

Project KO4159 NABL, Northern Axis – Barents Link

Work Package 2: Pre-study of Direct Federal Road Vartius-Lytta Border Crossing – Arkhangelsk



Photo: Vyacheslav Lyapin, Domer PK



Photo: Vyacheslav Lyapin, Domer PK



Photo: Ivan Sinitsin, Onega District Admin.



Photo: Vyacheslav Lyapin, Domer PK

21.9.2021



Pre-study launch information

- Application:
Made along with the NABL-application in December 2018 as WP2
- The client: Regional Council of Kainuu (the lead partner of the NABL - project)
- Tender for outsourced contractor 14.9.2020 :
Carried out by the LP
- Contract was signed 11.12.2020:
with the Finnish-Russian group of Traficon Oy - Domer Pk.
- Pre-study was completed: 30.4.2021



Information about the pre-study steps

Informing core stakeholders about the pre-study

During the pre-study, there has been a special situation, when the client of the pre-study is an organization, that is not administration of the current or future road. That is why the work started with contacting the core stakeholder organizations:

- FSI Administration of Federal Road "Saint-Petersburg - Murmansk of the Federal Road Agency"
- GKU Arkhangelsk Regional Road Administration ("Arkhangelskavtodor"), Russia
- The Republic of Karelia Road Authority
- Federal Road Agency Directorate of Moscow-Arkhangelsk Motoring Road (Holmogory)

Letters from LP were sent to these 4 core stakeholders in the end of the year 2020

Starting points, 1

Road Vartiuss/Lytta – Arkhangelsk in the “Russian Transport Infrastructure 2010-2030”:



The road ends up to M-8 road on “Rikasikha” near Severodvinsk



Starting points, 2

Russian Government Commission on Transport has included the direct federal road R-21 "Kola" - Arkhangelsk into the "Long-term development road plan until 2031" (decision from 13.04.2018).

(ПЛАН, перспективного развития сети автомобильных дорог общего пользования федерального значения до 2031 года)

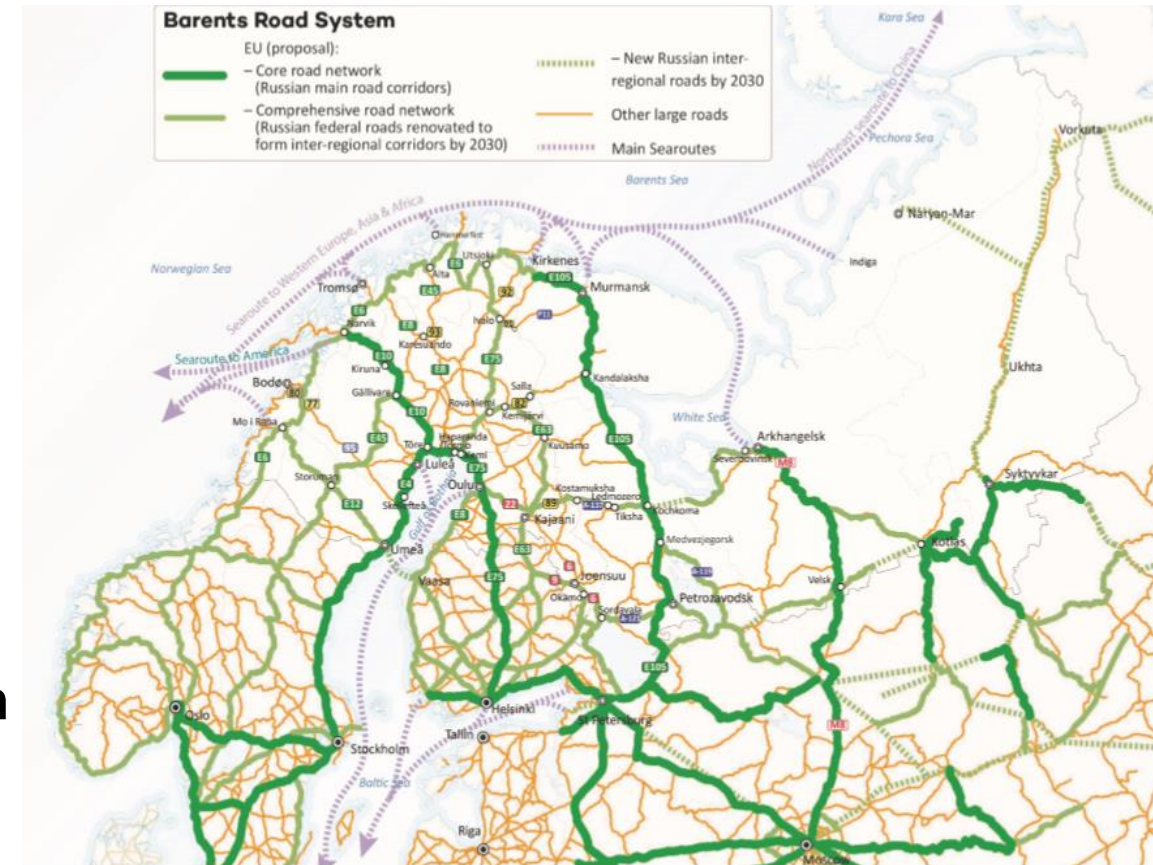
The road ends up to M-8 on Brin-Navolok. The estimation for the road to get the status of the federal road is estimated in 2029.

Брин-Наволоок – Онега – автомобильная дорога Р-21 «Кола» Архангельская область и Республика Карелия.

Starting points, 3 (JBTP)

The Barents Euro-Arctic Pan-European Transport Area (BEATA co-operation established between the ministers of transport of Norway, Sweden, Finland and Russia in May 1998) steering committee took the initiative for a Joint Barents Transport Plan (JBTP) in 2013. An Expert Group were appointed in winter, and it presented a document to the steering committee by early autumn 2013.

The document was revised later. The latest revised draft version is from 2019. The Vartius - Arkhangelsk road has been identified there as “new Russian inter-regional road by 2030”.



“Overview on the road system in the Barents Region” from the JBTP Revised Draft 2019.

Starting points, 3 (NDPTL)

Within the framework of the Northern Dimension Policy, the Northern Dimension Partnership for Transportation and Logistics (NDPTL) was established in October 2009 and is one of the four existing partnerships of the Northern Dimension with 11 countries and the EU commission.

