account

receivables for 1998 (mill USD). Compared to Industry overall, the non-ferrous metals industry is relatively concentrated in scope with a medium number of firms, for which private customers represent the majority of debtors. Government plays a relatively small part in the overall picture, whereas private customers represent about 65 %.

Table 7: Overdue Accounts Receivables by Key Non-Energy Sectors Jan - October 1998 USD Million Annualised No of Enterprises Acc Rec Overdue Customers Promissary State Overdue for Overdue Accounts Notes Customers More Than Receivables Three Months 888 874 Total 86 648 763 928 5 156 51 497 735 979 Of Which: Industry 20 884 460 672 395 002 2 782 34 505 362 960 Engineering and 5 530 67 853 57 134 570 10 843 52 610 Ferrous Metals 248 23 717 17 659 22 160 18 547 Chemicals & 565 22 006 19 243 56 428 18 409 Nonferrous Metals 379 16 727 10 927 480 119 10 942 Forest Products 2 580 7 810 6 191 44 76 6 497

Source: Russian State Custom Statistics 1998

The combined accounts receivables and payables indicate that the industrial concentration in East Siberia is not reflected by the limited scope and scale of foreign investments for 98. East Siberia represented only 1,8 % of the foreign investments in Russia, but represent 7,9 % of total account receivables and 8,52 % of total payables. In terms of general economic activity in Russia in 1998, it would probably be at the mark to assume that the administrative area represents about 8 % of total turnover and capital concentration. Krasnoyarsk Krai is the most important, about 4 % overall, of the independent federal subjects in Eastern Siberia.

One should also note that there is a general positive net balance receivables, which also reflects the trade surplus and export orientation of Russia. For overseas exports these are normally paid for in advance or by escrow accounts released when shipments are warehoused in ports or vessels. The relative high percentage being overdue for more than 3 months, indicates that the figures represent CIS customers which conform to the picture observed in the energy sector.

Russia & East Siberia Corporate Accounts Receivables & Payables 98 (Jan-Oct Annualised Rbl Million) TABLE 8 Accounts Receivable Accounts Payable Of Which Overdue Total Of Which Overdue Total % Russia Total % of Total Total % of Russia Total % of Total Total Debt Total 1 370 400 100 % 807 600 59 % 853 200 100 % Russia 460 800 54 % 108 815 7.9 % 68 068 63 % East Siberia 67 843 8,52 % 39 253 58 % Krasnoyarsk Territory 50 573 3,7 % 31 548 62 % 32 539 3,96 % 18 254 56 % Of Which: 56 0,0 % 50 89 % Taimyr Autonomous AO 38 0,01 % 36 94 % 89 % Evenki Autonomous AO 23 0,0 % 20 18 0,00 % 16 87 % 40 398 59 % 21 466 Irkutsk Region 2,9 % 23 776 2,75 % 12 650 59 % Of Which Ust-Ordynsky 34 0,0 % 19 57 % 17 0,00 % 50 % Chita Region 5 646 0,4 % 4 080 72 % 4 285 0,70 % 3 247 76 % Of Which Aga-Buryat AO 61 0,0 % 44 73 % 54 0,01 % 42 78 % Buryatia 6 356 0,5 % 4 795 75 % 4 490 0,57 % 2 642 59 % 601 0,0 % 420 70 % Tuva 374 0,07 % 340 91 % 3 449 5 242 0,4 % 66 % 4 690 0,46 % Khakasia 2 118 45 %

Source: Russian State Custom Statistics 1998

The profitability of industrial enterprises in Russia and Eastern Siberia supports the previous comments on the effects of regional endowments. Located in the interior, enterprises in Eastern Siberia operate at disadvantage versus other regions in Russia in terms of logistics and transportation costs. The major point however, is that the concentration of other factors; inexpensive energy in the form of hydro-electric power, natural gas and or petroleum products and partly raw material supplies, enables the region to add value from the start of the value chain, rather than having to integrate upwards.

Energy prices as input cost to metals smelters and refining is high in the western world, and a rule of thumb would be about 20 % of final cost of primary aluminium. The comparative advantage in cheap energy should thus be expected to remain for the foreseeable future. Mainly so, as alternative energy consumer markets in East Siberia cannot be seen likely in a contracting economy with reluctant allocation of foreign capital, despite the extensive interregional high-voltage power grid system.

It also seems unlikely that the competitiveness, although at the medium advanced levels of production that exist, can be attacked through anti-dumping measures, as the costs incurred in the rouble economy reflects the true cost of inputs. Thus as long as the value added is local – or regional, expenses incurred are in Rouble terms, and the proportion of value added

versus the final export price is high, outbound logistic costs are reduced to a relative low percentage of overall revenue generated. Being rouble based, the exports have been, and are likely to remain partially insulated towards the fall in world commodity prices, as the depreciation of the Rouble versus the USD valued exports compensates.

The regions contributing to the overall surplus and profitability of the Russian private sector are either export oriented, or centred on consumer-based Moscow or St.Petersburg. If Krasnoyarsk Krai is compared to the overall Russian profits, it contributes 40 % to total profits. Isolated however, to compare one region versus the overall national result does not alone make sense as other regions contribute both profit and losses. The concentration is however clear, as 16 subjects of the Federation contributed about 65 % of all revenues in the first nine months of 1998. The city of Moscow represented 22.5% of overall consolidated budget revenues, the Khanty-Mansiysk Autonomous Okrug 5.4%, the Moscow region 5.0%, and the city of St.Petersburg 4.8%.

What the profitability of the Krasnoyarsk Krai does indicate, is that a substantial resilience exist in the regional economy as it returns significant profits in a period of contraction of the Federal economy, and thus represent a market with purchasing power.

TABLE 9 Russia : Profitability of Industrial Enterprises in Eastern Siberia 1998 (Jan-Sept Annualised) Rouble millions									
, r	Balance of Profit & Losses	% of Total	Profits	% Profitable	Losses	% of Loss- making			
Russian Federation	10 301	100 %	131 216	49 %	120 915	51 %			
East Siberia	-117	-1 %	9 823	32 %	9 940	68 %			
Krasnoyarsk Territory	4 167	40 %	7 196	44 %	3 029	57 %			
Of Which:	0		0		0				
Taimyr AO •	1	0 %	1	100 %	0	0 %			
Evenki AO	0	0 %	1	71 %	0	29 %			
Irkutsk Region	-3 693	-36 %	1 732	29 %	5 425	71 %			
Of Which Ust-Ordynsky Buryat	0		3	33 %	3	67 %			
Chita Region	-424	-4 %	108	21 %	532	79 %			
Of Which Aga-Buryat	-4	0 %		0 %	4	100 %			
Buryatia	-104	-1 %	193	23 %	297	77 %			
Tuva	-93	-1 %	0	22 %	93	78 %			
Khakasia	31	0 %	593	30 %	563	70 %			

Source: Russian State Custom Statistics 1998

6 THE NON-FERROUS METALS INDUSTRY - ALUMINIUM

6.1 THE ALUMINIUM INDUSTRY

In general term the production process in the aluminium industry can be split into five separate stages:

- 1. Extraction of bauxite
- 2. Production of alumina
- 3. Refining of alumina into primary aluminium
- 4. Production of semi-processed components
- 5. Production of "ready to use consumer and industrial aluminium products.

