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USER PERSPECTIVE TO ROADEX II TEST AREAS' ROAD NETWORK SERVICE LEVEL

Results of a Questionnaire Study on Road Network Condition and theUse of Roads

ROADEX II
NORTHERN PERIPHERY

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March 2004

Timo Saarenketo and Johanna Saari

Roadscanners Oy

PREFACE

This is a final report from the Phase I survey of the Roadex II project, a technical transnational cooperation project between the Highland Council, the Western Isles Council, and Forest Enterprise from Scotland; the Northern Region (formerly Troms district) of the Norwegian Public Roads Administration and the Norwegian Road Haulage Association; the Northern Region of the Swedish National Road Administration; and from Finland the Regions of Central Finland and Lapland of the Finnish Road Administration, as well as Metsähallitus Region of Eastern Lapland, the Forestry Centre of Lapland (Lapin Metsäkeskus), Stora Enso Metsä, and Metsäliitto, Procurement Area of Northern Finland. The Roadex project is partly financed by the Interreg IIIB Northern Periphery Programme. The lead partner in the project is the Highland Council from Scotland and project consultant is Roadscanners Oy from Finland. Roadex II project Chairman is Ron Munro from the Highland Council and project manager is Timo Saarenketo from Roadscanners.

The questionnaire was designed from the Roadex II Road Condition Working Team by Timo Saarenketo, Geir Berntsen from the Norwegian Road Administration, Svante Johansson from Roadscanners Sweden and Ron Munro. The maps for the questionnaire were prepared mainly at Roadscanners. Road regions as well as officials from the towns and municipalities under survey mainly provided the contact information for the professional road users in each area. The local contacts in each road region have given valuable help in sending out questionnaires, conducting telephone interviews and helping with analysis of the results. The authors would like to thank Ron Munro, Teen Mackay, Janet Mackintosh, Gemma Cole and Richard Evans from Scotland, Eilif Mathisen, Geir Berntsen and Roar Femsteinevik from Norway, Johan Ullberg, Alf Granvik, Lenita Tornéus and Svante Johansson from Sweden and Seppo Kosonen, Tapani Pöyry, Hannu Keralampi, Soili Katko, Timo Hyvönen, Tarmo Posti and Ari Kilponen from Finland for all the help needed to get this survey completed.

Timo Saarenketo and Johanna Saari, both of Roadscanners, wrote the report. Virpi Halttu from Roadscanners has done statistical analysis, prepared maps and edited the report. Mika Pyhähuhta from Laboratorio Uleåborg designed the graphic layout. The language has been checked by Kent Middleton from Roadscanners and by Ron Munro. Merja Saarenketo from Roadscanners has given valuable help with maps, graphics, and data analysis.

Finally the authors would like to acknowledge the Roadex II Steering Committee for its encouragement and valuable guidance in this work.

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ABSTRACT

The goal for the Roadex II project phase I work was to provide a road user's perspective on the condition of the road network in each test area, which were representative of typical areas in each country. Most of the roads in these areas are low volume roads but are transportation routes critical to local livelihood. The survey was conducted through a questionnaire that had questions about the respondents profile, transportation needs and questions about the general condition and trend of the road network in summer and winter, traffic safety issues and what types of problem they encountered with their transportation work as well as their opinion regarding the level of cooperation with local road authorities. The respondents were also asked to indicate problem road sections on maps of their area, which were enclosed with the questionnaire. The test areas were Sutherland from Scotland, Island of Senja from Norway, Övertorneå-Överkalix from Sweden and Kemijärvi and Jämsä-Kuorevesi from Finland.

Road user profiles revealed that the average truckload, and thus stresses to road structures, in Nordic timber areas (Övertorneå-Överkalix, Kemijärvi and Jämsä-Kuorevesi) was much higher than in Sutherland and Senja. In Sutherland and Senja there was also a greater need to increase maximum loads allowed, by fish transporters especially, however a surprisingly large number of respondents were satisfied with current practises. Twin tyres were still the main choice of tyre, only in Sutherland were super single tyres widely used. Forestry, farming and a major part of the fish industry transporters required 24 hour access to the road network throughout the year

The results showed that in spite of small variations in the answer rates between areas, due to history of the road network and differences in the local topography, road users experienced similar road condition problems throughout the Northern Periphery. The road users in Sutherland had more problems with narrow roads, poor geometry, weak road shoulders and poor bearing capacity, while road users in Senja were unique in their slightly poorer ratings for summer road condition related problems. On the other hand respondents in Senja gave the best ratings for road condition management related to winter maintenance. Road users in Övertorneå-Överkalix had problems with unevenness and rutting in the road network but at the same time had the most positive feelings concerning the trend of the road network for both summer and winter. In Sweden, road users were also the most satisfied with the level of cooperation between themselves and local road authorities. In Finland road users were, in general, happier with road condition management in summer than the other Northern Periphery areas, but on the other hand were most critical of the level of cooperation with road authorities concerning winter maintenance issues.

The Roadex II project road user interview results clearly showed the importance of cooperation between local road authorities and road users in solving transportation problems. In those areas where there has been cooperation, the road users' opinions on the topic were much more positive.

Road users were also asked to mark problem roads in their area on the maps provided with the questionnaire. The report will also present answers as to where and why certain roads were reported to have caused problems.

KEY WORDS: Roadex, Northern Periphery, Road User, Questionnaire, Road Condition, Winter Maintenance.

1 The Study

1.1 GENERAL

The ROADEX II Project is a co-operation aimed at developing ways for interactive and innovative road management of low traffic volume roads. The Project partners represent the public road administration as well as forestry organizations, forest companies and haulage organizations across regions in the Northern Periphery of Europe: The Scottish Highlands and the Western Isles, the northern regions of Norway and Sweden, and the regions of Central Finland and Lapland in Finland. The Roadex cooperation maintains a web site at: www.roadex.org.

The Roadex II project is being conducted in three phases during 2002-2005: (1) Problem identification, (2) Understanding and Analysis, and (3) Innovation and Testing. This report presents the results of the surveys carried out in Phase 1 during 2002-2003. The goal of the surveys was to collect information from the professional road users, in each country, concerning their opinions, needs, expectations and problems with the road condition management related to their transportation tasks and compare this data to the regional road authorities' data bases and opinions regarding the main road related problems roads in their area. The survey also provides comparative information regarding the seriousness of certain road condition management problems in each road region.

The road users opinions were studied through close research of five test areas selected from within the regions. The road user survey was conducted using a questionnaire that was sent to organizations who regularly used the road network in the test area and who have, over time, developed a good understanding of the condition of their local roads. At the same time, local road maintenance officials were interviewed with regard to the engineering problems encountered in each test area.

2 Test Areas

2.1 General

The road user survey was conducted in all the four Roadex II partner regions, in the following five test areas (figure 1):

Finland:	Lapland Region	Kemijärvi
	Central Finland	Jämsä-Kuorevesi
Sweden:	Northern Region	Överkalix-Övertorneå
Norway:	Troms County	Senja
Scotland:	The Highlands	Sutherland

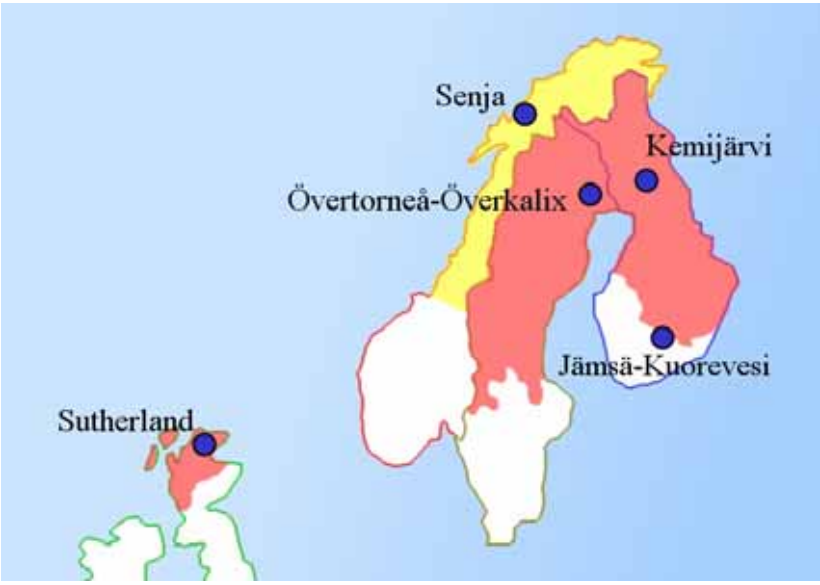


Figure 1. Location of the test areas.

The test areas were selected to provide settings with a wide range of rural road types, communities and industries typical of the regions. Finland was unique in that two areas were chosen for study. First the questionnaire was tested in the Kemijärvi area in order to evaluate the relevance and effectiveness of the questions. The second area, Jämsä – Kuorevesi, situated in the Southern part of the periphery area made it possible to compare road users opinions inside one country. A short description of the areas is given below.

The **Kemijärvi** test area near the Polar Circle in Finnish Lapland has one major centre, the town of Kemijärvi, and a population of a little under 10.000 inhabitants spread over a relatively large area of 3.942 km²; the population density is 2.7 inh./km² and 11% (453 km²) of the area is covered by water. Railroads and a national highway connect the area with population centres in the Southwest, the nearest of which are within 100 km of Kemijärvi.