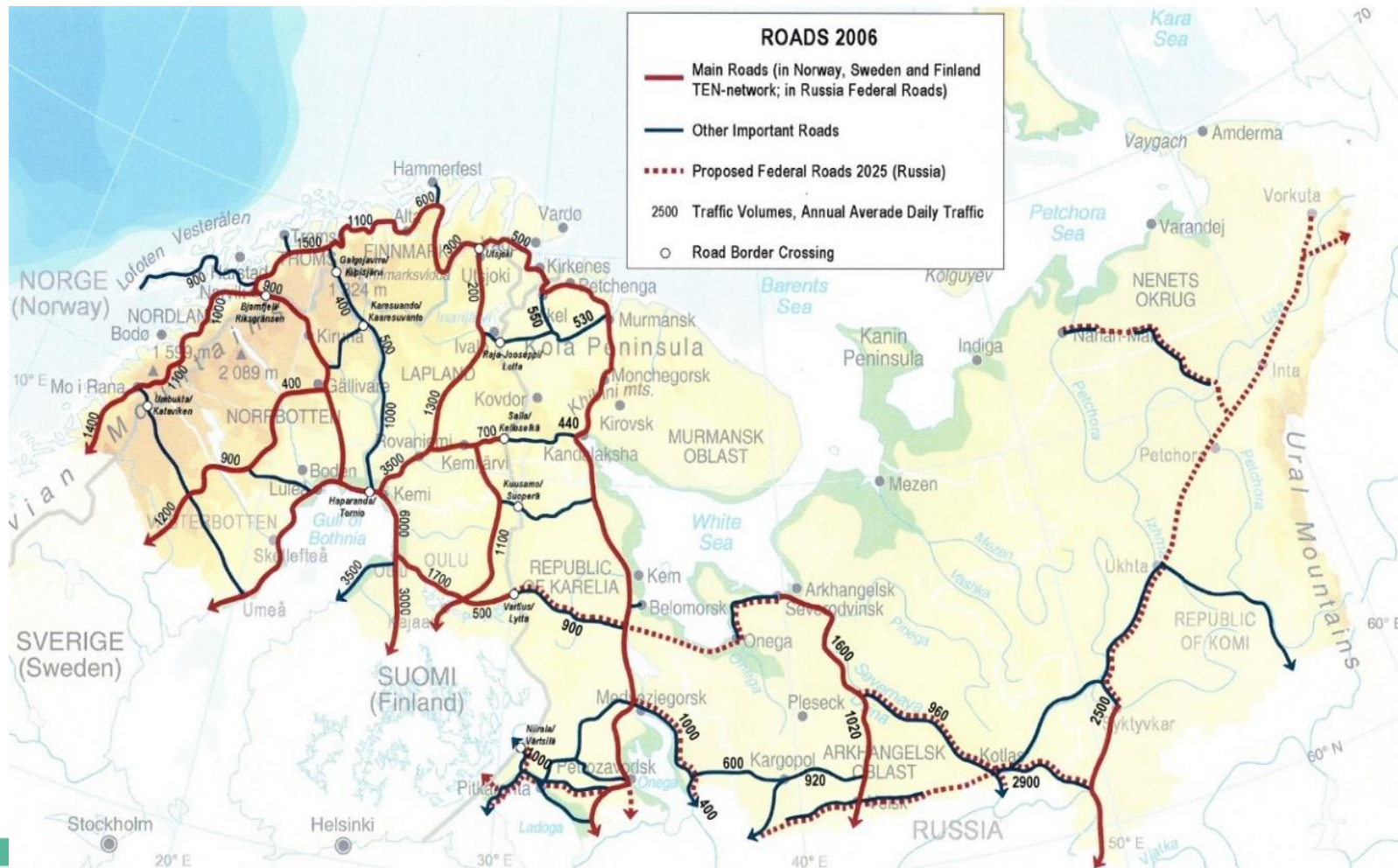
The NDPTL has recognised the Vartius-Arkhangelsk road as part of the NDPTL Regional Road Network.



‘NDPTL Regional Road Network’
(Source: <http://www.ndptl.org/road-network>)

Starting points 4

Traffic flows, Annual Average Daily Traffic, AADT 2006 (vehicles /24h)



*source: Barents Link
Corridor- report, Joint
Authority of Kainuu
Region, 2007*

Starting points 4

Estimation of current traffic flows, AADT 2020 (veh./24h)



*modified from the map of
source: Barents Link
Corridor- report, Joint
Authority of Kainuu
Region, 2007*

Starting points 4

Preliminary split of traffic flows, if the new road would be already implemented, AADT 2020 (veh./24h)



*modified from the
map of source:
Barents Link
Corridor- report,
Joint Authority of
Kainuu Region,
2007*

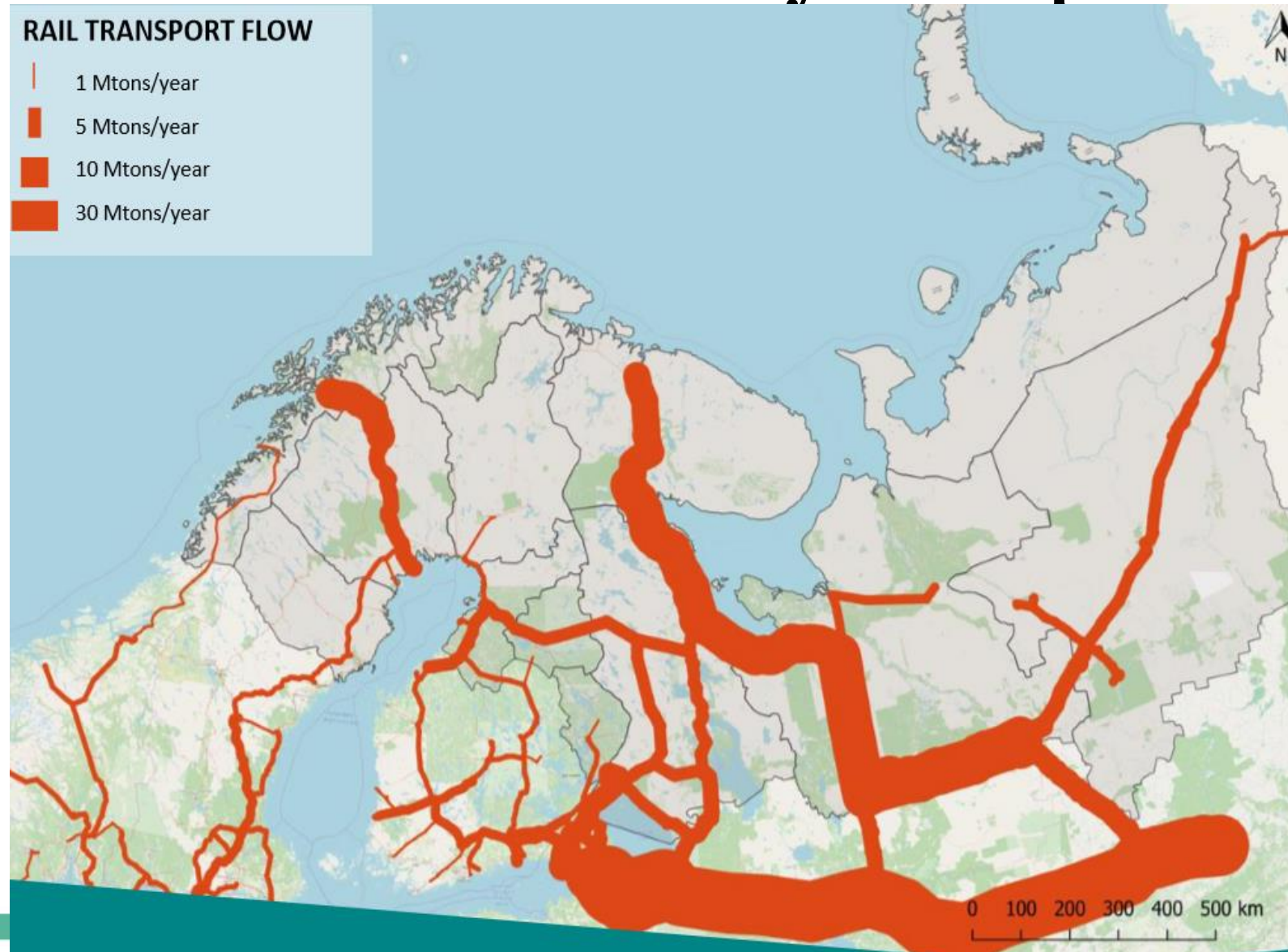
Starting points 4

Preliminary split of traffic flows after implementation of the new road, AADT 2050
(veh./24h)



*modified from the
map of source:
Barents Link
Corridor- report,
Joint Authority of
Kainuu Region,
2007*

Current railway transport



*source: KO1029
Barents Region
Transport and Logistics
-report “World
Transport Market and
Logistics Projects”
with Lead Partner
Regional Council of
Kainuu 2020*