TABLE 10 : World Bauxite Production 1991 - 1996								
	1991	1992	1993	1994	1995	1996		
Australia	40.500.000	39.750.000	41.320.000	41.650.000	42.660.000	43.000.000		
Guinea	17.070.000	16.000.000	17.040.000	11.120.000	12.390.000	12.500.000		
Jamaica	11.610.000	11.370.000	11.180.000	11.560.000	10.860.000	11.000.000		
Brazil	10.360.000	9.370.000	9.670.000	8.670.000	8.670.000	8.760.000		
China ·	5.930.000	6.660.000	6.470.000	6.620.000	6.700.000	7.000.000		
Venezuela	2.000.000	1.120.000	2.530.000	4.770.000	5.180.000	5.200.000		
India	4.740.000	4.900.000	5.280.000	4.810.000	5.160.000	5.100.000		
Suriname	3.140.000	3.250.000	3.160.000	3.800.000	3.580.000	3.700.000		
Russia		4.580.000	4.260.000	3.630.000	3.500.000	3.500.000		
Total	95.350.000	97.000.000	100.910.000	96.630.000	98.700.000	99.760.000		

Source: Lloyds Shipping Economist 1998

As shown in table 10 in terms of Bauxite production at domestic Russian deposits this has been reduced by slightly over 1 million tonnes in the period 1991 to 96. Australia dominates with about 43 % of the world production that totalled about 100 million tonnes in 1996. Australia however, has a significant domestic production, and Guinea dominates as an exporter with 11 million tonnes, followed by Brazil, Australia, Jamaica, Guyana and Sierra Leone. For alternative supplies to the Russian and the CIS aluminium industry other than domestic supplies, the alternatives are either from West Africa, the West Indies or South America through Novorossiysk, the Baltics or Murmansk. Alternatively from Australia through Vladivostok, Nadhodka or Vostochny on the Pacific coast (Primorsk Krai). One of the determining factors is the availability of closed railwagons for further transportation, and thus ports with compatible terminals that also export significant quantities of minerals and

or ores are at a comparative advantage. Murmansk is at a disadvantage distance wise for Eastern Siberia, but the ability to take part loads also destined for Kandalaksha and Nadvoitsy enables larger economies of scale for the Trans-Atlantic imports at sea.

	T.A	ABLE 11 : World	l Bauxite Expor	ts 1991 - 1996		
	1991	1992	1993	1994	1995	1996
Guinea	12.700.000	11.100.000	10.200.000	10.400.000	11.100.000	11.500.000
Brazil	5.450.000	5.350.000	4.800.000	4.900.000	4.900.000	5.000.000
Australia	5.820.000	4.360.000	6.510.000	4.420.000	5.050.000	5.500.000
Jamaica	4.260.000	4.130.000	3.920.000	3.650.000	3.550.000	3.600.000
Guyana	1.330.000	2.190.000	2.050.000	2.000.000	1.970.000	2.000.000
Sierra leone	1.080.000	600.000	1.210.000	1.030.000	980.000	1.000.000
Indonesia	1.180.000	1.370.000	940.000	740.000	1.060.000	1.000.000
Greece	320.000	400.000	370.000	450.000	390.000	400.000
China	540.000	860.000	520.000	380.000	450.000	450.000
Ghana	300.000	230.000	280.000	270.000	270.000	300.000
World Total	34.910.000	32.240.000	32.390.000	29.780.000	31.300.000	32.000.000

Source: Lloyds Shipping Economist 1998

From the distribution of world bauxite production, one observes that the majority of the world's industrialised countries In the Northern Hemisphere are at equal disadvantage in terms of factor abundance. This is confirmed by the import distribution in the table below, where the European Union, the United States, Canada, Russia and Japan dominate. A short comment would thus be that production at stage 1 is dominated by developing countries, with the exception of Australia. From stage 2 to 5 a two-track system applies, producers abundant in energy and dominant in comparative advantage at stage 2 and 3, but with less sophisticated home markets for stage 4 and 5. Secondly the reverse with markets that have to compete for energy supply and pay market prices for electricity, but that are able to significantly increase value added in scale and scope for sophisticated home markets.

TABLE 12 : World Bauxite Import 1991 - 1996							
	1991	1992	1993	1994	1995	1996	
EU (12/15)	10.060.000	10.150.000	9.390.000	10.590.000	10.760.000	10.750.000	
US	11.710.000	11.110.000	11.640.000	10.700.000	10.100.000	10.100.000	
Canada	2.770.000	2.800.000	2.860.000	2.930.000	2.620.000	3.000.000	
Russia	1.850.000	2.850.000	2.790.000	3.440.000	2.870.000	2.870.000	
Japan	2.050.000	1.820.000	1.850.000	1.860.000	1.860.000	1.860.000	
Ukraina				2.180.000	1.560.000	1.560.000	
World Total	32.850.000	31.990.000	32.030.000	33.780.000	32.060.000	32.420.000	

Source: Lloyds Shipping Economist 1998

To determine the potential, scope and scale of Eastern Siberia in terms of non-ferrous metals production, and its relative competitiveness, the overall figures for Russia and the CIS is a good indicator. Russia dominates aluminium production within the former Soviet Union, representing about 91 % of the total output.

TABLE 13 : Russia &	CIS Aluminium Proc	luction in 1998 v	ersus 1997 (000	' tonnes)
	1998	December 98	% Change 97	1997
Russia	3004,7			2 914,5
Ukraine	106,7		0,061	100,6
Tadsjikistan	195,6		0,036	188,8
Total	3 307,0		0,035	3.195,2

Source: Interfax Newsagency 1998

Eastern Siberia dominates the sector internally in Russia, 75 % of the actual output originates in ES. Bratsk in Irkutsk Oblast is the major producer with 884 thousand tonnes, an increase of 5,7 % over 1997. Krasnoyarsk Aluminium is the second largest, 802 thousand tonnes output followed by the Sayansk works in Khakasia and the amalgamated Siberian-Ural Aluminium (SUAL) company with production facilities in Irkutsk and Perm at about 330 thousand tonnes.