The town has a large pulp factory (Stora Enso); other important livelihoods in the area include industrial production of timber products, electronic assembly, farming and forestry, reindeer husbandry, and tourism. The newly opened border crossing with Russia, in the neighbouring municipality, may bring significant new business activity, and more transport traffic to the roads passing through the Kemijärvi area.

The **Jämsä-Kuorevesi** area is situated in rural Central Finland. The most important employers in the area are a sizeable pulp and paper plant in sub-centre Kaipola, and an aviation plant located in the area of Kuorevesi, in the sub-centre Halli. Jämsä also offers good opportunities for recreation and tourism, both in winter and summer. Originally Jämsä and Kuorevesi were two separate municipalities, but in 2001 Kuorevesi merged with Jämsä and at the same time it changed its administration area from Häme to Central Finland. In addition, the road network in the Kuorevesi area became a part of the Road Region of Central Finland.

Jämsä	
Total area:	1 186,3 km² , land area: 1 004,0 km²
Population:	15 411
Population density:	15,4 inh./km² of land area
Total number of jobs:	6 509
Jobs by branch:	agriculture 5,0 %, processing 39,7 %, services 55,3 %
Labour force:	7 282
Unemployment rate:	14,30 %
Access to the airport from Jämsä centre:	Halli 23 km
Access to the international airport:	Jyväskylä 75 km, Helsinki-Vantaa 215 km
Railwaystation:	in Jämsä centre

http://www.jamsa.fi/english/

Övertorneå and **Överkalix** are two neighbouring municipalities on the Polar Circle in Swedish Lapland, in the county of Norrbotten. Övertorneå, situated along the Finnish border, covers a land area of 2.381 km², has 5.500 inhabitants and an average population density of 2.3 inh./km². The municipality has three main settlements: Svanstein, Övertorneå and Hietaniemi. The municipality Överkalix covers an area of 2.787km² and is inhabited by 4.206 persons; the population density of the community is 2 inhabitants per km². Thus the total test area covers 5.168 km² and has a population of approximately 9.700.

The municipalities are home to several workshops, including an assembly plant for heavy transport vehicles, a plastics producer; as well as garden product enterprises. The border municipality Övertorneå also has a traditionally strong retail trade and transport business sector.

http://www.overtornea.se/svenska/kommun/statistik/index.shtml,
http://www.overkalix.se/overkalix/view.cfm?oid=1001

Senja Island in Troms county in Northern Norway has an area of 1.570 km² the third largest island in Norway. The population of Senja is approximately 10.000 people. The landscape in Senja varies from sharp gulfs and shafts to low mountains and forests in the eastern parts of the island.

The islanders mainly derive their livelihood from fisheries, fish farming and tourism. Senja also has a mining settlement, Skaland, with approximately 250 inhabitants. Other larger settlements include Senja's largest fishing settlements: Gryllefjord, Torsken, Botnhamn and Skolsvik. Recently, new road connections and ferry lines have been planned in order to meet the expected expansion of the tourism industry.

http://www.hamnisenja.no/webprospekt/communications%20engelsk.htm

The County of **Sutherland** is located in the far north of mainland Scotland, and covers an area of 7.650 km². The population of Sutherland is 13.778 (2001). The area has six major settlements: Dornoch, Golspie, Brora, Helmsdale, Lairg and Lochinver. Sutherland is a country of "mountain, moor, loch and glen". Tourism, public sector employment and manufacturing dominate the local economy; other important sectors are forestry, construction, nuclear engineering, public and private services (such as call centres), sea fisheries and agriculture.

http://www.scottishdevelopmentinternational.com/, http://www.hie.co.uk/case/our-conomy.html, http://www.highland.gov.uk/plintra/iandr/cen/prof_sut.htm

2.2 Road Network

The road network information was collected through visits to the test sites, interviews with the road engineers responsible for the local public road network and from data collected from the roads (e.g. rutting/roughness data, structural measurements using ground penetrating radar, and bearing capacity measurements). Background information, important to understanding the road properties of each region was drawn from comparison studies done during the previous Roadex project (1998-2002).

Geomorphology and settlement history characterized the road network in each test area. In Sutherland, roads follow routes that are hundreds of years old while the main transportation route in Senja has been the sea and the majority of the road network has been built during the last 50 years. The public road networks in each area are presented in appendix 1. Detailed descriptions of the subgrade soils and typical road structures in each region are given in the Roadex I CD-ROM presentation.

In **Sutherland**, Scotland, the total length of the public road network managed by The Highland Council is 1323 km. The other public road in the area is the 56 km long trunk road A9. The forest road network in Sutherland area is about 200 km long. A large share of the Council roads in Highlands are single-track roads with weak shoulders and this caused major problems for heavy transport and road maintenance (figure 2).

The Central part of Sutherland also has vast areas of weak peat subgrade and most of the low volume roads have been built on top of it. During the winter there are several snowstorms and freeze-thaw cycles, which cause problems for the road users and road structures.

Figure 2. Timber haulage on a single-track road B871 in Central Sutherland.

The island of **Senja** has 552 km of public roads, of which 177 km are asphalt surfaced National Roads and 205 km Country Roads (171 km asphalt and 34 km gravel wearing course). Senja has 169 km of municipal roads with no statistics on pavement type. The total length of private roads with gravel surface is 128 km. The length of forest roads in Senja is 55 km.

Of all the Roadex test areas, Senja has the roughest terrain with high mountains, steep valleys and fjords. This has caused major problems especially for road geometry. For that reason Senja has several road tunnels and new tunnels (figure 3) are currently being built to connect settlements. Special problems in Senja, due to high topography, are landslides and avalanches.

Figure 3. A tunnel on road 864 in Senja.

Övertorneå has 442 km of public roads and about 80 km of municipal roads of which almost all are paved. In addition to that there are roughly 28 km of private roads that are mainly gravel. The total length of public roads in **Överkalix** is 423 km and in addition the municipality has 16 km of roads. In Övertorneå-Överkalix public roads have 84 km of asphalt pavement, 310 km of soft bitumen pavement and 124 km of surface dressing. Total length of public gravel road in the area is 347 km. Statistics are unavailable for private roads in the area. Information on the length of forest roads in Övertorneå-Överkalix was also not available.

Figure 4. Road 855 is a typical gravel road in the Övertorneå area with spring thaw bearing capacity problems

Due to flat topography, the roads in the Övertorneå – Överkalix area have quite good geometry and in general are quite wide. However the structures in low volume roads are far too weak to bear modern truckloads and differential frost heave and thaw weakening are causing major problems for the road network especially during the spring (figure 4).

The public road network in **Kemijärvi** comprises 518 km of public roads and 55 km of municipal roads. In addition, Kemijärvi has a 426 km long forest road network in state owned forest areas maintained by Metsähallitus (a state enterprise operating under the Ministry of Agriculture and Forestry) and a 850 km long forest road network in private owned forests. Small private road cooperatives maintain an approximately 205 km long road network.

Figure 5. Road 19789 has been changed to a gravel road due to severe frost problems.

The subgrade soil in Kemijärvi is mainly glacial till and peat, around the lake of Kemijärvi there are also highly frost susceptible silts. The frost problems and shortage of funding for rehabilitation has resulted in a number of old paved roads being changed back to gravel roads (figure 5).

The public road network of **Jämsä-Kuorevesi** comprises a total length of 395 km, of which 44 km is Class I main road, 40 km Class II main road, 97 km other highways and 214 km local roads. Approximately 100 km of the public road network has hot mix asphalt pavement and 133 km has cold mix overlay. In Jämsä-Kuorevesi 183 km of the road network is still unpaved with wearing course made of crushed gravel (figure 6). The municipality of Jämsä has approximately 100 km of road. From private roads and forest roads in the area there are no statistics available.

Figure 6. Gravel roads in Kuorevesi area are narrow and have problems with poor geometry, road 3424.

The subgrade soil in the Jämsä-Kuorevesi area is characterized by highly frost susceptible silty areas and moraine covered bedrock hills. In these areas, roads suffer from severe spring thaw weakening problems. Another problem in this area are narrow roads with poor vertical and horizontal road geometry which especially caused problems because long truck and trailer combinations are damaging the pavement on the inside edge of curves (figure 7).

Figure 7. Road 3423 in Kuorevesi is a typical road with pavement damages on the inside edge of the curve.

3 The Questionnaire

3.1 Questions and maps

The questionnaires included 25 questions with six different themes:

1. The use of the road network,
2. Need for access to roads,
3. Current condition and maintenance of the road network in summer,
4. Current condition and maintenance of the road network in winter,
5. Traffic safety,
6. Cooperation with local road authorities and other road users.

Most of the questions were multi-choice questions, where the respondent was to pick one of 4-5 options. These answers were stored and analysed using SPSS statistical analysis software for quantitative analysis. The relatively small number of respondents limited the use of quantitative tests for dependencies between several answer classes; therefore the main tool for analysis was to cross tabulate each question per test area. Where appropriate, answers where also classified by another factor, such as type of activity, to test possible dependencies.