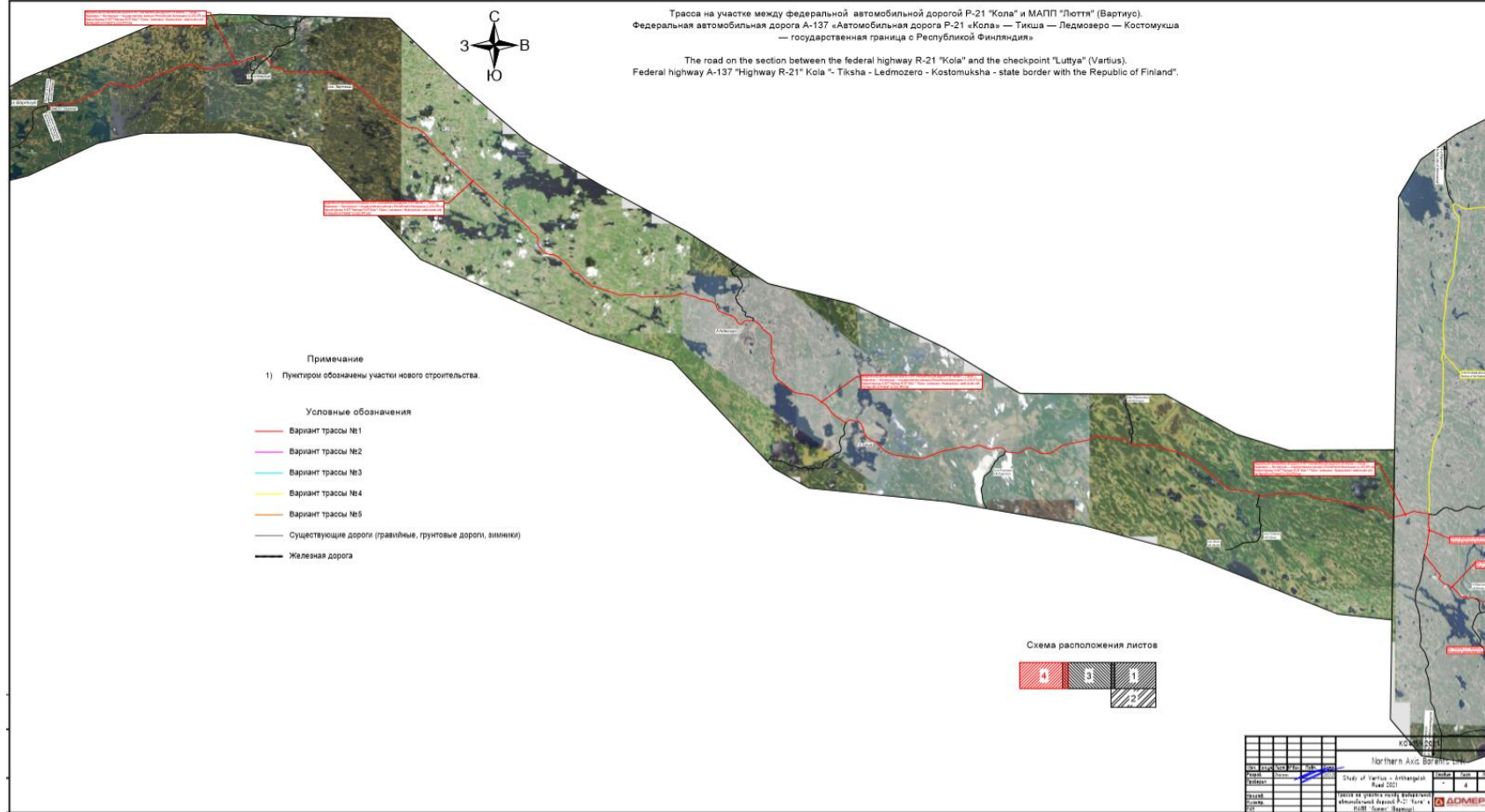
The road alternatives in this study

Routing options for the Vartius – Arkhangelsk federal level road

- 1 between Vartius/Lytta border crossing – “Kola” federal road (current federal road A137)
- 2 between “Kola” road – the border of the Republic of Karelia and the Arkhangelsk Region
- 5 between the border of the Republic of Karelia and the Arkhangelsk Region – Onega town
- 3 between Onega town – Arkhangelsk city

The road alternatives

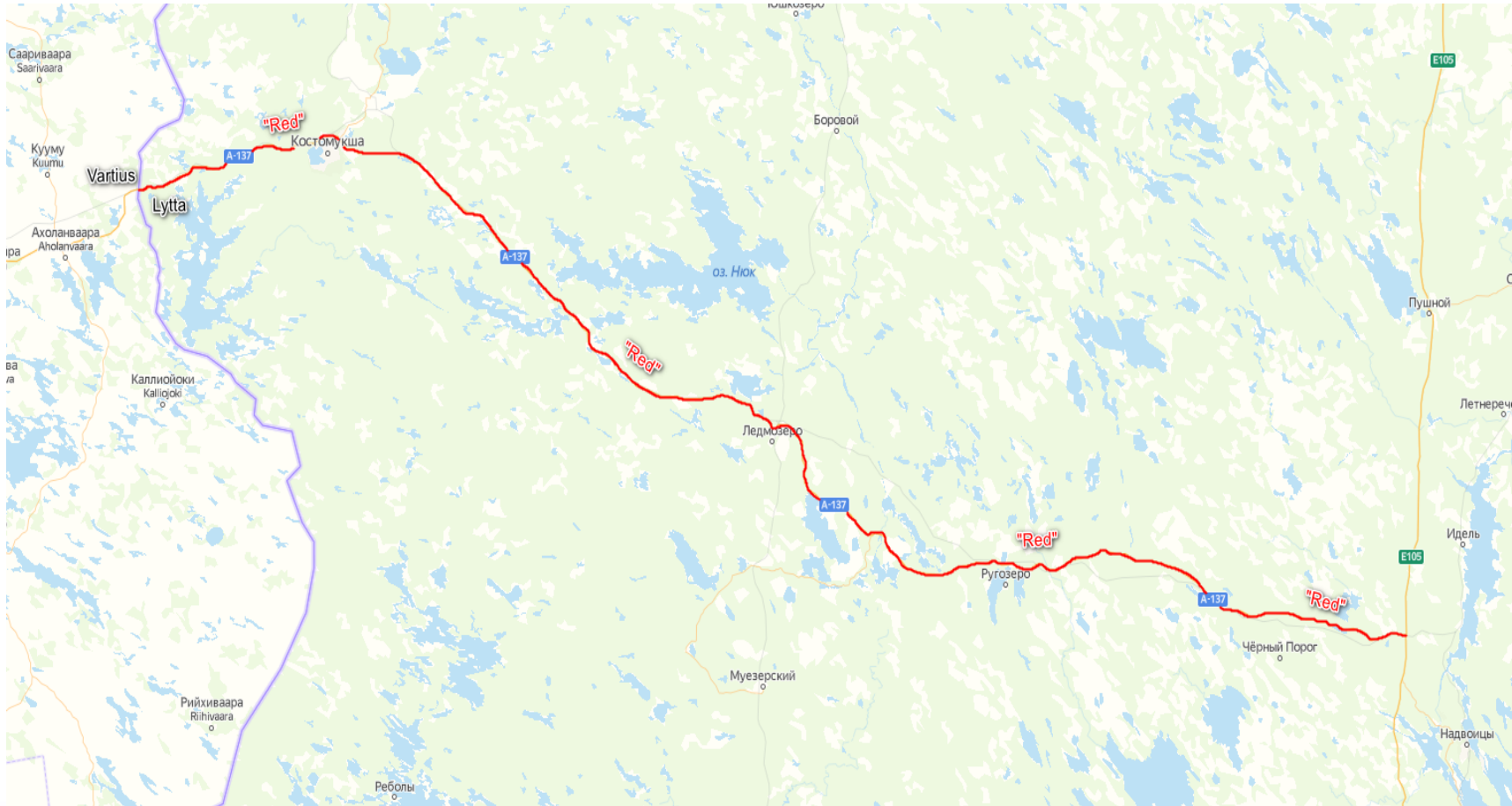
Between Vartius/Lytta – “Kola” federal road (current federal road A137)



*Source of the satellite
photo: Google Earth*

The road alternatives

Between Vartius/Lytta – “Kola” federal road (current federal road A137)



*Source of the map:
Yandex.ru*

The road alternatives

Photos of the road Vartius/Lytta – “Kola” federal road (= current federal road A-137)