TABLE 14 : Eastern Siberia Aluminium Production in 1998 versus 1997					
	1998	December 98	% Change 97	1997	
Bratsk	844,2	72,2	0,058	797,9	
Krasnoyarsk	802,0	69	0,019	787,0	
Sayansk	330,0	30,7	0,011	326,4	
SUAL	338,4	29,2	0,011	334,7	
East Siberia	2 314,6				

Source: Interfax Newsagency 1998

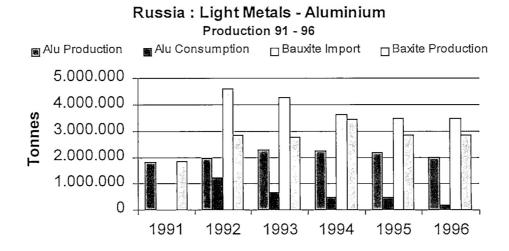
Minor Producers are located in Volgograd, Kandalaksha (Murmansk Oblast-White Sea Bay), Nadvoitsy (Karelia Oblast on the Baltic-White Sea Canal) and Volkhov. To note is that all aluminium works have increased output in a period of contraction in the Federation economy. That is a good indicator of the degree of export orientation in the industry.

One thus can observe that the major determining factor for location has been access to cheap, renewable, continuous and abundant electricity supply based on hydroelectric power. This pattern of aluminium plants being served by power stations connected to large manmade reservoirs include, the Bratsk plant being supplied by the Bratsk dam, Krasnoyarsk plant by the dam after its name, the Sayansk plant by the Sayano-Shushensk dam and Volgograd plant by the 22nd Congress dam.

TABLE 15 : Ru	ussian Aluminiu	ım Production in	1998 versus 19	97
	1998	December 98	% Change 97	1997
Novokuznetsk	268,6	23	0,023	262,6
Bogoslovsky	156,5	13,2	0,021	153,3
Volgograd	127,6	11,5	0,065	119,8
Kandalaksha	66,0		0,065	62,0
Nadvoitsy	59,8		-0,002	59,9
Volkhov	11,6		0,068	10,9

Source: Russian Customs Committee 1998

The second determining factor has been proximity to the littoral as indicated by the Kandalaksha and Nadvoitsy works, but as previously commented upon, internal logistics do not represent the portion of costs as does the power supply.



Russia thus is better off than the western industrialised countries in that it only partially has to import bauxite, and has its main comparative advantage at stages 2 and 3 through significantly lower input cost in terms of electricity, labour and cost of capital. Cost of capital advantages are a result of the majority of the plants were privatised at values significantly below the true market price reflected by discounted net earnings of the export-oriented production. At stages 4 and 5 there is room for both developing the home market and an improving production technology, and a must if Russia is to increase its exports earnings significantly in this sector.

Aluminium (alu) smelters work by tolling alumina, which means they do not have to part with foreign exchange here. Nor do they have to spend hard currency on coke and pitch when

they enter into compound tolling agreements. Aluminium smelters pay their rail, electric and other natural monopoly bills in roubles. Most of Russia's and East Siberia aluminium smelters, though, are in need of modernisation as much of their equipment is obsolete. The Bratsk smelter, Russia's biggest, was built in 1966; the Krasnoyarsk smelter in 1964; the Sayan smelter in 1985; and the Novokuznetsk smelter as long ago as 1943.

A constraint for upgrading the smelters, and thus being able to approach the high value added market at stages 4 and 5, is the Central Bank of Russia's recent decision to make exporters sell 75% of their foreign Exchange earnings instead of a previous 50%. Investment projects in the aluminium industry will probably suffer through reduced ability to direct purchase of equipment and western proprietary technology. Government thus is a constraint, and the general decline in commodity prices has obviously pressed the Russian Federal budget.

The overall evidence on government however, is that the privatisation and transformation in the Russian industry sector has been successful. Western style vertical integrated companies have evolved to capture a larger portion of the value chain through cost and profit control. It also allows for financial creativity through intra firm transfer pricing to minimise tax etc. TaNaKo financial and industrial group, is one such example, which control or have significant stakes in the Krasnoyarsk aluminium smelter, Krasnoyarsk metallurgical plant, which fabricates aluminium, Krasnoyarskenergo power utility, Krasnoyarsk hydroelectric dam and the Achinsk alumina refinery.

6.2 THE INDIVIDUAL COMPANIES

Name	Region	Products	1994	1995	1996	1997	1998
Bratsk	Irkutsk	Primary A	751	768	783	800	
Krasnoyarsk Alu	Krasnoyarsk	Primary A	717	756	777	787	
Sayan Aluminium	Khakasia	Primary A	285	315	325	327	
Siberian Urals Alu Company	Sverdlovsk	Primary A			322	331	334,7
Total Primary Aluminium Production			1 753	1 838	2 207	2 245	
Krasnoyarsk Metall W	Krasnoyarsk	Roll Aluminium	22	40	9	9	

Source: Russian State Custom Committee - Interfax Newsagency 1998

Exports	of Primary Alumi	nium 1996 – 199	97 000' To	nnes			
Name	Region	Products	1994	1995	1996	1997	1998
Krasnoyarsk Alu	Krasnoyarsk	Exports PA			728	725	
Bratsk	Irkutsk	Exports			718	716	
Sayan Aluminium	Khakasia	Exports			309	292	
Siberian Urals Alu Company	Sverdlovsk	Exports			127	121	
Total Export Volumes of Primary Al	u				1 883	1 855	

Source: Russian State Custom Committee - Interfax Newsagency 1998

6.2.1 Krasnoyarsk Aluminium

Name	Region	Products	1994	1995	1996	1997	1998
Krasnoyarsk Alu	Krasnoyarsk	Primary A	717	756	777	787	802,0
Krasnoyarsk Alu	Krasnoyarsk	Exports PA			728	725	

Source: Russian State Custom Committee - 1998

Krasnoyarsk Aluminium (Kraz) was commissioned in 1964 and privatised into a Western style corporation in 1992. The smelter has attracted the interest of several Russian and western companies. One of the more noteworthy events was a decision in 1994 to remove Britain's Trans World Group from the shareholder register, depriving the company of the opportunity to participate in the management of the smelter. TWG's position as of today is assumed to have stabilised, and it has acquired a stake of 12 % of total share capital via associated companies. It currently has one representative on the board of directors.

The largest shareholder as of 1998, is Rossiiskiy Kredit which at one point acquired 47 of the total capital, but had to relinquish control over two 10 % stakes that were returned to Gennady Druzhinin, a member of the board and Anatoly Bykov, the chairman of the board.

Total capital is 1.684 817 000 Rbls split into 13 478 536 common shares at par value 125.

Table 17 : Holder of Shares	Controlling Stake
Rossilsky Kredit & Associated Companies	33 %
Tanako Financial and Industrial Group	20 %
Trans World Group	11,8 %
Anatoly Bykov	10 %
Gennady Druzhinin	10 %
Glencore International	5 %
Daewoo Corporation	5 %

Source: - Interfax Newsagency 1998

Kraz also has auxiliary divisions, which supply raw materials including anode paste and fluorine salts. In terms of raw materials Kraz annually consumes more than 1,5 million tonnes

of alumina of which the majority is supplied under tolling agreements from abroad. The Russian suppliers are the Achinsk Alumina refinery in the Krasnoyarsk Krai and the Bogoslovsky Aluminium Plant located in the Urals.