Another important part of the questionnaire were maps of the road network in the test area, on which the respondents were asked to indicate:

- Routes their organization used regularly (MAP1);
- Problem sections in summer and winter (MAP2, MAP3);
- Roads to be avoided for their poor condition (MAP4); and
- Road sections which are dangerous (MAP5)

To facilitate the indication of problems, the questionnaire was delivered with two colour pens: The blue pen was used to indicate a minor problem and the red pen to indicate a severe problem. When totalling the number of markings for each road section, the colours were given different values: blue equalling 1 'hit', red equalling 2 'hits'. The thus quantified data was transferred to digital maps, where the sum total of hits for each road section was marked using different colours.

In addition to the multi-choice question, the questionnaire also included spaces where the respondent was invited to for example describe the condition of roads in their own words. These answers were translated to English in the respective country, and then analysed together with the quantitative data.

3.2 Issuing the Questionnaire

The questionnaires were mailed in autumn 2002 in Kemijärvi (Finland), during spring 2003 in the test areas of Senja (Norway), Överkalix-Övertorneå (Sweden) and Sutherland (Scotland), and finally in September 2003 in Jämsä-Kuorevesi (Finland). Answers were returned anonymously to the local roads administration offices, from where they were forwarded to Roadscanners Oy for analysis.

The questionnaire was sent to all haulage companies and other professional transporters, who had a registered address, or who were known to regularly use the roads in a test area. The addressees included truck, bus, and van transporters working for public transport and other public services, retail trade, and raw materials transports to industry.

In Sutherland, Senja, Övertorneå-Överkalix and Jämsä-Kuorevesi, telephone interviews were used to improve the answer rate, with good result. Interviewers called each addressee in the test area and asked if they had already responded to the questionnaire and, if not, requested that they go through the questions over the phone. In addition, one of the authors (Timo Saarenketo) conducted a few phone interviews as well as interviewing truck drivers when he visited the test areas.

3.3 Answer Rate

Table 1 presents a summary of the answer rate for the questionnaire. The survey produced 147 answers from the five test areas. The answer rate in each test area varied from 38% in Kemijärvi to 61% in Sutherland. The average answer rate was 45%, which can be regarded a satisfactory result.

Table 1. Summary of questionnaire answer rates.

Test Area	Nr issued	Answers	Answer Rate
Sutherland	84	51	61 %
Senja	75	29	39 %
Övertorneå-Överkalix	60	24	40 %
Kemijärvi	56	21	38 %
Jämsä-Kuorevesi	55	22	40 %
Total	330	147	45 %

3.4 Respondents

3.4.1 Type of Activity

There is no exact record of how well the collected answers represented the different livelihoods in each region, but differences in the industry profile of the answers per area (Figure 8) suggest, that the key sectors in the regional economies were correspondingly represented in the study results from each test area. Only the representation of forest industry transporters was slightly too low in the Jämsä-Kuorevesi area.

Whereas forest industry transports slightly dominate in Övertorneå-Kalix area and Kemijärvi, the fish industry was the largest sector represented in the answers from Sutherland and Senja. In Jämsä-Kuorevesi area representation of forest industry among respondents can be argued to be too low compared to the timber haulage traffic in the area. Statistical errors may result from the fact, that respondents, especially in the timber industry, can operate several trucks in the area.

Haulage of soils, aggregates and construction materials was a significant group in all areas. Respondents classified some of these activities as "Other". Public services and distribution of daily goods was also well represented in the collected answers from all test areas.

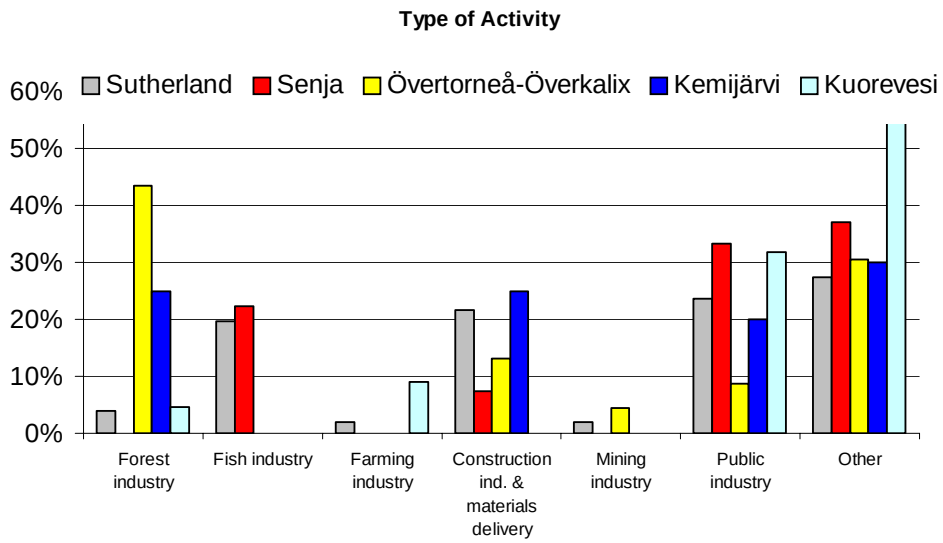


Figure 8. Industry profile of the answers per area. "Please indicate the main industry in which your company provides transportation."

3.4.2 Different Vehicle Types

In general, all vehicle types (car, van, bus, truck, trailer) were represented among the respondents, but understandably, transporters using truck and truck/trailer combinations comprised the majority (50-63%) of respondents in all test areas. In Övertorneå-Överkalix, trucks and truck/trailer combinations were remarkably high, accounting for 83% of respondents.

Roughly 10% of all respondents operated buses – with the exception of Jämsä-Kuorevesi, where bus companies comprised 20% of respondents. Van and minibus transporters were represented mainly in Scotland and to some extent also in Jämsä-Kuorevesi and Kemijärvi. Car transporters formed an uneven share of respondents in each test area, varying from 20% in Kemijärvi to 4% in Övertorneå-Överkalix.

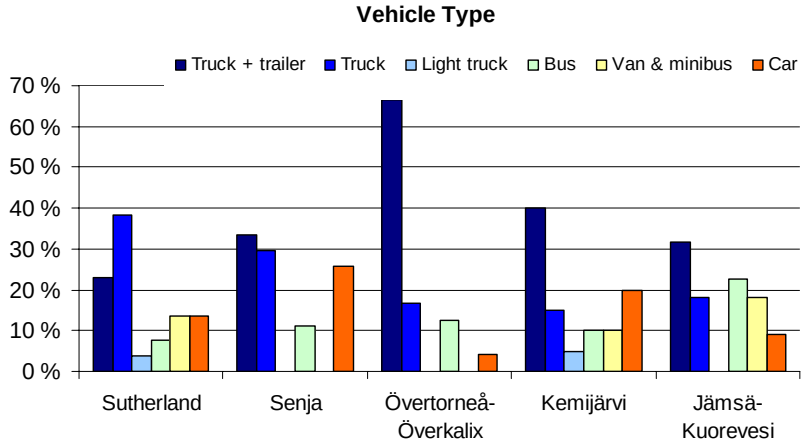


Figure 9. Vehicle type. "What type of vehicle do you mainly use?"

3.4.3 Traffic Loads

The test areas presented notable differences in the normal and maximum loads of the respondents' vehicles. There seems to be a division between Nordic timber areas (Överkalix-Övertorneå, Kemijärvi, Jämsä-Kuorevesi) where 19-27% of the respondents indicated that their normal transport loads were over 50 tons, and the fish-producing Senja and Sutherland, where the majority of respondents reported normal transport loads to be less than 20 tons. Table 2 presents values of the normal loads given by respondents in each test area. The table shows that the cumulative stresses on pavement structure were much higher in Nordic timber areas than in Sutherland and Senja.

Table 2. Mean gross vehicle weight given by road users in test areas.

Load class	< 20 tons	21-30 tons	31-40 tons	41-50 tons	51-60 tons	> 61 tons		
Övertorneå-Överkalix							Average (t)	Total
Normal	8	4	3	1	5		32	21
Max	3	4	8	1	4	1	35	21
Kemijärvi							Average (t)	Total
Normal	7	2	2		4		28	15
Max	3	4	2		4	1	36	14
Jämsä-Kuorevesi							Average (t)	Total
Normal	10	2	1		3		23	16
Max	6	1	1		7		37	15
Senja							Average (t)	Total
Normal	17	4					12	21
Max	13	5	2	1			18	21
Sutherland							Average (t)	Total
Normal	24	5	7	3			22	39
Max	18	7	6	8			25	39

3.4.4 Load calculation

The majority of respondents measured their load by weighing it (figure 10). In Senja and Jämsä-Kuorevesi, measuring the load by volume was also quite common (30% and 21% of respondents, respectively). Other means of calculating the load, as given by respondents, included using load information from a shipping bill/ freight bill, and estimating the load by a count of transported persons.