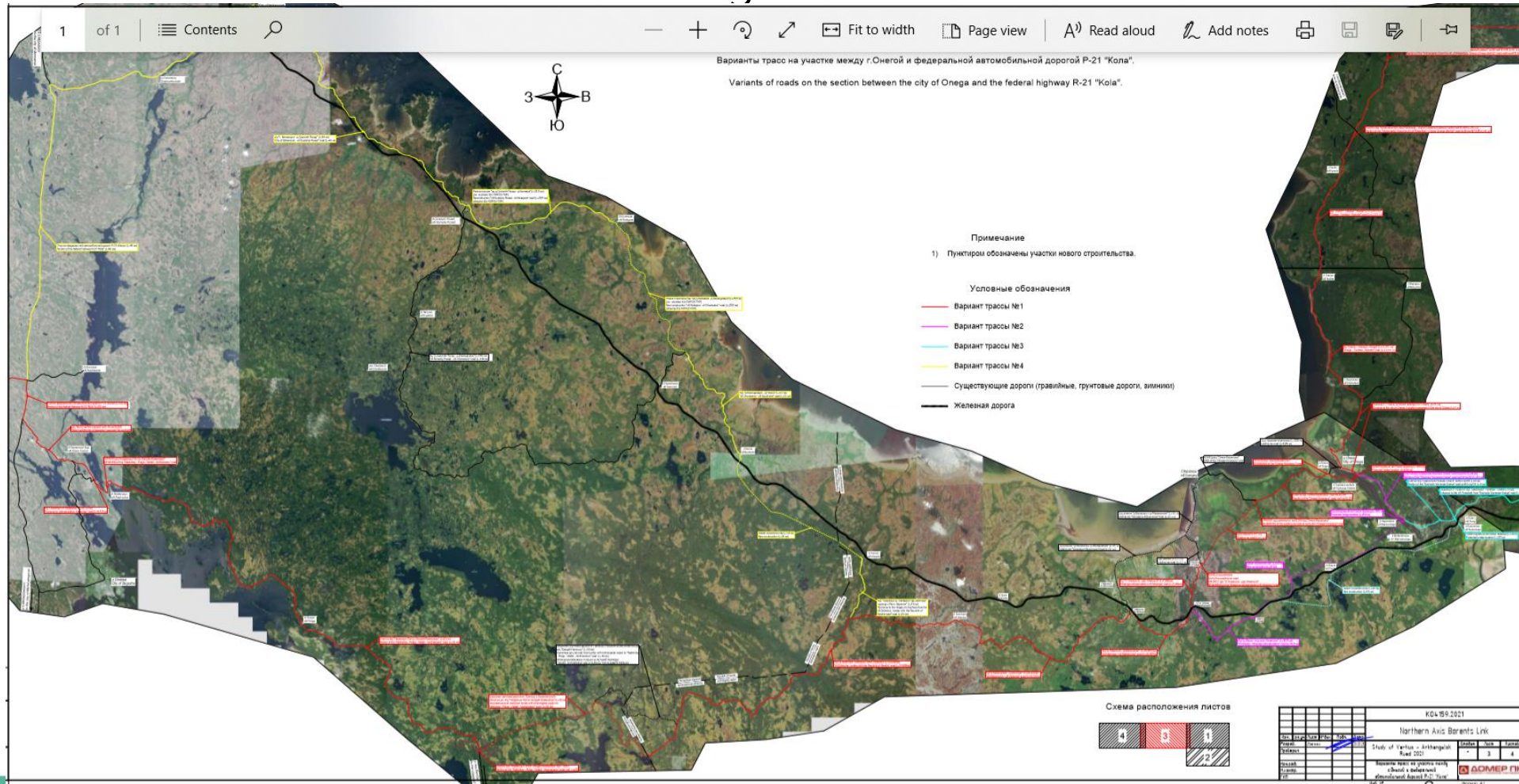
Federal road A-137 between Kostomuksha and federal road “Kola” R-21



Photos: Vyacheslav Lyapin, Domer PK

The road alternatives

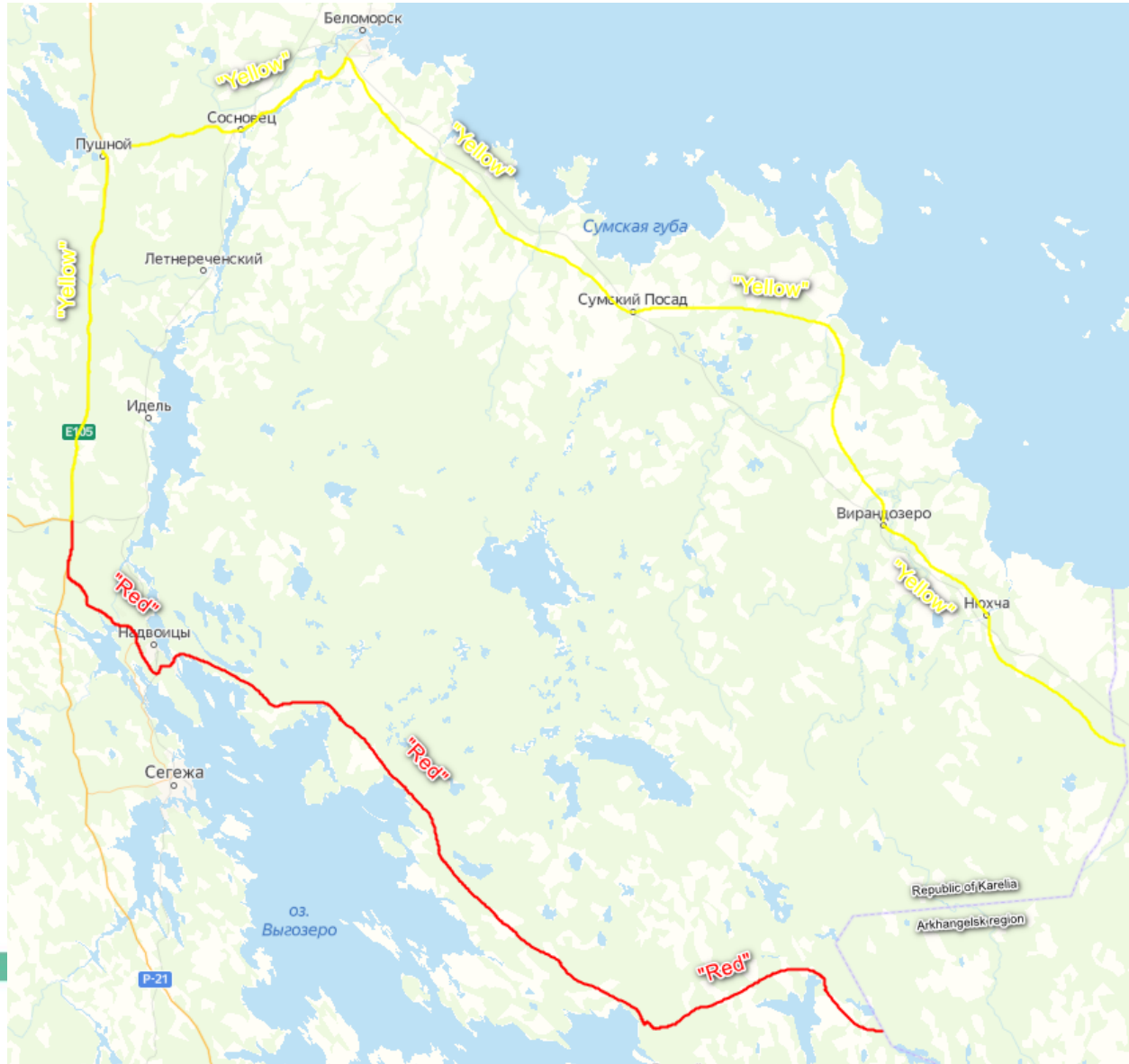
Between: “Kola” road R-21 – Onega town



Source
of the
satellite
photo:
Google
Earth

The road alternatives

Between: “Kola” road R-21 – the border of the Republic of Karelia and the Arkhangelsk Region