Kraz has diversified its capital and holds share positions in the South Ural Cryolite Factory, the Yaroslav Mining and Milling Plant, the Achinsk Alumina Plant, the Krasnoyarsk Metallurgical Plant and the Novosibirsk Electrode Works. Kraz also has an ownership position in the Krasnoyarsk Hydroelectric Power Plant from which deliveries of cheap electricity is facilitated. Electricity accounts for about 20 % of production costs at Kraz. Less than 10 % of production is sold inside Russia due to low effective demand, in 1997 this accrued to 61,8 thousand tonnes.

The Kraz reconstruction programme aims to implement conversion of its anode lines from Søderberg to pre-bake technology over the next 10 years at a cost USD 2,2 billion. Most western smelters have largely completed this process.

Mergers and Acquisitions (M&A) activity of interest is the membership in TaNAKo (Transnational Aluminium Company) financial and industrial group which has vertically integrated across manufactures of alumina, primary and fabricated aluminium, power and transport providers as previously mentioned. In light of the meagre allocation of foreign capital to the industry in general, being able to front as an alliance (TaNAKo) to raise Western capital for the modernisation programme must be considered essential.

6.2.2 Krasnoyarsk Metallurgical Works (Kramz)

Krasnoyarsk Metallurgical Works (Kramz) is located in Krasnoyarsk and was formed in 1970. The current structure as a joint stock company is from 1992. The Kraz and TaNAKo are assumed to be the largest shareholders, percentage still not known. It produces milled aluminium and alloy products, extrusion bars and sections etc. The complex consist of five different works, two foundries producing round and flat ingots of aluminium, a plant making extrused bars and sections, a plant making extruded and welded pipes, a facility making forgings and casting and a mini-plant producing consumer goods.

Kramz supplies mainly the domestic market (89,5 % of production), only 9 500 tonnes of aluminium products were exported in 1997. In 1995 the company signed a USD 135 million contract with US Hunter Engineering Company for delivery of equipment for cold rolling aluminium sheets. US Eximbank has offered the rollover credit facility against the Federal

Russian and Regional Krasnoyarsk guarantees. In terms of M & A activity, Kramz is a member of the TaNAKo (Transnational Aluminium Company).

Share capital is 1 476 737 000 Roubles of which common shares 12 961 970 (87,8 %) and preferred shares of 1 805 400 (12,2 %) at par value 100 Roubles.

TABLE 18 : Holder of Shares		Controlling Stake
Severo-Vostochny Investment bank		57.94%
Forest Trading Ltd		10 %
OAO Krasnoyarsk Aluminium Smelter (Kraz)		N/A
TOO Doverso (Moscow)		8 %
OOO Polis (Krasnoyarsk)		7,3 %
Beralin Finances S.A		5%
Albador United Inc	9	5%
TOO Modus (Moscow)		3,8 %

Source: Interfax Newsagency 1998

6.2.3 Bratsk Aluminium

Name	Region	Products	1994	1995	1996	1997	1998
Bratsk Aluminium	Irkutsk	Primary A	751	768	783	797,6	844,2
Bratsk	Irkutsk	Exports			718	716	

Source: Russian State Custom Committee - Interfax Newsagency 1998

The Bratsk Aluminium (Braz) was commissioned in 1966 and privatised in its current corporate structure in 1992. It is the worlds largest primary aluminium producer, and employs about 11 000 persons. After privatisation, Trans World Group (GB) soon became a shareholder, and has steadily increased its stake in the company, much based on the proprietary information TWG acquired during the first years after privatisation. Based on this TWG became the biggest trader of its tolled aluminium, and controlled the bulk of its raw material supplies. 1995 was a year of turbulence between the Braz management backed by TWG and the Vash finansovy pepechitel (Your Financial Guardian), which reportedly had bought shares on behalf of the Nikolayev alumina refinery in Ukraine (also a Braz supplier). The purchase was claimed to be in breach of the current legislation, and the dispute continued until 1997 when a truce agreement was signed.

The share capital is of 1 101 billion roubles, split into 1 010 061 common shares at par value 1000 Roubles each.

Holder of Shares	Controlling Stake
Trans World Group & Associates	50 %
Vash finansovy popechitel and Associates	25,1 %
Others	24,9 %

Source: Interfax Newsagency 1998

In terms of core capacity at Braz, it consists of 24 electrolysis pots. Braz also possesses ancillaries that supply inputs like anode paste and silicon used to make silumin. It consumes more than 1,5 million tonnes of alumina annually, and for which 80-90 % is received under tolling agreements. Braz imports alumina from Australia and New Guinea through the Far Eastern Ports (Nahodkha, Vostochny and Vladivostok). It also imports from Kazhakhstan and its Pavlodar refinery, one of the FSU largest. From the previous tables Bratsk is both the largest producer, 884 000 in 1998, and the largest exporter of refined primary aluminium.

Similar as for Kraz the Bratsk smelter utilises Hydro electricity, generated by the Bratsk Hydroelectric Power Plant on the Angara River which is run by the Irkutskenergo. Energy input per ton of aluminium produced is 16 000 kwhrs, and account for 11 % of production costs. Its competitiveness is self evident in terms of costs and documented by export volumes. The company has zero interest payments and capital costs.

Braz use potlines with overhead current leads, and can cast ingots and bars of various descriptions. The main disadvantage for the Braz as for the others FSU producers is the remoteness from the final market, and lack of a developed home market to stimulate product developments and further integration along the value chain. This is the flip side of the coin of having a major shareholder in an illiquid domestic market. The TWG group however, has a number of possible transfer pricing arrangements from vessel charters in the Pacifics through out the final delivery of the traded product, as it controls the international logistic and trading arrangements.

6.2.4 THE SIBERIAN - URALS ALUMINIUM COMPANY (SUAL).

Siberian Urals Alu Company	Sverdlovsk	Primary A	322	331	334,7
Siberian Urals Alu Company	Sverdlovsk	Exports	127	121	

Source: Russian State Custom Committee - Interfax Newsagency 1998

The Siberian-Urals Aluminium Company (Sual) was formed by the merger of the Urals Aluminium Plant (Uraz) which was put into service just before the Second World War, and the Irkutsk aluminium Plant (Irkaz) that opened in 1962. Both companies were privatised in

1992. The U.S joint venture "Renova" gained a controlling stake of Irkaz in 1994, and preceding the merger "Renova" co-operated closely with Uraz on purchases of alumina for the Irkutsk smelter. The decision to merge was approved in May 1996, despite opposition from among others Bank Rossiskiy Kredit. The Duma in Sverdlovsk Oblast set up a holding company in 1993, "ALKUR" took a stake of 44 % in Uraz, and thus had a negative vote in the company (above the 33 % voting rights that is required to block significant changes). ALKUR supported the merger and handed the trust of the company over to "Renova".