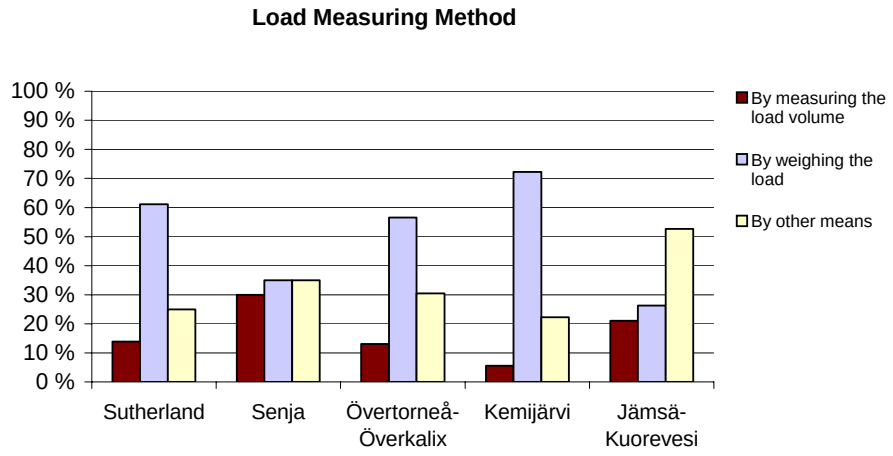


Figure 10. "How do you calculate the weight of your vehicle load?"

3.4.5 Tyres

The majority of respondents in all test areas mainly used twin tyres for their large transport vehicles (Figure 11). The questionnaire results show, that super single tyres are, at present, only common in Sutherland (42%) (figure 12). In the two Finnish test areas, 'Other' tyre type was selected fairly often (21% / 25%); the verbal explanations given here referred to normal van or car tyres. 60% of respondents in the fish industry sector reported using super single tyres as their main tyre type. The corresponding figure in forest industry is 19%, in construction and materials transports 25%, and in other activities 10%. In Sutherland, 70% of respondents in fish industry used mainly super single tyres

Figure 11. Twin tyres are still mainly used in Northern Periphery area.

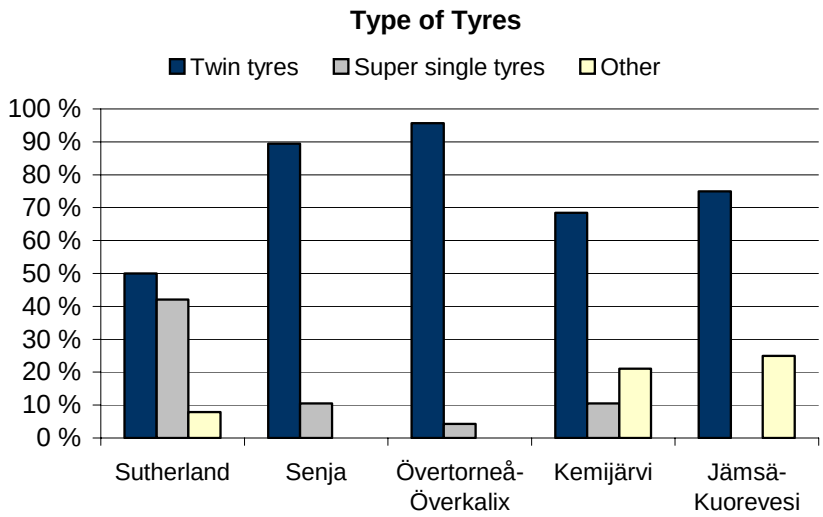


Figure 12. Summary of the answers for the question "What tyre type do you mainly use on your vehicle(s)?"

4 Use of the Road Network

4.1 Used Road Network

In order to evaluate how widely the respondents were using the road network in the area, they were asked to mark the transportation routes they were normally using on the map. The summary maps of these markings are presented in Appendix 1. Maps show that the respondents were using almost the entire public road network in each test area. Only a few unmarked roads could be identified from the maps.

4.2 Frequency of access to roads

The respondents were asked about the frequency at which they need to access the roads they marked on the maps (appendix 1). Figure 13 presents a summary of the results. On average, 20-30% of the respondents in all the test areas answered that they need access to the roads they normally use more than three times a day. Daily access was required by another 20-30% of respondents in all test areas, with the exception of Övertorneå-Överkalix, where daily transport needs account for 45% of the respondents. In all the test areas, the largest vehicles (2/3 of all truck or truck/trailer operators) tended to access their transport routes in the test area at least once a day.

An examination of the road access frequency per industry reveals differences that can be found between the test areas. In Övertorneå-Överkalix and the two Finnish test areas, *forest industry* transports require access to their normal routes daily, but in Sutherland 3-6 times per week is adequate for forest industry transports. *Mining*, which is represented in Sutherland and Övertorneå, seems to be another industry that requires frequent access to transport routes. The frequency of transports by the *fish industry* varies from 3-6 times per week to over three times per day, both in Senja and in Sutherland. In the classes “public” and “other” transportation, route access frequency varies widely.

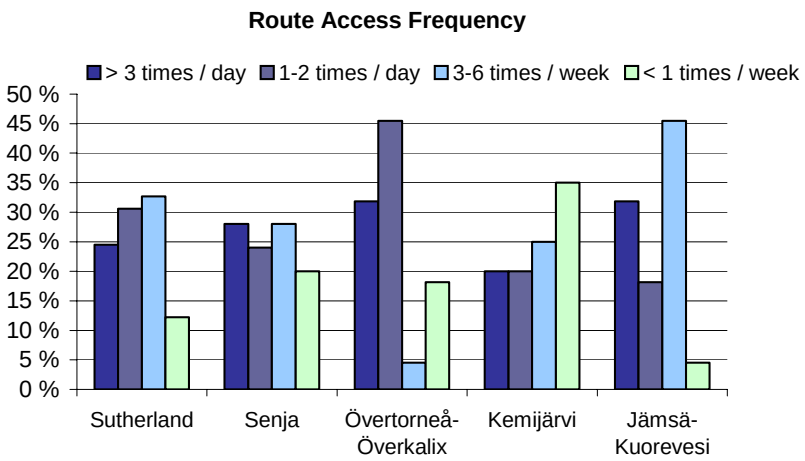


Figure 13. Summary of answers for the question "How often does your organization use the routes you marked?"

4.3 Daily use

When asked about the need for road access with regard to the time of the day, 50-60% of the respondents in all test areas, with the exception of 40% in Kemijärvi, answered that they require 24 h access to their transport routes (figure 14). Almost as many respondents need to access the routes only during daytime (6 am – 10 pm). The share of respondents, who only require random access to the routes, varied from 15% in Kemijärvi to 0% in Jämsä-Kuorevesi.

A 24 h access was required, understandably, by most of the respondents active in the public sector or fish industry transports. In Swedish Övertorneå-Överkalix and the two Finnish test areas, 24 h access was also required by the forest industry.

Figures 15-19 present the need to access the road network in each test area at different times of the day, classified by the type of activity.

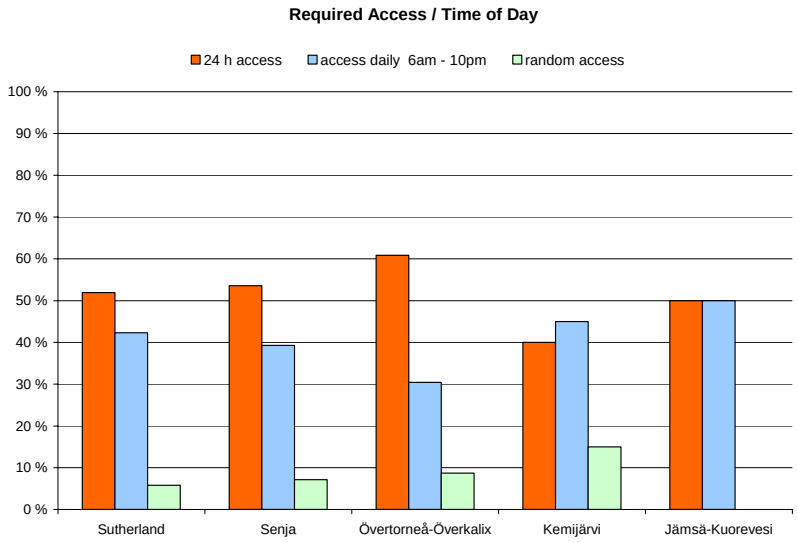


Figure 14. Summary of answers for the question "At which times of day do you need to have access to the roads in the area?"

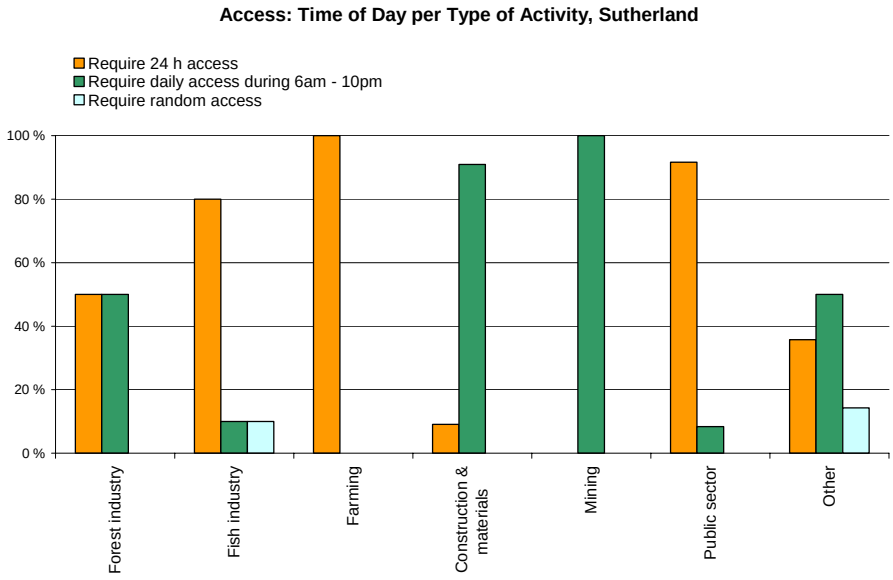


Figure 15. Need to access the road network in Sutherland in different times of the day, classified by type of activity.