*Source of the map:
Yandex.ru*



The road alternatives

Photos : “RED”. Between “Kola” road R-21 – the border of the Republic of Karelia and the Arkhangelsk Region



*Current Nadvoitsy–Ponga–Valdai-
Vochmozero road near Nadvoitsy
Photo: Vyacheslav Lyapin, Domer PK*

*Current private non-constructed road near
border between Karelian Republic and
Arkhangelsk Region
Photo: Vyacheslav Lyapin, Domer PK*



The road alternatives

Photos : “YELLOW”. Between “Kola” road R-21 – the border of the Republic of Karelia and the Arkhangelsk Region border through Belomorsk



Current Belomorsk – Sumposad regional road in the Republic of Karelia
Photo: Vyacheslav Lyapin, Domer PK



Current Sumposad - Kolezhma regional road in the Republic of Karelia
Photo: Vyacheslav Lyapin, Domer PK



The road alternatives

Photos : “YELLOW”. Between “Kola” road R-21 – the border of the Republic of Karelia and the Arkhangelsk Region through Belomorsk



Picture. Current road near Kolezhma in the Republic of Karelia

Photo: Vyacheslav Lyapin, Domer PK

The road alternatives

Between: the border of the Republic of Karelia and the Arkhangelsk Region –
Onega town



*Source of
the map:
Yandex.ru*

The road alternatives

Photos: “RED”, between the border of the Republic of Karelia and the Arkhangelsk Region – Onega town



*Current border of the Republic of Karelia
and the Arkhangelsk Region – Zolotukha
municipal road (near Zolotukha village)*

Photo: Vyacheslav Lyapin, Domer PK



Current Zolotukha – Maloshujka municipal road

Photo: Vyacheslav Lyapin, Domer PK



The road alternatives

Photos: “RED”, between the border of the Republic of Karelia and the Arkhangelsk Region – Onega town



*Current Zolotukha – Maloshujka
regional road (near Maloshujka)
Photo: Vyacheslav Lyapin, Domer PK*



*Current regional road between the railway station
Nimenga and Nimenga village
Photo: Ivan Sinitsin, Onega District Administration*



The road alternatives

Photos: “RED”, between the border of the Republic of Karelia and the Arkhangelsk Region – Onega town



*Current non-constructed ground (winter) road without owner
Photos of this slide: Ivan Sinitsin, Onega District Administration*



Current Varzogori – Onega regional road (near Onega River)

The road alternatives

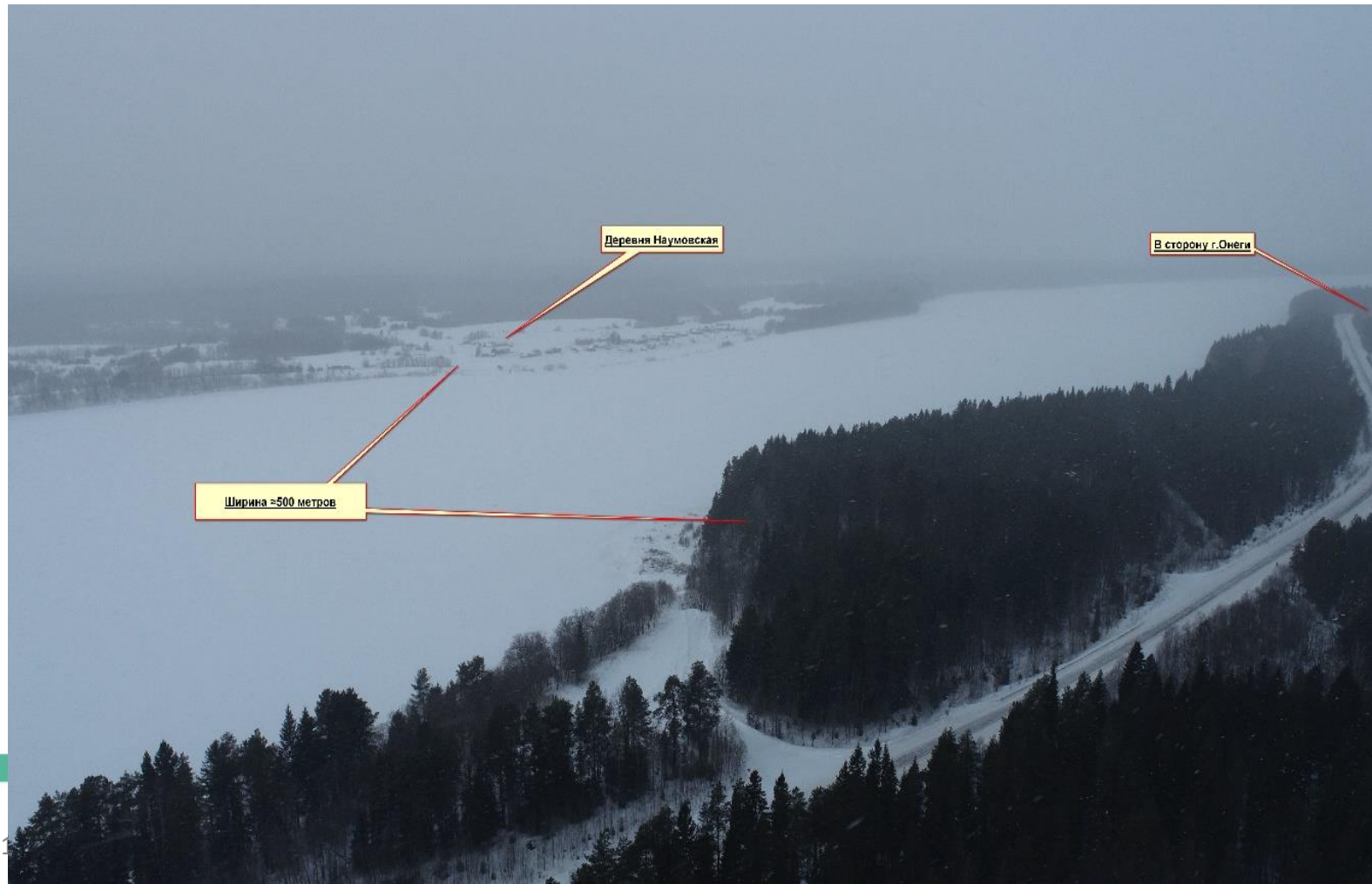
Photos: “RED”, between the border of the Republic of Karelia and the Arkhangelsk Region – Onega town



*Location of the new
bridge over Onega River
between Trudovaya
Sloboda and Onega town.
Photo: Vyacheslav
Lyapin, Domer PK*

The road alternatives

Photos: “VIOLET”, Between the border of the Republic of Karelia and the Arkhangelsk Region – Onega town