Share Capital is 168 020 million Roubles split into 168 020 567 common shares at par 1 000 Roubles.

Holder of Shares	Controlling Stake
Irkutsk Aluminium Plant	43 %
Urals Aluminium Plant	43 %
ALKUR	14 %

Source: Russian State Custom Committee - Interfax Newsagency 1998

Aluminium production is mainly carried out at Irkaz located in Shelekov, Irkutsk Oblast, partially at Uraz located in Kamensk-Uralsky in Sverdlovsk Oblast.

Raw material supply is facilitated by its own alumina refinery, for which 80 % of output is used internally in aluminium production. SUAL also produces crystalline silicon and production facilities are located in both plants. Further it produces anode paste for its aluminium smelter. Irkaz's smelter as the Bratsk smelter receive energy from the Bratsk and Ust-Illimsk Hydoelectic stations, for which proportion of output cost is less than 10 %.

For Uraz, which is an old smelter and obtain electricity from the Krasnogorsk thermal coal fired power station, electricity account for closer to 30 % of costs. The Sverdlovsk Oblast department of the Federal Commission for Securities and the Stock Market registered an issue of 120 million, 1-ruble shares by SUAL by the end of December 1997. The issue proceeds are indicated to be used for a stake in coal companies in Kazakhstan. The plan is to supply cheap coal to the Sverdlovskenergo power utility in return for low-cost electricity. One thus observes that internal comparative advantages are at work in the FSU. It is however puzzling that a low cost commodity as coal is able to bear the transportation difference from Kazakhstan, being abundant in supply in the Komi Republic among others.

Contrary to Bratsk and Krasnoyarsk aluminium plants, the SUAL delivers the majority of its production to the domestic market, about 60 %. The main buyers are cable plants and

producers of aluminium foils.

In terms of future investments the key project is the development of the Sredne -Timanskoye bauxite field in the Komi Republic. Annual investments to develop the field are estimated to be USD 20 – 30 million. The total recoverable reserves are 280 million tonnes and can be strip-mined. If developed, the total costs are estimated up to USD 600 million at an annual capacity of 3 million tonnes. That would resolve the import need for the Russian alumina and aluminium industry, or allow for deliveries to Northwest Europe for which the French (Pechiney), Norwegian (Norsk Hydro – Elkem) or German aluminium industry could be takers. The development would replace the SevUralBoksitruda, which is the largest producer as of today with recoverable reserves down to 23 million tonnes. Approximately USD 7 million was invested into the Timan project in 1998 to raise bauxite production to 300,000 tonnes. In 1999 the construction of a 30-km rail track linking the new field with the mainline is likely to be finished. SUAL is not planning to boost production of primary aluminum in 1999.

6.2.5 SAYAN ALUMINIUM

Sayan Aluminium	Khakasia	Primary A	285	315	325	327	330,0
Sayan Aluminium	Khakasia	Exports			309	292	

Source: Russian State Custom Committee - Interfax Newsagency 1998

Sayan Aluminium (Saaz) was built in 1985 at Sayanogorsk in the Republic of Khakasia, and privatised in 1992. The smelter was commissioned in 1985, and the anode plant in 1986. Trans-World Group acquired significant share volumes in 1995 and established control over tolling supplies of alumina and primary aluminium exports. Its influence diminished throughout 1997 as the management opted for a more independent financial, economic and production policy. In particular this related to the selection of foreign trade partners, probably to remove transfer-pricing mechanisms. By the end of 1997 TWG lost its influence.

Share Capital is 1 229 000 000 Roubles issued on 1 229 422 common shares at par value 1 000. A share split was performed in 1995 into 4 917 688 common 250 roubles shares.

Holder of Shares	Controlling Stak			
AluminJProdukt	20 %			
Russian State Property Fund	15 %			
Salomon Brothers	15 %			

Source: Interfax Newsagency 1998

The core production capacity consists of eight electrolysis plants, and Saaz also possess a factory that produces baked anodes. Saaz is the newest aluminium smelter, has a majority interest (70 %) in the Sayanal aluminium foil mill that is located on Saaz territory and provides the primary aluminium necessary. Comparatively in general terms the Søderberg technology uses about 20 % more electricity than pre-baked technology at the same age and development, but electricity is only 15 % of total production costs. Saaz gets its electricity from the Sayano-Shushensk Hydro-electric power station located 50 km upstream at the Yenisey. Saaz consumes about 80 % of the total energy delivered by the power station and invested itself more than USD 20 million in repairs on the dam in 1996.

7 THE NON FERROUS METALS INDUSTRY - NICKEL & COPPER

7.1 AGGREGATED PRODUCTION & EXPORTS

Russia : Aggregated Export of Prime Non-Ferrous Metals 1998 (Jan – Oct Annualised)								
January-October 1998			January-Octo	ber 1997	Av Unit Price USD /			
				Tonnes				
	000' Tonnes	USD Million	% of Total	000' tonnes	USD Million	1998	1997	
Total Exports	0	70.540	100,00 %	0	83.738	1998	1997	
Primary Aluminum	2.771	3.850	5,46 %	2.685	3.748			
Outside CIS	2.767	3.843	5,45 %	2.681	. 3.741	1.389	1.396	
CIS	4,4	7,0	0,01 %	3,5	6,6	1.389	1.395	
Primary Nickel	207	1.097	1,56 %	215	1.476			
Outside CIS	207	1.096	1,55 %	215	1.472	5.287	6.871	
CIS	0,1	1,3	0,00 %	0,1	. 3,7	5.283	6.860	
Copper	535	893	1,27 %	533	1.132			
Outside CIS	534	891	1,26 %	532	1.130	1.669	2.124	
CIS	0,7	1,7	0,00 %	1,0	2,4	1.667	2.123	

Source: Russian State Customs Statistics 1998

Russia is one of the major non-ferrous metals producers in the world, which also can be ascribed to nickel and copper production. Aluminium is the most important as discussed in the previous chapter, accounting for 4,56 % of Russia's export revenue in 1998. Nickel as a commodity account for 1,56 % or USD 1, 097 Billion in 1998. Copper accounted for 1,27 % or 893 Million USD. The difference between the two commodities in Russia is that nickel production is concentrated on the hand of one company, Norilsk Nickel, whereas the Copper production is represented by more producers, but still more than half of the production is controlled by Norilsk Nickel. Nickel production is also concentrated in two geographic specific regions, the Taimyr Peninsula North in Krasnoyarsk Krai, and Murmansk Oblast, whereas copper production takes place in both these places, but also in the south Urals, Magadan etc. Commodity unit prices of nickel and copper on the world market differ at a factor 3:1.