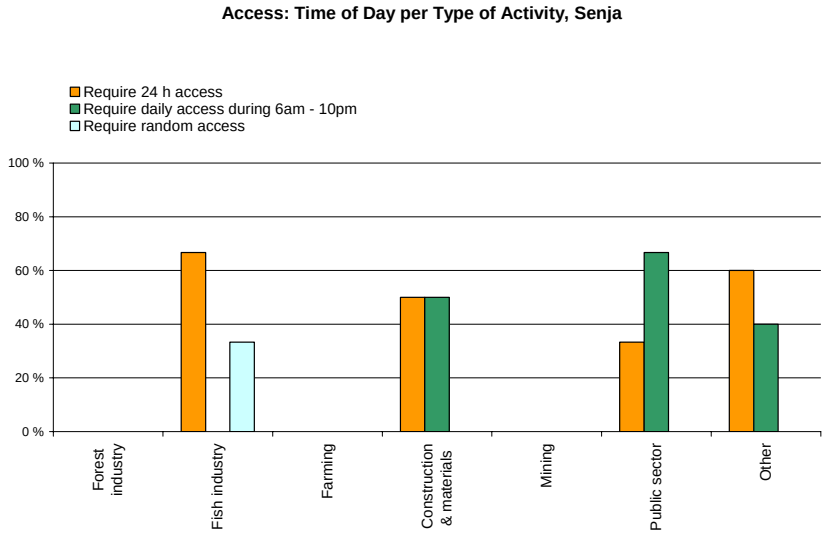


Figure 16. Need to access the road network in Senja in different times of the day, classified by type of activity.

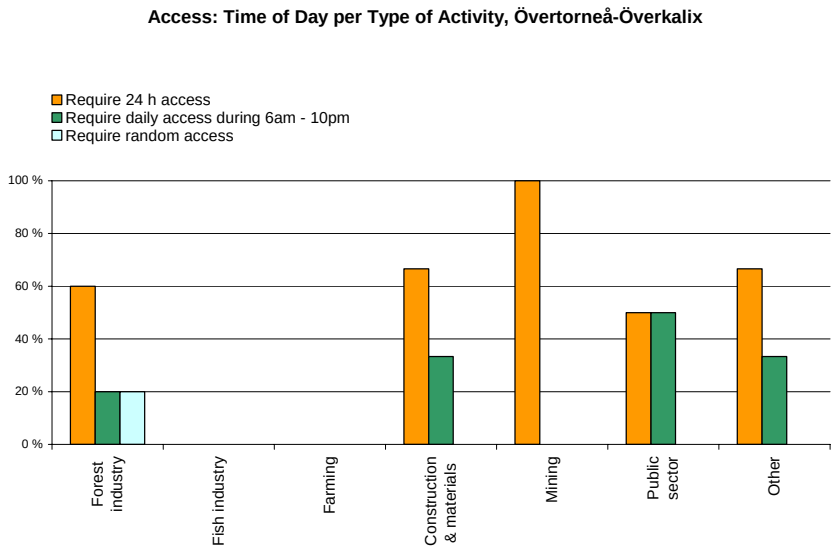


Figure 17. Need to access the road network in Övertorneå-Överkalix in different times of the day, classified by type of activity.

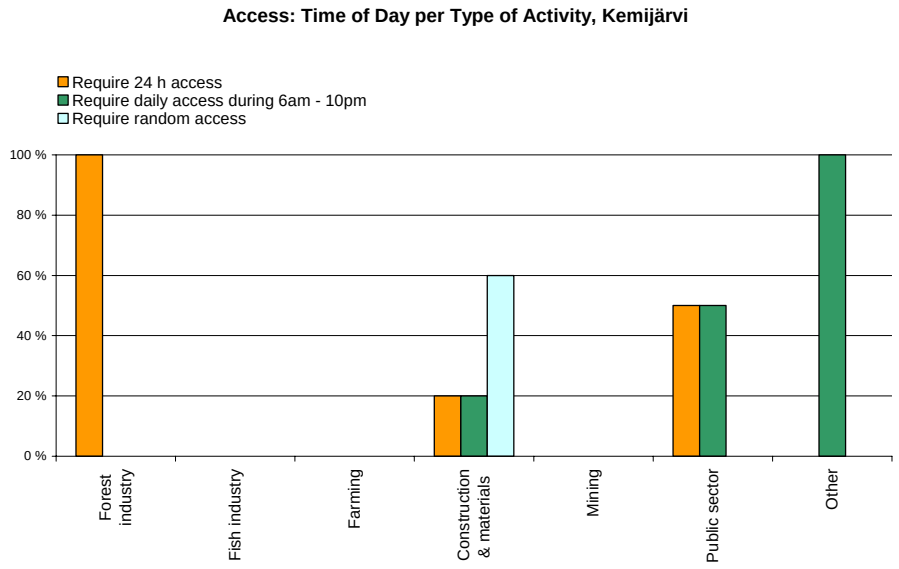


Figure 18. Need to access the road network in Kemijärvi in different times of the day, classified by type of activity.

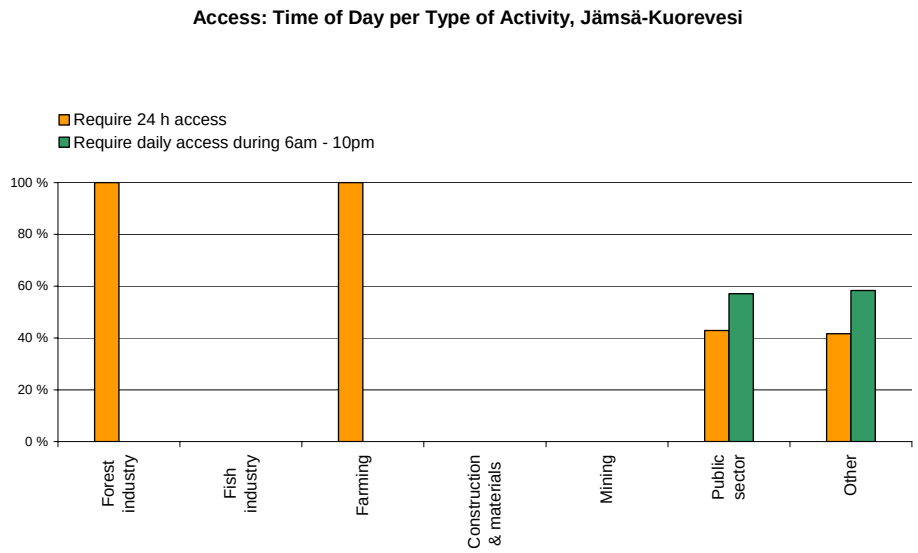


Figure 19. Need to access the road network in Jämsä-Kuorevesi in different times of the day, classified by type of activity.

4.4 Use in different times of year

To the question of the respondent's need for access to their routes with respect to time of year, in all test areas the main answer category, for 75-95 % of respondents, was "Require access throughout the year". Some respondents, mostly in the construction industry & materials transports mainly required access in summer. Occasional answers from the forest, farming, or fish industry transporters claimed to require access mainly in winter.

5 Quality of the Road Network in summer

5.1 Current condition of the road network in summer

Figure 20 presents respondents opinions on the current condition of the road network in their area during the summer, and an average rating for each test area, calculated from the answers using a scale from one (extremely poor) to five (excellent).

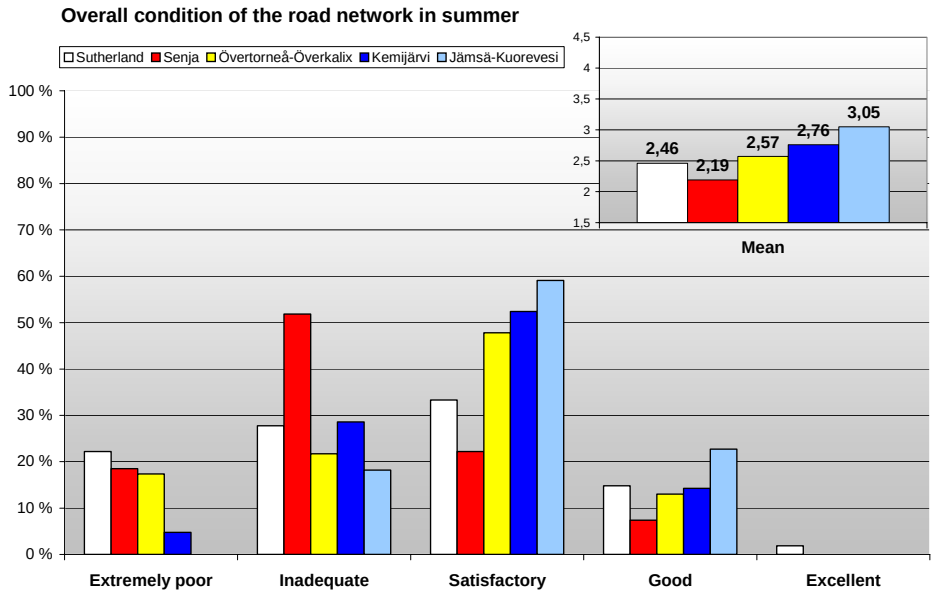


Figure 20. Summary of the answers for the question: "What is your opinion on the overall quality of the road network area in summer?"