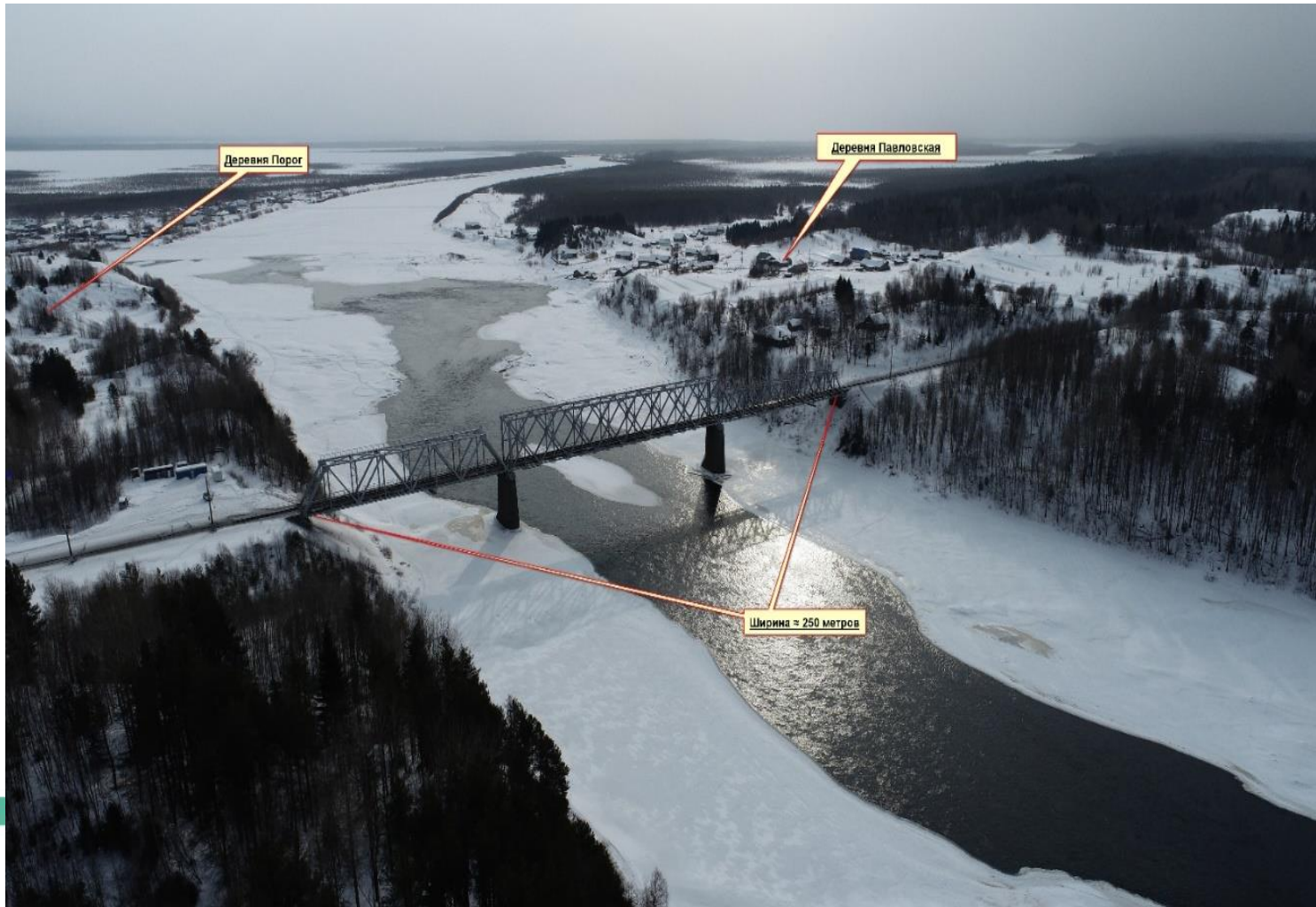


Location of the new bridge over Onega River near Naumovskaya village and the current regional road Savinskij – Yarnema - Onega (near Onega town).

Photo: Vyacheslav Lyapin, Domer PK

The road alternatives

Photoes: “BLUE”, Between the border of the Republic of Karelia and the Arkhangelsk Region – Onega town



Location of the current railway bridge, new road bridge location over Onega River (near Porog village). (Photo: Vyacheslav Lyapin, Domer PK)



The road alternatives

Photo: "YELLOW", Between the border of the Republic of Karelia and the Arkhangelsk Region – Onega town



*Current regional road
between border of the
Republic of Karelia -
Unsezhma (near
Unsezhma village).
Photo: Vyacheslav
Lyapin, Domer PK*

The road alternatives

Between Onega town – Arkhangelsk city through Rikasikha and through Kodino



Source of the satellite photo: Google Earth

The road alternatives

Between Onega town – Arkhangelsk city through Brin-Navolok



Source of the satellite photo: Google Earth

The road alternatives

Between Onega town – Arkhangelsk city through Rikasikha and through Kodino



*Source of the map:
Yandex.ru*

The road alternatives

Photoes between Onega town – Arkhangelsk city through Rikasikha : “RED”



Current municipal road “Entrance to the city of Onega”

Photo: Vyacheslav Lyapin, Domer PK



Current regional road Kyanda – Rikasikha near Onega

Photo: Vyacheslav Lyapin, Domer PK

The road alternatives

Photoes between Onega town – Arkhangelsk city through Rikasikha : “RED”



Current regional road Kyanda – Rikasikha between Kyanda and Severodvinsk.

Photo: Vyacheslav Lyapin, Domer PK



Current regional road Kyanda – Rikasihka near Rikasikha (concrete road)

Photo: Vyacheslav Lyapin, Domer PK

the road parameters in alternatives, Annex 1

Example: “RED” alternative, between “Kola” R-21 road – Valdai road – Arkhangelsk border

Section	road class 2020/ proposed 2050	speed level 2020/ proposal for 2050 (km/h)	number of lanes and their width 2020/ proposal for 2050	paveme nt type 2020/ proposal for 2050	length of the road structure 2020/ proposal for 2050 (km)	Culvert pipes 2020 diameter up to 1,0/1,01- 1,5/1,51-3,0 / more 3,0 meters	Culvert pipes 2050 diameter up to 1,0/1,01- 1,5/1,51-3,0 / more 3,0 meters	amounts of bridges/ their approximate lengths 2020 (m)	amounts of bridges/ their approximate lengths 2050 (m)	cost estimate for new road construction (MRub)	cost estimate for road rehabilitation (MRub)
Section of current federal road “Kola” R-21 (E105) b/w A137 and Segezha road	III/III	90/90	2/2	Ab/ Ab	6/6	0/ 0/ 10/ 0	0/ 0/ 10/ 0	1/90	1/90	0	0
Section of current regional road b/w Kola R-21 federal road and Segezha road	IV/IV	90/90	2/2	Ab/ Ab	11,2/11,2	10/3/0/0	10/3/0/0	1/75	1/75	0	0
“Access to Nadvoicy” (whole current regional road)	IV/IV	60/60	2/2	Ab /Ab	8,7/8,7	5/2/0/0	5/2/0/0	0/0	0/0	0	0
Section of current regional road Nadvoicy – Ponga – Valdai – Vochmozero	IV/III	90/90	2/2	Gavel /Ab	93/93	10/95/15/0	0/105/15/ 0	8/201	8/220	0	9 700
Current private road (“with no owner”) ending up to the border of the Republic of Karelia and the Arkhangelsk Region	V/IV	no	1/2	not paved /Ab	38/38	3/1/0/0	5/12/0/0	3/66	3/90	5 004	0
Total for the road section	-	-	-	-	157	-	-	-	-	5 004	9 700

The road alternatives' construction indicative cost

Variant in the Karelian Republic MRub (M€)	Variant in the Arkhangelsk Region MRub (M€)	Onega – Rikasikha road MRub (M€)	Total (without Onega – Rikasikha) MRub (M€)
“red” 14.700 (163)	“red” 17.800 (198)	16.400 (182)	32.500 (361)
“red” 14.700 (163)	“black” 19.700 (219)	16.400 (182)	34.400 (382)
“red” 14.700 (163)	“violet” (till Onega) 18.400 (204)	16.400 (182)	33.100 (368)
“red” 14.700 (163)	“blue” (till Onega) 20.700 (230)	16.400 (182)	35.400 (393)
“red” 14.700 (163)	“blue-brown” (via Kodino till Brin Navalok) 45.700 (507)		60.400 (671)
“yellow” 21.300 (237)	“red” 16.800 (189)	16.400 (182)	38.100 (423)
“yellow”* 3.400 (35)	“red” 16.800 (189)	16.400 (182)	20.200 (224)

*) Kola fed road R-21 – Belomorsk – Nyuhcha road investments are not counted in the project costs

The road alternatives' impacts to travel time

Example, Travel time change in RED variant:

Origin - destination by road	distance currently by car	distance after the new road by car (kms, hours)	difference b/w current and new route (kms), (hours)
Arkhangelsk – Moscow	1200 km 16 h		
Arkhangelsk - St. Petersburg, via Vologda	1400 km 17,5 h	1145 km 14 h	255 km, 3.5h
Arkhangelsk - St. Pet., via Mirnyj, Vytegra	1160 km 18 h	1145 km 14 h	15 km, 4h
Arkhangelsk – Petrozavodsk via Pudozh	980 km 15 h	735 km 11 h	245 km, 4 h
Arkhangelsk- Murmansk via Pudozh	1600 km 23 h	1115 km 16 h	485 km, 7 h
Arkhangelsk- Vartius/Lytta via Pudozh	1200 km 19 h	705 km 11 h	495 km, 8 h

Alternative	Shortens car trip from Arkhangelsk to St. Petersburg, Petrozavodsk, Murmansk and Vartius/Lytta border crossing in average:
“Red-red” through Onega – Rikasikha	333 km
“Red-black” through Onega – Rikasikha	308 km
“Red-violet” through Onega – Rikasikha	302 km
“Red-blue” through Onega – Rikasikha	281 km
“Red-blue-brown” through Kodino – Brin-Navolok	169 km
“Yellow – Red” through Onega – Rikasikha	243 km



Preliminary estimation of the environmental impacts and their mitigation

- Nature protection areas (2 pcs, no contradiction)
- River crossings (bridges, culvert pipes, construction, exploitation) and the White Sea shore
- Densely populated areas, road variants go through about 45 villages crossing them about 90 km (light traffic paths, road lights)
- Historical and culture surroundings (White Sea coast villages, mostly via “Yellow” variant)
- Ancient relic objects (one, near “yellow” variant)

Citizen participation process

Description of the Citizen participation process of road projects in Russia

Description of the Citizen participation process of road projects in Finland

At this study was limited to communication with following organizations:

- GKU Arkhangelsk Regional Road Administration (“ArkhangelskAvtodor”)
- Karelian Republic Road Authority, Petrozavodsk
- FKU UPRDOR Kola, Petrozavodsk
- FKU Agency of the federal road Moscow-Arkhangelsk, Vologda
- Ministry of nature resources and forest industry of Arkhangelsk Region
- Ministry of nature resources and ecology of the Republic of Karelia
- Onega district (in Arkhangelsk Region)
- The Primorskij district (in Arkhangelsk Region)
- The Plesetsk district (in Arkhangelsk Region)
- The Segezha district (in Karelian Republic)
- The Belomorsk district (in Karelian Republic)
- Administration of the National Park Vodlozerski (Arkhangelsk Reg., Karelian Rep.)
- Novgorod branch of JSC Stroyproekt Institute (Новгородский филиал АО «Институт «Стройпроект»)



Impacts on regional transport

Preliminary distribution of traffic b/w current/new roads

Origin - destination by road	distance currently by car	distance after the new road by car	difference b/w current and new route
Arkhangelsk – Moscow	1200 km 16 h		
Arkhangelsk - St. Petersburg, via Vologda	1400 km 17.5 h	1145 km 14 h	255 km, 3.5h
Arkhangelsk - St. Pet., via Mirnyj, Vytegra	1160 km 18 h	1145 km 14 h	15 km, 4h
Arkhangelsk – Petrozavodsk via Pudozh	980 km 15 h	735 km 11 h	245 km, 4 h
Arkhangelsk- Murmansk via Pudozh	1600 km 23 h	1115 km 16 h	485 km, 7 h
Arkhangelsk- Vartius/Lytta via Pudozh	1200 km 19 h	705 km 11 h	495 km, 8 h



Impacts on regional transport

Preliminary distribution of the traffic in the new road Arkhangelsk – “Kola” R-21

- 10% of traffic volumes use origin-destination Arkhangelsk - Murmansk (475 km savings/vehicle)
- 20% of traffic volumes use origin-destination Arkhangelsk – Vartius/Lytta border crossing (465 km saving/vehicle)
- 30% of traffic volumes use origin-destination Arkhangelsk – Petrozavodsk (225 km saving/vehicle)
- 40% of traffic volumes use origin-destination Arkhangelsk – St. Petersburg (115 km average saving/vehicle, a half from Vologda road, a half from Vytegra road)



Impacts to the Barents Region and the EU

Currently the road distance between the EU and Arkhangelsk is about 1200 km and 19 hours.

About 1 million inhabitants in Arkhangelsk Region and 2 million inhabitants of Western parts of Barents region will be about 500 km and 8 hours (by car) nearer to each others.

For the EU, the benefit is a new market area of more than a million inhabitants 500 km by road closer than today.

The Vartius - Arkhangelsk road is facilitating the Joint Barents Transport Plan, where the road has been identified as “new Russian inter-regional road by 2030”. As well, Northern Dimension Partnership for Transportation and Logistics (NDPTL) has recognized the Vartius- Arkhangelsk road as part of the NDPTL Regional Road Network.

Economy calculations, used values

<i>Unit cost of similar road construction at the end of 2020 Index (MAKU 2010 =100)</i>	<i>Construction of the new road Russia (Finland)</i>	<i>Reconstruction of the current road Russia (Finland)</i>	<i>Construction of the new bridge Russia (Finland)</i>
<i>year 2020, index 115</i>	<i>110 MRub/km (1,2 M€/km)</i>	<i>70 MRub/km (0,8 M€/km)</i>	<i>2,5 MRub / length-m (28.000 € /length - m)</i>
<i>year 2030 index 150</i>	<i>143 MRub/km (1,6 M€/km)</i>	<i>91 MRub/km (1 M€/km)</i>	<i>3,3 MRub / length-m (37.000 € / length-m)</i>

Comparison: Unit costs used in Finland 2020:

- Construction of main new section (2 lanes): 1,2 ME/km (108 MRub/km)
- Reconstruction of current main road section (2 lanes): 0,7 ME/km (63 MRub/km)
- Construction of new bridge: 1.000E/m² (90.000 MRub/m² or 0,75 MRub/length-m)

Economy calculations, construction costs 2030

Variant in the Karelian Republic MRub (M€)	Variant in the Arkhangelsk Region MRub (M€)	Onega – Rikasikha road MRub (M€)	Total (without Onega – Rikasikha) MRub (M€)
“red” 14.700 (163)	“red” 17.800 (198)	16.400 (182)	32.500 (361)
“red” 14.700 (163)	“black” 19.700 (219)	16.400 (182)	34.400 (382)
“red” 14.700 (163)	“violet” (till Onega) 18.400 (204)	16.400 (182)	33.100 (368)
“red” 14.700 (163)	“blue” (till Onega) 20.700 (230)	16.400 (182)	35.400 (393)
“red” 14.700 (163)	“blue-brown” (via Kodino till Brin-Navalok) 45.700 (507)		60.400 (671)
“yellow” 21.300 (237)	“red” 16.800 (189)	16.400 (182)	38.100 (423)
“yellow”* 3.400 (35)	“red” 16.800 (189)	16.400 (182)	20.200 (224)

*) Kola fed road R-21 – Belomorsk – Nyuhcha road investments are not counted in project costs

Economy calculations, used values

Russian similar roads annual of maintenance costs used were **0,9 MRub/km (10.000 E/km)** on year on 2030.