7.2 NORILSK NICKEL

Norilsk nickel was established as a state enterprise in 1989, and was privatised in 1994. Under Norilsk nickel are six subsidiaries, Norilsk Integrated Mining & Metallurgical Plant at Norilsk, Severonickel, Pechenganickel and Olenogorsk Mechanical Works in Murmansk Oblast, Krasnoyarsk Non-ferrous Metals Plant in Krasnoyarsk and Gipronickel Institute in

St.Petersburg.

Holder of Shares	Controlling Stake				
ZAO Swift (Uneximbank and MFK)	38,02 % (50,7 % voting)				
ZAO Renaissance - Kapital	16 %				
AO CS First Boston	4,7 %				
AO Credit Suisse (Moscow)	4,5 %				

Source: Interfax Newsagency 1998

The enterprise is closely integrated with Uneximbank – MFK group which is the major shareholder with 50,7 % of the voting shares. The shares are probably the most liquid in the Russian stock market. NN is one of the world's largest copper-nickel ore extraction, and nickel, copper, cobalt, platinum and platinum group production, companies. The two main developments are the Talnakh and Oktyabrskoye deposits in the Talnakh ore node on the Taimyr Peninsula. The Talnakh node contains 48 % of the nickel, 38 % of the copper, 47 % of the cobalt and about 30 % of the platinum group metals. It is thus clearly the most important asset to the company. Several underground mines have been built to the Talnakh node, Mayak, Komsomolsky, Oktyabrsky and the Taimyrsky which are operational. Two mines are not currently being worked, the Skalitsky and the Gluboky. Pechenganickel's copper – nickel deposits on the Kola Penisula include Kotselvaara, Semiletka, Zhdanov, Bystrinskoye and Tundrovskoye, all of which are extensively worked.

NN also owns 30 % of Norilsk Gazprom, and as such has a significant stake in its own power supply. Norilsk Nickel must be considered vertically integrated and one of Russia's most internationally exposed enterprises. Norilsk Nickel produce 91 % of Russia's nickel, 57 % of all copper, 80 % of all cobalt and 95 % of the country's platinum group metals.

Norilsk Nickel : Major Prime Non Ferrous Metals Production 1994 – 98 000' Tonnes							
Name	Region	Products	1994	1995	1996	1997	
Norilsk Nickel	Taimyr	Copper	314	339	340		
Norilsk Nickel	Taimyr	Nickel	163	180	177		
Total Norilsk Production			476	519	517		

Total Exports by Norilsk Nickel 1994 – 98 000' Tonnes								
Name	Region	Products	1994	1995	1996	1997		
Norilsk Nickel	Taimyr	Export of C	119	110	241	299		
Norilsk Nickel	Taimyr	Export of N	· 89	88	105	103		
Total Exports from Norilsk			208	198	346	402		

Source: Russian State Custom Committee - Interfax Newsagency 1998

8.1 CURRENT PRODUCTION

The only current production of energy resources is along the lower tributary of the Yenisey River by Norilskgazprom. Gas production is carried out at two sites on the westbank (to the northwest of Igarka) at the South-Solenino and North-Solenino deposits, with pipelines of natural gas and condensates crossing the Yenisey to the city of Norilsk serving the needs of the Norilsk mining-metallurgical plant. Associated crude oil production by Norilskgazprom accrued to a meagre 14 thousand tonnes in 1998. This does not however indicate the potential of the region, but reflect the relative location of proven reserves versus the current infrastructure and the previous central – periphery priorities of the Former Soviet Union.

8.2 New Reserves

TABLE 20 : Krasnoyarsk Krai : Recoverable Reserves in Evenk & Dolgij AO - 1999								
	Crude Oil Mill Tonnes	Natural Gas Billion Cum	Condensate Mill Tonnes	Area Square km				
Yurubchensky	281	374	29	5.569				
Kuyumbinsky	212	2.000	16	5.310				
Tersko-Kamovsky	. 263	292	. 23	5.232				
Omorinsky		8	1	6.320				
Sobinsky	11	158	9	4.222				
Dzhelindukovsky	8	43		12.200				
Ayavinsky	17	198		11.500				
Total	791	3.074	78	50.353				

Source: Russian Petroleum Investor 98

To realise this potential the Evenk-Dolgij deposits could open up a sector previously closed. Along a pipeline route the North South axis in the territory can be accessed on a year-around basis, and likely contribute to developing the mining and forestry sectors. A direct pipeline into the Chinese market can achieve this, or through a northbound route to the Dudinka area where a reserve of underused infrastructure exists. Krasnoyarsk Krai would within its regional economy probably be able to contribute to reach a 70 percentage local content of deliveries. (For a further description see INSROP Working Paper 144 - Ramsland 99). Through the NSR and Yenisey-Angara river system, it can at least facilitate the import of all necessary equipment to, and potentially the export of its hydrocarbon resources.

9 The Forrest Products & Cellulose Industry

The Krasnoyarsk Territory is one of the most densely forested areas of Russia. Forests occupy about 168,1 million hectares (i.e. 69% of the total surface of the Territory). The total wood stock consists of 14,4 billion cubic meters, or 29% of Russia's reserves. Production is about 16,3 million cubic meters annually, which is about 25.2% of estimated forest growth. The most important productive region is the Angara-Yenisei region (the area of the lower flow of the Angara River, or Nizhnaya Pri-angara), where about 58% of the total volume of timber cutting is concentrated. The most significant growth factor for industry in the Territory is a surplus of hydroelectric power. This is due to extensive development of the hydroelectric potential of the rivers in the Territory, which means that large amounts of electricity are available for low rates.

9.1 ELECTRICITY SUPPLY

The annual volume of water flow is 700 cubic kilometers, or about 20% of the volume of all the rivers in Russia. The highest hydro-energy potential is in the Yenisey and Angara rivers. Two hydro-power dams are currently operating on the river Yenisey. The forest products industry of the Territory makes it third in Russia and the first in lumber production in the country. The wood industry is presented by more than 200 enterprises. Forest products traditionally have been and still remain the main export item of the Krasnoyarsk Territory.

10 CONCLUSION

This project has amalgamated two parts of the suggested findings of INSROP Phase I. The first to evaluate the Yenisei basin as a regional point of pivotage for potential cargoes on the NSR. The second to evaluate the metals industry as a sector of contribution of transit cargoes on the Europe - Far East trade (The main segment in 1994).

The amalgamation has proved correct in that there exists a cluster of factors and production units in Eastern Siberia (Dunning), and in particular in Krasnoyarsk Krai. The initial project focus must thus be said to be on the mark. In this context it should be stated that the author found it correct to approach the paper through the aggregation of the Eastern Siberia Administrative Area, rather than that of the Angara Yenisey Region. Basically this was done so as to conform to the aggregation of Russian national statistics, upon which the paper is based. The differential is however minute.