The majority of the respondents (50-80%) in all test areas, except Senja, were relatively satisfied with the current condition of the area's road network in summer; but on the other hand about 20 % of road users in Sutherland, Senja and Övertorneå-Överkalix also found the summer condition of the roads to be extremely poor. The best average value for summer road condition was given by road users in Jämsä-Kuorevesi.

There were differences among the opinions in the different sectors in each test area: In Senja, all transporters in the public service sector found the summer condition of roads to be inadequate. In Sutherland, the public sector also seemed to be more dissatisfied by the summer roads than others. In Övertorneå-Överkalix, 70% of the forest industry transporters found the road condition to be satisfying or good. On the contrary, in Kemijärvi, 60% and Sutherland both respondents from the forest industry stated the road condition was inadequate. In Kuorevesi, all sectors seem equally satisfied with the road condition.

Respondents were also able to give written comments for this question. In Sutherland there was no specific reason for the answers and comments varied from passing problems on single-track roads during the summer time with tourists to potholes, weak verges and vegetation. In Senja the main complaint was rutting but also several road users commented on uneven frost heaves and culverts. In Övertorneå-Överkalix, Jämsä-Kuorevesi and Kemijärvi road users complained about potholes and especially the condition of gravel roads.

Figure 21. Road 232 in Senja was rated as a problem road in summer due to rutting, potholes and uneven frost heaves around culverts.

5.2 Trend in summer condition

The trend in the road network's summer condition, on the contrary, was not seen too positively in any of the test areas. Figure 22 shows the results from this question, and an average rating for each test area, calculated from the answers using a scale from one (rapidly worse) to five (rapidly better). The most negative opinions, regarding trend, were obtained from the road users in Senja (average value 1.89). Although opinions were scattered, the most commonly selected option for the question in all test areas, except Övertorneå-Överkalix, stated that the summer road condition is developing "slowly to worse". In Övertorneå-Överkalix and Sutherland, a notable number of answers also estimated that summer road condition has not changed.

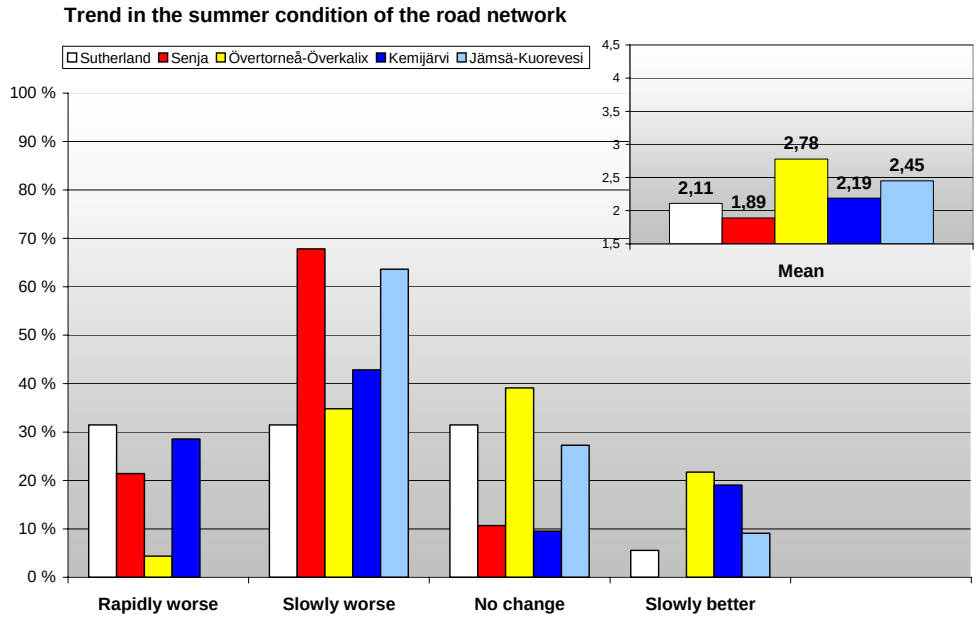


Figure 22. "What is your opinion of the general trend in the road network's summer condition in the test area? Is the condition becoming (circle one)?"

Of the different sectors, the trend was seen most negatively by the construction industry (50%) and the fish industry (33%) in Sutherland, the construction industry (50%) and fish industry (67%) in Senja, and by the forest industry (40%) in Kemijärvi.

The written comments, from Senja, regarding the trend, pointed out that poor summer maintenance was the reason why "roads are falling to pieces". In Övertorneå-Överkalix, Jämsä-Kuorevesi and Kemijärvi almost all the comments focused on poor grading of gravel roads in summer. In Sutherland there were no specific comments, one road user complained that road widening projects have not been done properly.

5.3 Location of problem roads in summer– comparison with the information at road administration

The maps in Appendix 2 show those roads in the test areas that the respondents indicated as having major problems in road condition during the summer. Each regional road administration has been able to give their comments concerning these maps.

In **Sutherland** the map appeared generally as was expected (Ron Munro). The black section on A897 is a particularly poor section of single-track road that is periodically flooded by the River Oykel during times of spate and high tides. The road was scheduled for upgrading under The Highland Council's 'Forest Roads Programme' but the programme was removed from the Council's Roads Budget. The remaining black and red sections were located on single-track roads in the Council's strategic 'A' road network and are main heavy haulage routes.

In **Senja** the map was also, more or less, what was expected (Geir Berntsen). Only the poor ratings for the Northern part of road 274 were unexpected.

In **Övertorneå-Överkalix** the E10, south from Överkalix, had problems earlier but was repaired in summer 2003 (Johan Ullberg). The northern part of E10 is an old road with poorer standard as normal main road in Sweden. A poor rating for road 98, between Övertorneå and Överkalix, was quite surprising because, according the regional road administration, it has rather good standard. Road 392 is poor but the worst sections were repaired in summer 2003. Road 841 has surface dressing and load restrictions during the spring. On the other hand road 855 South from Rantajärvi had surprisingly few comments (see also figure 4).

In **Kemijärvi** both of the "black" roads were gravel roads that are used as main transportation channels to the Kemijärvi pulp mill (Tarmo Posti). Road 9613 suffers from spring thaw weakening but is currently being strengthened in the weakest sections. Road 19769 is still partly covered by old pavement but is in poor shape.

The problem roads in **Jämsä-Kuorevesi** were mainly gravel roads that have had problems during the spring thaw season (Timo Hyvönen). The poor ratings for road 56 are most likely due to poor geometry and narrowness of the road.

5.4 Specifying the road problems in summer

In order to evaluate if road users were able to specify their problems in summer to certain technical terms and problems used by road engineers, the questionnaire asked the road users to rate the significance of some specific problems listed below, by using the scale (1-5): no problems/ very mild problems/ mild problems/ severe problems/ very severe problems.

a. Roughness and unevenness (potholes, bumps, cracks etc)

b. Rutting (deep wheel ruts)

c. Weak road shoulders (soft road edges, verges etc)

d. Poor road geometry (steep hills, tight curves)

e. Poor bearing capacity (week road surface, settlement)

f. Other (please indicate, e.g. slippery roads)

The respondents clearly identify the greatest problems in the test areas' road networks to be connected with road surface quality, especially with the roughness and unevenness of the pavement.

5.4.1 Rutting

Figure 23 presents a summary of the road users' opinions on how they felt rutting caused problems for them. The results showed that the respondents in Finland indicated that rutting caused moderate problems, while in Senja and in Övertorneå-Överkalix a great part respondents indicated that rutting caused them severe or extremely severe problems. In Sutherland, respondents' opinions of rutting were widely scattered and 1/3 indicated that rutting did not cause them any problems.

Nearly 50 % of the forest industry and fishing industry transporters indicated that rutting caused them severe or very severe problems (figure 24).

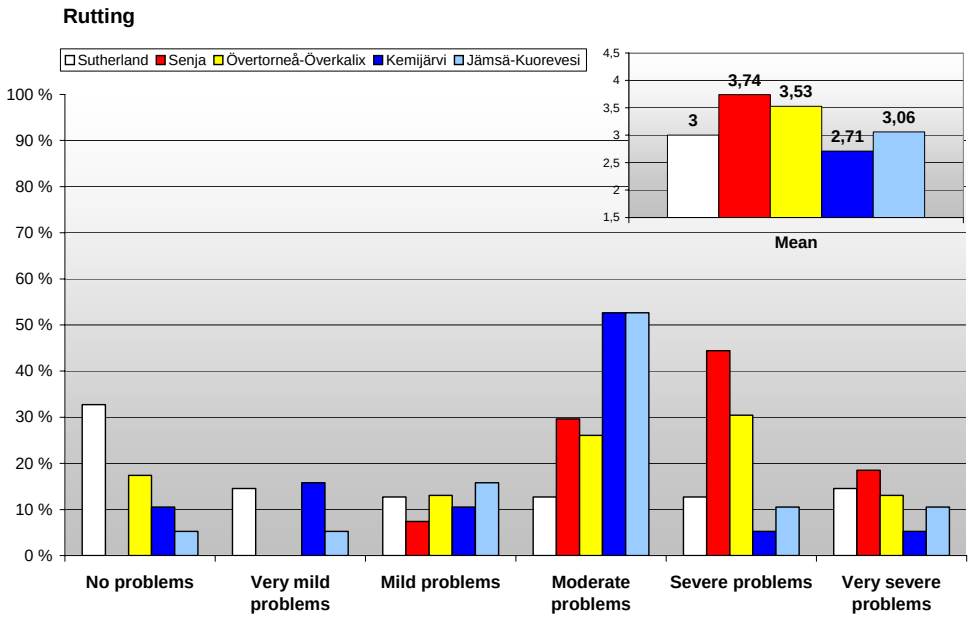


Figure 23. Summary of answers to question "Please rate your problems in using the road network with regard to the road defects listed below." / Rutting (deep wheel ruts).