Following unite costs has been used for vehicle and time costs (from Finnish costs by dividing corrected Rus GDP/Fin GDP, 55%)

• vehicle costs for light vehicle (car)	3,6 Rub/km/car	0,04 €/ veh.km
• time costs for light vehicle (car)	522 Rub/h/car	5,8 €/ veh.h
• vehicle costs for heavy vehicle	14,4 Rub/km/ veh.	0,16 €/ veh.km
• time costs for heavy vehicle	2146 Rub/h/veh.	23,8 €/ veh.h

As the Russian accident costs have been used the following values. They are higher than in Finland as the accident likelihood is many times higher in Russia:

• accident costs for all vehicles	2,7 Rub/ veh.km	0,03 €/veh.km
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Relation between light and heavy vehicles on the new road has been evaluated as 68%/32%. After this the used unit costs 2030 used are:

• vehicle costs for this project (all vehicles),	7 Rub/saved veh.km	0,078 €/km
• time costs for this project (all vehicles),	1040 Rub/ saved h	11,57 €/h
• accident costs for this project (all vehicles),	2,7 Rub/ veh.km	0,03 €/km



Economy calculations, shorter trips by car

	Shortens car trip b/w: Arkhangelsk – Vartius/Lytta, Arkhangelsk - St. Petersburg, Arkhangelsk – Petrozavodsk Arkhangelsk - Murmansk
“Red-red” through Onega – Rikasikha	333 km
“Red-black” through Onega – Rikasikha	308 km
“Red-violet” through Onega – Rikasikha	302 km
“Red-blue” through Onega – Rikasikha	281 km
“Red-blue-brown” through Kodino – Brin-Navolok	169 km
“Yellow – Red” through Onega – Rikasikha	243 km
“Yellow – Red” without Kola R-21 – Belomorsk – Nyuhcha road costs	243 km

Economy calculations, basic

	User cost savings 2030-2060, MRub M€	Residual value 2030, MRub M€	Maintenance cost 2030-2060 MRub M€	Investment cost, 2030 MRub M€	B/C – ratio	Paying - back period, years
“Red-red” through Onega – Rikaskha	76.700	1.000	3.720	32.500	2,28	13
	852	11,1	41,3	361		
“Red-black” through Onega – Rikaskha	61.800	1.060	3.980	34.400	1,71	18
	687	11,8	44,2	382		
“Red-violet” through Onega – Rikaskha	55.000	1.020	4.030	33.100	1,57	19
	611	11,3	448	368		
“Red-blue” through Onega – Rikaskha	52.400	1.100	4.400	35.400	1,39	22
	582	12,2	48,9	393		
“Red-blue-brown” through Kodino – Brin-Navolok	42.100	1.850	7.300	60.400	0,61	49
	468	20,6	81,1	671		
“Yellow – Red” through Onega – Rikaskha	38.400	1.190	3.820	38.100	0,94	32
	427	13,2	42,4	423		
“Yellow – Red” without Kola R-21 – Belomorsk – Nyuhcha road costs	38.400	623	3.820	20.200	1.74	17
	427	6,9	42,4	224		

Economy calculations, emissions added

	User cost savings 2030-2060, MRub M€	Residual value 2030, MRub M€	Maintenance cost 2030-2060 MRub M€	Emission cost savings 2030-60 MRub M€	Investment cost, 2030 MRub M€	B/C – ratio	Paying - back period, years
“Red-red” through Onega – Rikasikha	76.700 852	1.000 11,1	3.720 41,3	1.990 22,1	32.500 361	2,34	13
“Red-black” through Onega – Rikasikha	61.800 687	1.060 11,8	3.980 44,2	1.880 20,9	34.400 382	1,77	17
“Red-violet” through Onega – Rikasikha	55.000 611	1.020 11,3	4.030 448	1.830 20,3	33.100 368	1,63	18
“Red-blue” through Onega – Rikasikha	52.400 582	1.100 12,2	4.400 48,9	1.680 18,7	35.400 393	1,43	21
“Red-blue-brown” through Kodino – Brin- Navolok	42.100 468	1.850 20,6	7.300 81,1	1.280 14,2	60.400 671	0,63	48
“Yellow – Red” through Onega – Rikasikha	38.400 427	1.190 13,2	3.820 42,4	1.440 16	38.100 423	0,98	31
“Yellow – Red” without Kola R-21 – Belomorsk – Nyuhcha road costs	38.400 427	623 6,9	3.820 42,4	1.440 16	20.200 224	1.81	18

Economy calculations, Onega – Rikasikha costs included

	User savings 2030-2060, MRub M€	Residual value 2030, MRub M€	Maintenance cost 2030-2060 MRub M€	Investment cost, 2030 MRub M€	B/C – ratio	Paying - back period, Years
“Red-red” through Onega – Rikasikha	76.700 852	1.000 11,1	3.720 41,3	48.900 543	1,51	20
“Red-black” through Onega – Rikasikha	61.800 687	1.060 11,8	3.980 44,2	50.800 564	1,16	26
“Red-violet” through Onega – Rikasikha	55.000 611	1.020 11,3	4.030 448	49.500 550	1,05	29
“Red-blue” through Onega – Rikasikha	52.400 582	1.100 12,2	4.400 48,9	51.800 576	0,95	32
“Yellow – Red” through Onega – Rikasikha	38.400 427	1.190 13,2	3.820 42,4	54.500 606	0,66	45
“Yellow–Red” w/o Kola R-21 – Belomorsk – Nyuhcha road costs	38.400 427	623 6,9	3.820 42,4	38.100 423	0.92	33



Estimation of the development needs

It would be advisable to **strengthen the pre-design phases** (study of need, pre-study, preliminary engineering) in Russian road planning procedures, and include at least a minimum demand of them in required procedures.

The planning of **land use** and **pre-phases of the road** planning carried out **simultaneously** (and better, if possible, on the same table with a group of experts) in Western countries have good experience. The results are worth testing also in Russia.

Very large amounts of citizen participation is realized in preliminary engineering phase of road planning procedure in the Western countries. We could recommend besides a **larger preliminary engineering phase**, also larger citizen participation carried out in Russian road projects.

To Russian road planning procedure would also be recommendable to carry out **real economic evaluation**. This would need approval of unit costs by society (authorities) for vehicle costs, time costs and accident costs, road noise costs and emission costs from the road traffic enabling to carry out economic counting. As well, the required discount rate (%) approved by the authorities would be needed.



Conclusions and recommendations

This kind of **pre-study** would be advisable to carry out in Russian road projects as very preliminary study to get preliminary information of the road project and understand its preliminary impacts.

As for Vartius/Lytta – Arkhangelsk direct road is recommended:

- To choose economically the **most feasible variants** for further development. They are either the “red” variant Kola R-21 road- Nadvoicy – Onega - Rikasikha or “yellow-red” variant Belomorsk – Nyuhcha – Onega – Rikasikha. The latter would be feasible only, if Belomorsk – Nyuhcha road will be implemented by the Republic of Karelian as a regional road and therefore excluded from the costs of Vartius/Lytta – Arkhangelsk direct road.
- The most feasible **bridge location over the Onega River** is the one nearest to Onega town. Although it is the longest, in other bridge location variants (Naumovskaya and Porog) the road owner would need to construct more road and they would give less road user benefits as their vehicle driving costs would be higher.
- To **correct the decision** of the end point location of the future federal road between “Kola R-21” and “M-8” from Brin-Navolok into Rikasikha. The first gives cost- benefit ratio 0,6 and paying back period 49 years. The last gives cost- benefit ratio 1,5 and paying back period 20 years.

As for the questions, by whom and when the Vartius - Arkhangelsk direct road works could be implemented, will be solved during negotiations between current owners of the road (local and regional administrative bodies) and the potential future owner or owners of the road (federal road authorities).

Conclusions and recommendations, the proposed first phase of implementation

In Karelian Republic:

- Improvement of about **38 km** section of private (“with no owner”), non-constructed road between Nadvoicy – Valdai regional road and the border of the Republic of Karelia and the Arkhangelsk Region.

In Arkhangelsk Region:

- Improvement of about **13 km** section of current non-constructed ground road (“with no owner”) and carry out year-round road maintenance.
- Facilitating of about **1,5 km** ice road (in winter) and ferry (in summer) over Onega River as a service provided by regional road administration. Organisation of current ferry is not enough stabile (reliable) in producing that service.
- Going on designing/implementing the reconstruction of the **Onega – Kyanda – Rikasikha 160 km** regional road.
- Densely populated areas shall be facilitated with **road lighting and separate path or paths for light traffic** (walking and cycling) if by-passes will not be implemented. In the Republic of Karelia (variant “red”), these sections are on **13 km** of the road length. In the Arkhangelsk Region (variant “red”) these sections are on **17 km** of the road length. In Onega- Rikasikha road, there are about **57 km** of this kind of road sections.

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NABL WP 2 Arkhangelsk – Vartius road pre-study

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