Generally one observes that the high volumes coincide with, and are a function of two coinciding events. The end phase of contraction in the newly privatised Russia, (but still reflection of the Soviet past) industry, and secondly a Chinese economy expanding faster than its domestic infrastructure could support. The asymmetry of market information, in particular on Russia's behalf led to export prices probably being at significant discount.

During the last 4 years the Chinese market has partly become saturated as it has built stocks in terms of finished infrastructure, but also has developed indigenous sources of supply to capture producer surpluses. Further Russia does not hold any significant stocks of surplus material, and produces on resources and prices that reflect the real cost of its factor abundant economy. Russia (and North West Europe) as an exporter thus maintains production volumes, but import volumes in the Far East, and in particular China, declining and leveling out. Market allocation for exporters then shifts to South East Asia and the indian sub-continent.

The main contribution of the River system Yenisey – Angara to the region, is that of a continuous and predictable supply of inexpensive hydroelectric power. This is the cornerstone of the regional enterprises that allow for a significant value added otherwise impossible to obtain. In particular it can be attributed to non-ferrous metals industry in the production of aluminium, and to the industry of cellulose production in the Irkustsk Oblast.

The second contribution is that of a logistic artery that allows for internal transportation and production of goods, mainly within the forestry sector of logs and sawn timber. The river fleet, in particular that of the pusher tugs and the barges, is depreciated and well preserved (INSROP Working Paper no 44 - Ramsland 94). It is operated for less than half the year in fresh water, and must be reckoned intact for years to come and thus able to serve the industry. However the constraint is the period of navigation, late May to November, that will persist on climatic grounds alone. That allows for zimniks (winter roads) built on the surface, but are not significant for industrial use.

Foreign investments do not reflect the importance of the region, but that of the key industries being more than aware of its potential and which have taken a slow approach to modernisation, rather than to relinquish control of the assets. On the other hand barriers in terms of remoteness and risk perception have been too high for the Western investors. However, some multinational enterprises have been able to penetrate this market, best illustrated by the Trans World Metals Group.

The Administrative Area (AA), and in particular the Krasnoyarsk Krai contributes considerable to the national economy in an overall perspective, and probably represents about 7-8 % of the total economic activity. If the energy sector of crude oil, oil products and natural gas is excluded, it is most likely the most significant subject in the Federation to generate Foreign Exchange. This also makes the AA prone to its exports market. For the industries to develop further, and to penetrate higher value markets in the industrialised countries, it needs to raise capital at better terms than as of today. Thus two paths can be envisioned, either a stagnant sector content with stable deliveries of semi-finished goods prone to the general industrial cycle. Alternatively an industry at terms with the market that cedes collateral or representation, but one that penetrates along the value chain.

The energy deposits in the Evenk Dolgij AO could be developed into the project that would lift Krasnoyarsk Krai from the foreign perception of the "Middle of Nowhere" to the realm of its Centre of Gravity.

REVIEW of "Angara and Yenisey Region, Cargo Generating Area for the NSR" Supervisor: Trond Ramsland

Reviewer: Craig ZumBrunnen, Department of Geography University of Washington, Seattle, WA 98195 - phone (206-543-4915) FAX 206-543-3313, email - craigzb@u.washington.edu.

First, unlike the previous review, I have made numerous comments on the return manuscript that is included in this FAX which draw attention to suggested grammar and style changes, unclear phrasing and in a few instances typographical errors which need to be corrected. While native speakers of most Slavic languages tend to leave out definite ("the") and indefinite articles ("a") of speech when writing in English, this paper in a number of places either includes articles of speech where they are not needed to appear awkward to a native speaker or omits them. I have tried to systemically assist the author in making appropriate changes. Thus, the narrative of this review is shorter than the previous review.

Some more important substantive general comments follow:

Most importantly, although this paper includes a great deal of detailed regional economic data on individual industrial firms in the Angara-Yenisey region, the version of the paper I received had absolutely no documentation or bibliographical/source information for any of the detailed and interesting data tables nor for textual information. This omission is BY FAR the most critical comment I have and what, I believe, definitely needs to be addressed in the final version. All of the tables should include bibliographical information on the source(s) of the data. Stylistically it would be very helpful to label/name the tables in some systematic way.

The introduction needs to be rewritten to more directly inform the reader about the scope and motivation for the study. Or perhaps, some reorganization could be done to separate the materials appropriate for the introduction from that which appears in part "2" on the Suez Canal statistics (note on page 6 a graph is mentioned in the text, but no graph exists in the paper) and at the same time perhaps more completely or clearly justify the inclusion of the Suez data. The third line from the bottom on page 8 mentions stream gradients ranging from 5 to 100 meters/km. Over short distances and/or in headwater regions of drainage basins such high gradients are possible, but certainly not over long distances, say 500 km at 100m/km would equal 50,000 meters in vertical relief. something seems very wrong here. Even 5m/km over 100 km would represent quite a large change in vertical relief, I believe, for navigation. For example, if the Yenisev where to average a gradient of 5m/km over its length the vertical relief would represent over 20,500 meters! If the point here is to raise the potential for hydropower site development, it is one thing and should be discussed directly. The other content of section "3" seems straightforward, descriptive and accurate. Section "4" contains an interesting richness of regional detail on foreign investments. Besides the previously mentioned lack of documentation of sources, I believe that there is one IMPORTANT factual error on page 14. There ARE indeed major high voltage interregional electric

power grid connecting East Siberia both to the European part of Russia and as far east as Chita and south of former Karaganda in Kazakhstan. Thus, I suggest the following change in wording:

2nd paragraph, lines 5-6, page 14 ".... Of foreign capital despite the extensive interregional high-voltage power grid system."

On page 18 line 6 there is reference to the Siberian-Ural Aluminium plant in Irkutsk-Perm. What is meant by Irkutsk-Perm? Does Irkutsk refer to the aluminium plant at Shelekhov?

Does Perm refer to the old aluminium plant at Yekaterinburg (formerly Sverdlovsk)? Or does it refer to the bauxite deposit in the Urals in the vicinity of Perm or what? The item on the middle of page 26 suggests to me that it is an amalgamation of the Shelekhov and formerly Sverdlovsk plants. Is this true?

On page 21, last paragraph; first line "...24 electrolysis plants." Does the author really mean "24 electrolysis plants" or "24 electrolysis vats"? Same question occurs for the first line on top of page 24!

One final comment is that I would suggest the author to add short "transitional" sections between the numbered sections.

Department of Shipping, Trade and Finance

Professor Costas Th. Grammenos, OBE, DSc Head of Department Pro-Vice Chancellor, City University



27 February, 1999

Claes Lykke Ragner INSROP Secretariat PO Box 326 N-1324 Lysaker Norway

Dear Claes,

Re: Project III.01.5: "Angara - Yenisey Region", by Trond R. Ramsland

The paper looks at potential cargo generation for the NSR from the Angara — Yenisey region. The author has put together a substantial collection of information, most of which refers to the aluminium production capacity and export potential of the region. In this respect the paper is quite valuable for any party who might be interested in attracting cargo traffic through the NSR, but overall I found the paper wanting.