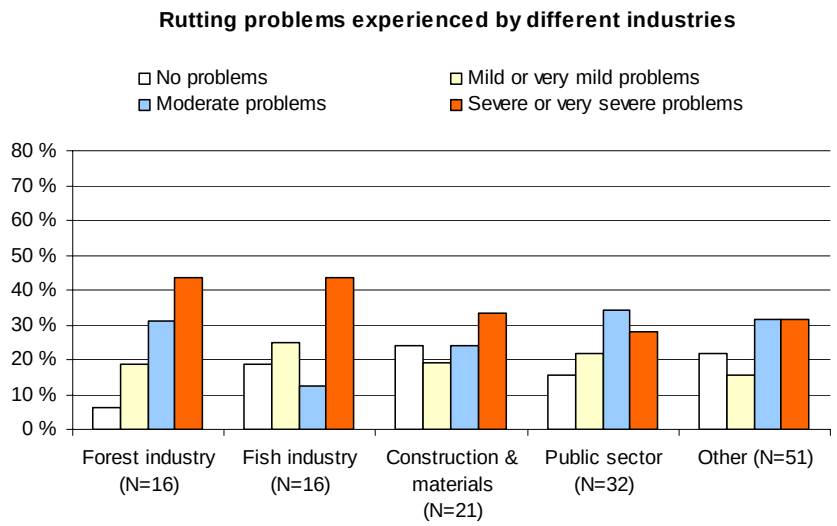


Figure 24. Rutting problems experienced by different industries. Class 'Other' also includes Mining (N=1) and Farming (N=2).

Figure 25. In Senja the road users classified rutting to be the worst problems compared with other test areas.

5.4.2 Roughness and unevenness

Figure 26 presents a summary of respondents' opinions on how roughness caused problems for them. The rough and uneven roads were rated to be major problems especially in Övertorneå-Överkalix area where almost 40 % of the respondents stated that these roads caused severe problems for them.

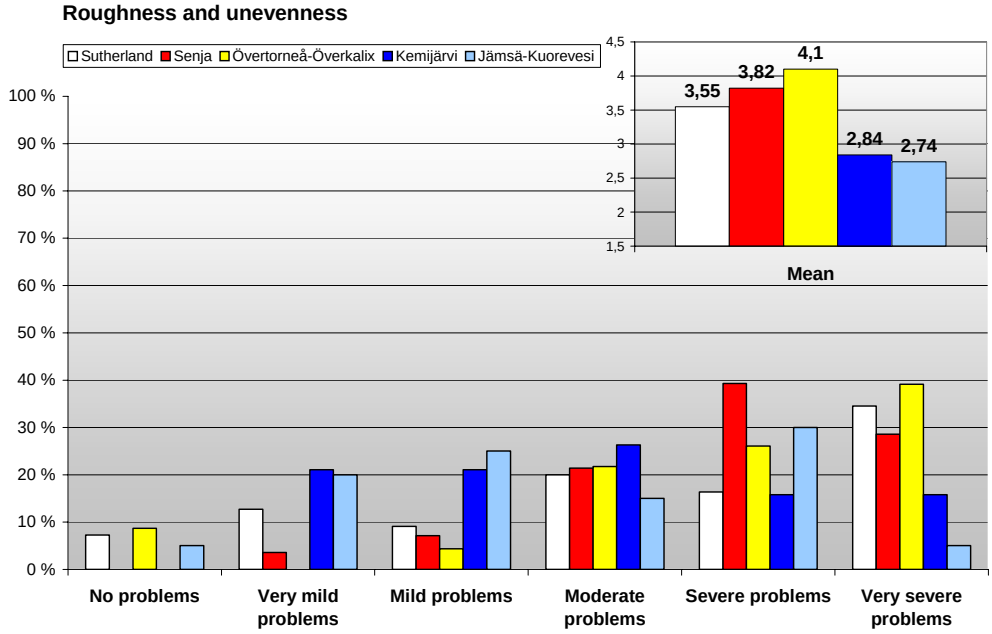


Figure 26. Summary of answers to question "Please rate your problems in using the road network with regard to the road defects listed below." / Roughness and unevenness (potholes, bumps, cracks etc).

Roughness was a major problem especially for the forest industry and 70% of timber transporters stated that uneven roads were their main problems; also more than 50% of the respondents in the construction industry and public industry indicated that rough roads caused them severe problems (figure 26). Quite surprisingly, the fish industry transporters stated that roughness caused only moderate problems; even though there was discussion that uneven frost heave can severely damage or break the polystyrene boxes used to transport fish. In Finland, timber truck drivers stated that in winter and spring the worst possible sections were those that have culverts, with frost problems, located at the bottom of valleys with steep hills both sides of the culvert. This situation requires that a driver slow the vehicle's speed, almost to zero, in order to save their suspension and then after passing the culvert the truck does not have enough speed to climb the opposite hill. On rough roads fuel consumption is also much higher.

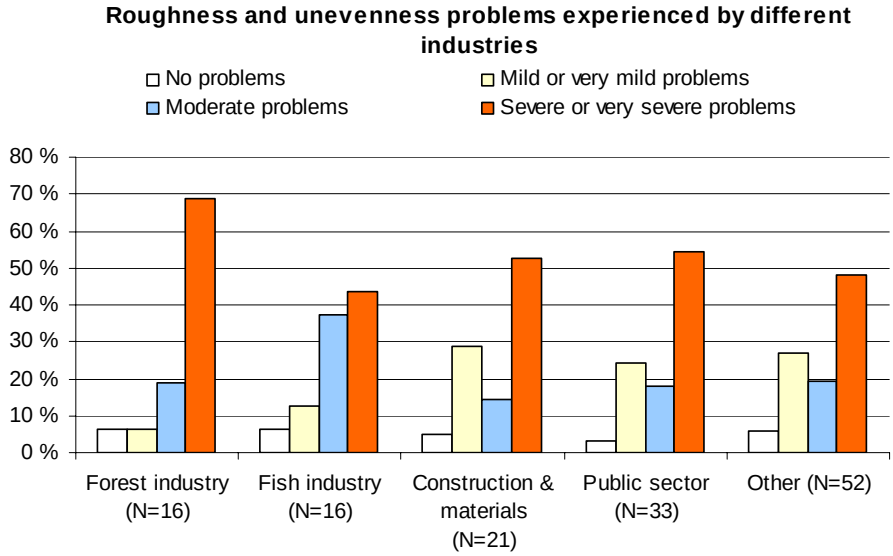


Figure 27. Roughness problems experienced by different industries. Class 'Other' includes also Mining (N=1) and Farming (N=2).

Figure 28. Rough and uneven roads were major problem for road users in Övertorneå – Överkalix. Road 915 is a good example of such a road. This road was also marked to be a road that respondents tried to avoid using (see chapter 7) and will be rehabilitated in summer 2004.

5.4.3 Weak road shoulders

The questionnaire results clearly showed that weak road shoulders (figure 29) are a big problem in Sutherland where almost 50% of the respondents reported that shoulders had caused them very severe problems (figure 30). In Finland also 40% of respondents answered that weak road shoulders had caused them severe or very severe problems.

The criticism by road users in Sutherland is understandable because shoulders there have been built using weak subgrade materials such as peat, while in Nordic countries road shoulders are mainly built using the same material used in the road structures.