The first and most important element missing is the <u>aim</u> of the study. Is this simply a description of the current situation or is it supposed to translate all the information into potential demand for transport through the NSR? I do realise the difficulty of producing any actual cargo forecasts, but the author could perhaps look at the advantages (if any) of using the NSR for e.g. bauxite/alumina/aluminium exports. If the NSR is to be used, target markets for such exports would be in the Far East; so one could compare the costs (and hence viability) of Russian exports (including NSR transit costs) with costs from competitive sources (notably, Australia). As the paper does not make any such attempt, I consider it incomplete.

It may be quite possible, of course, that the author's intention was never what I assumed it to be, which brings me back to the initial point about the lack of statement of the aim. I would strongly recommend an abstract — which states the aim, methodology and major findings of the paper — be put at the beginning.

My second observation is that the paper seems to have been written in a hurry for the following reasons:

- there is no conclusion;
- sections 6 and 7 are far too short and in stark contrast to the extensive section on aluminium;
- some editing of the English is necessary, as mistakes in both expression and spelling are rather frequent and may sometimes mislead the reader about what the author means to say.

In conclusion, the paper has potential, but needs to "translate" the discussion on the existing industries in the Angara — Yenisey region into cargo potential for the NSR, in a more explicit manner. Otherwise, if the aim of the study is less far reaching, it should be clearly stated at the outset.

I hope my remarks will be helpful

Sincerely yours

Michael

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COMMENT TO THE REVIEW OF INSROP PROJECT III.01.5

First I would like to clarify the issue of sources that the ZumBrunnen found important to address and that relates to the "detailed and interesting tables". This had regretfully been omitted due to the time schedule imposed, but has of course been abided in the final paper.

The project work has been solved by two separate papers on one hand, and is also a prolongation of the Phase I work on the other. (In this context I take that the reviewer's introductory comments refers to the Russian III.01.5 Paper). Thus I did not find it necessary to reiterate the result on the timber trade out of Lesosibirsk, Yeniseysk and Igarka that continues today and was covered in INSROP working paper no 44. Secondly the Russian part of project III.01.5 by Mark Bandman et.al deals with the forest and cellulose industry in detail, although on time series of some age. Thirdly as this is the main export commodity from the Russian Far East Administrative Area to the Far East (dealt with in INSROP Paper III.01.6), a region equally factor abundant in forest products, and at advantage in terms of geography and logistics. That addresses why this issue has been left out, simply to avoid duplication.

Thus the industry that generate volumes of some scale of interest to shipping and investors is that of the non-ferrous metals industry. This segment has been addressed in detail to clarify the particular issues at stake.

The Suez Canal Statistics are justified in that they point out that the main Russian cargo segment of interest for exports to the Far East is that of fabricated metals. It thus highlights the relative importance of East Siberian non-ferrous metals export to the overall Russian exports of metals on the one hand, on the other it is illustrative in terms of the North West European exports. This should help the readers to access the industry figures from an overall approach of cargo volumes.

Also a certified Navigator, I concur to the remark on gradients, incurred by a slip of the pen.

To Tamvakis comments, initially I regret that the INSROP Secretariat did not succeed in forwarding the correct edition, as such the conclusion etc was lacking.

The reviewer suggests to cost exports of bauxite, alumina or aluminium from Russia with comparison to Australia. Firstly, Russia does neither export bauxite or alumina over the Far Eastern ports, only aluminium. Any comparison versus Australian production for these commodities is thus irrelevant. That also partly explains the remarks (of) the reviewer to the aim of the study. There has not been put forth any information therein, or found sources to suggest export of these products. I thus disagree with Tamvakis. The paper is complete in that respect.

Tamvakis also suggest comparison for a regime under NSR transit costs. For this reference I refer to INSROP Working Paper 140 (Ramsland 99) section 8.4, where it is clearly documented that operations on the NSR under the transit costs suggested, is non-profitable when compared to an other tariffs system, the Suez Canal. Secondly on this issue, even if only half the NSR distance where involved, the tariffs are not progressively reduced see working paper 128 page 15. Thus cost would under any case be higher per tonnes for part use of the NSR.

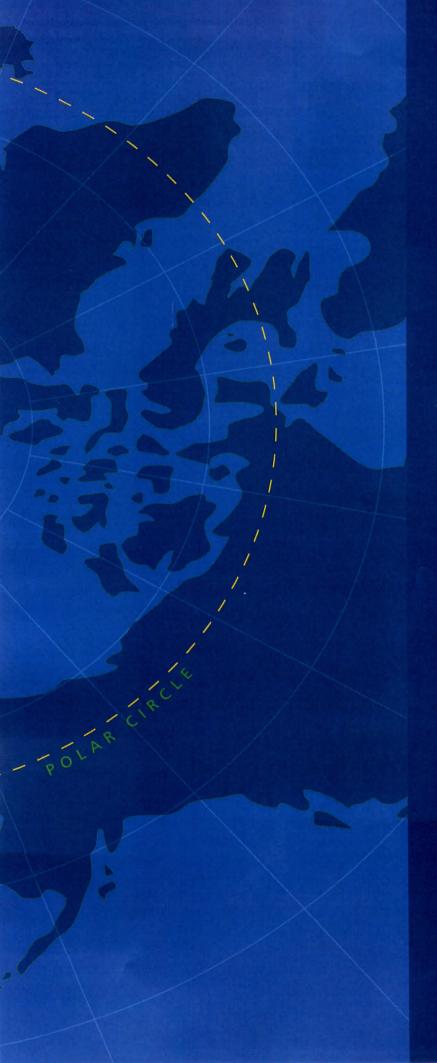
If commodities <u>were</u> relevant to compare, Australia is at shorter distance vs the Far Eastern Markets, which would make it cheaper disregarding tariffs on the one hand. On the other it does not involve any tariffs at all, and as such would be cheaper for any which alternatives of seaborne transport. Thirdly, it would not involve ice-classed tonnage, and as such the supply side operator would at any point be able to offer a service at lower freight rates, as he does not have to carry the investment premium. Lastly he would be able to offer economies of scale, that in cases at least could apply to bauxite and in some cases alumina. Thus to compare the NSR versus Australian supply do not make sense.

The relevance of the NSR is that of a comparison vs European cargoes for which the transport costing and break even tariffs has been performed, see working paper no 140.

An abstract has been included to summarise the findings of the paper.

Sincerely

Innl Rimiteral
Trond Ragnvald Ramsland



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 Nippon 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 stockholding 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 multidisciplinary approach, entailing extensive cooperation with other research institutions both at home and abroad. The INSROP Secretariat is located at FNI.