Figure 29. Problems with weak roads shoulders on B871 in Sutherland

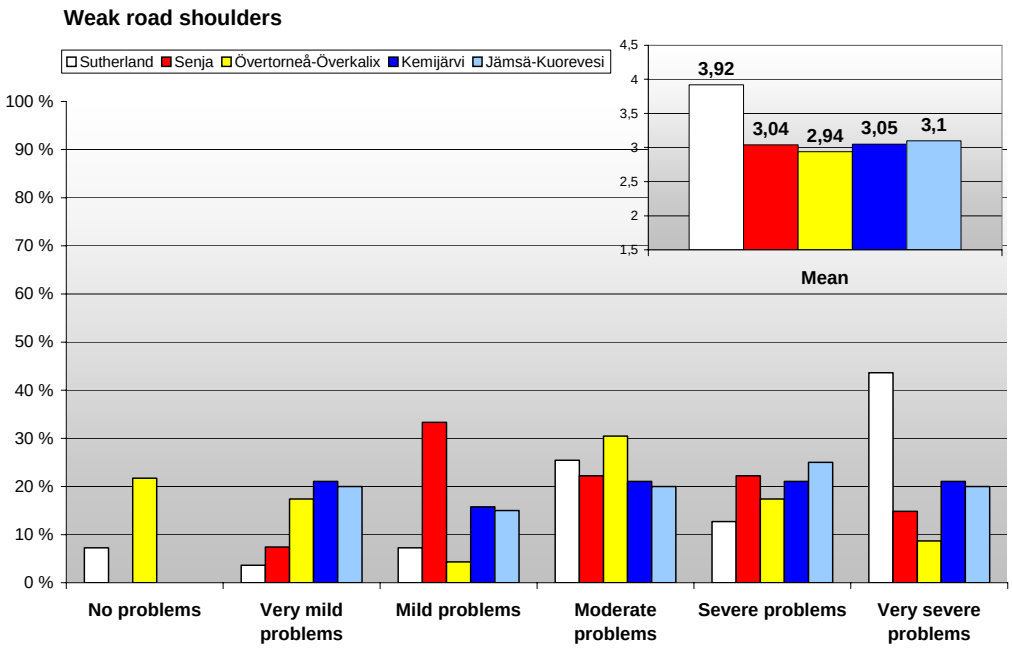


Figure 30. Summary of answer to question: "Please rate your problems in using the road network with regard to the road defects listed below." / weak road shoulders.

5.4.4 Poor road geometry

The respondents' statements, with respect to problems of poor geometry (steep hills, tight curves), correlate very well with topography in each area (figure 31). The biggest problems with both vertical and horizontal geometry were reported by road users in Senja (figure 32). Road users in Jämsä-Kuorevesi and Sutherland also reported problems with road geometry. Road users from Övertorneå-Överkalix reported fewer problems with poor geometry.

Figure 31. Road 232 in Senja.

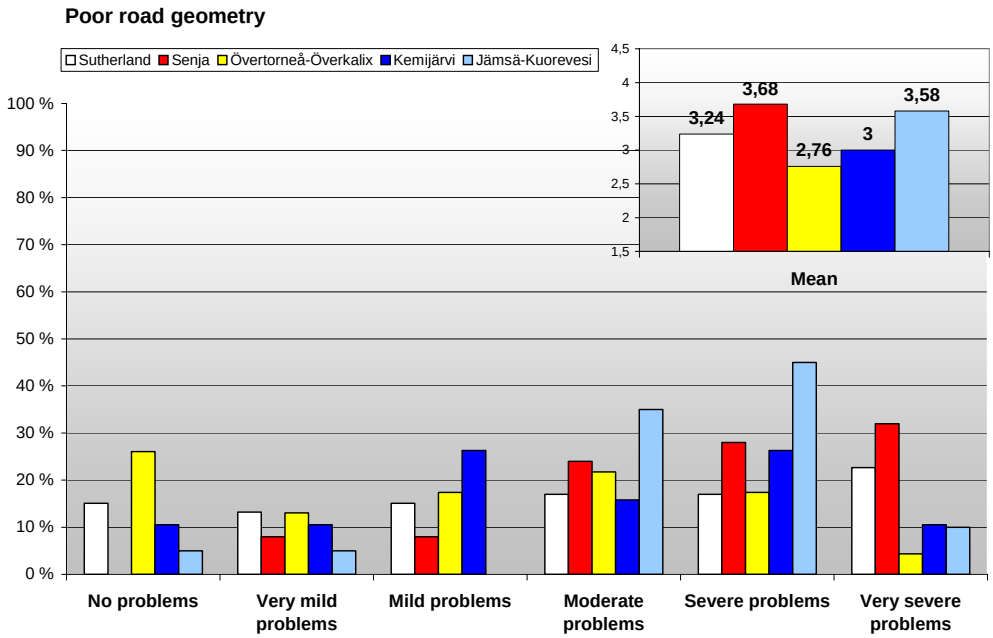


Figure 32. Summary of answers to question: "Please rate your problems in using the road network with regard to the road defects listed below." / Poor road geometry (steep hills, tight curves).

5.4.5 Poor bearing capacity

About one third of the respondents in Sutherland stated that poor bearing capacity caused very severe problems for them. Poor bearing capacity was also identified as a severe or very severe problem by a significant portion of the respondents in Senja and Jämsä-Kuorevesi (figure 33).

Surprisingly, most of the respondents saw bearing capacity problems only as mild or moderate in the areas of Kemijärvi and Övertorneå-Överkalix, which have heavy timber transports, up to 60 tons, well represented among respondents.

A comparison between the different types of activity of all the respondents shows, that fish industry transports clearly experienced the greatest bearing capacity problems (figure 34). Here it may be reasonable to note, that 2/3 of all respondents from the fish industry were from Sutherland. The construction industry was also surprisingly satisfied with bearing capacity.

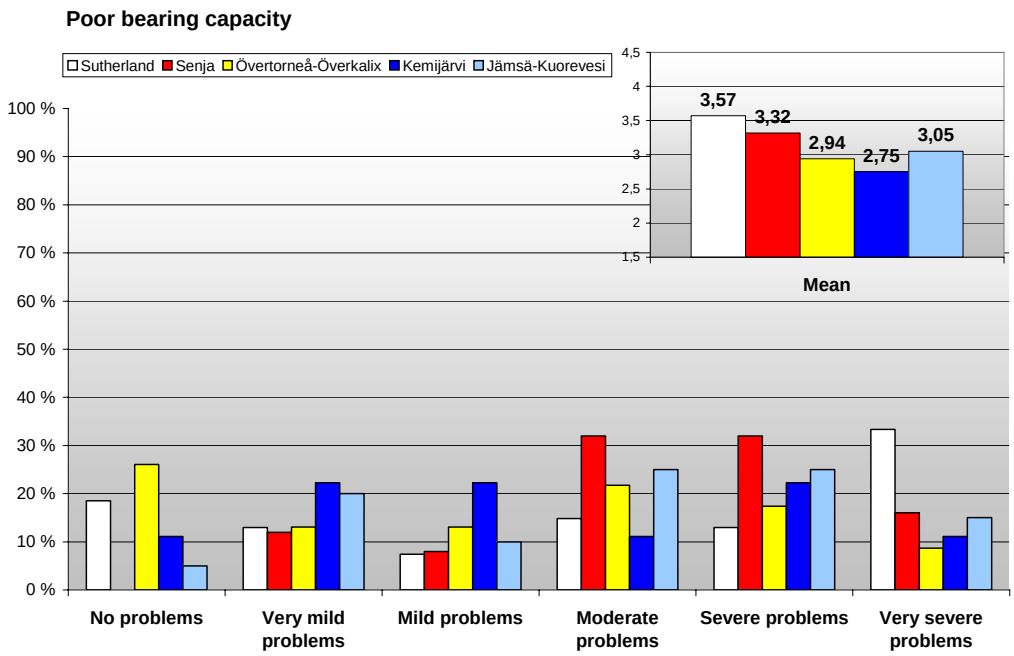


Figure 33. Summary of answers to question: "Please rate your problems in using the road network with regard to the road defects listed below." / Poor bearing capacity (week road surface, settlement).

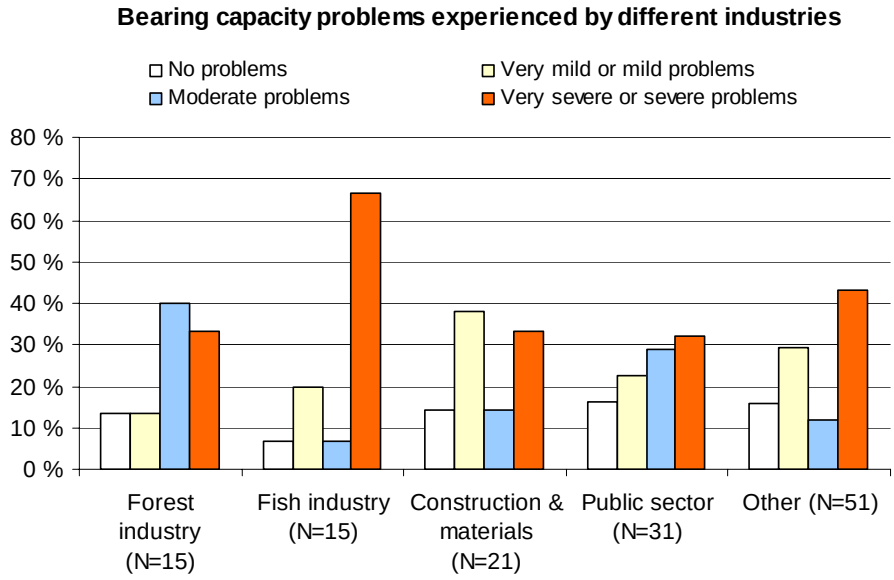


Figure 34. Bearing capacity problems experienced by different industries; all test areas. Type of activity classes "Farming" and "Mining" are included here in the class "Other".

6 Quality of the Road Network in winter

6.1 Current condition of the road network in winter

The respondents were asked to rate the overall condition of the road network in each test area during winter, with the following scale: 1 extremely poor, 2 inadequate, 3 satisfactory, 4 good, 5 excellent. The summary of these answers is presented in figure 35.

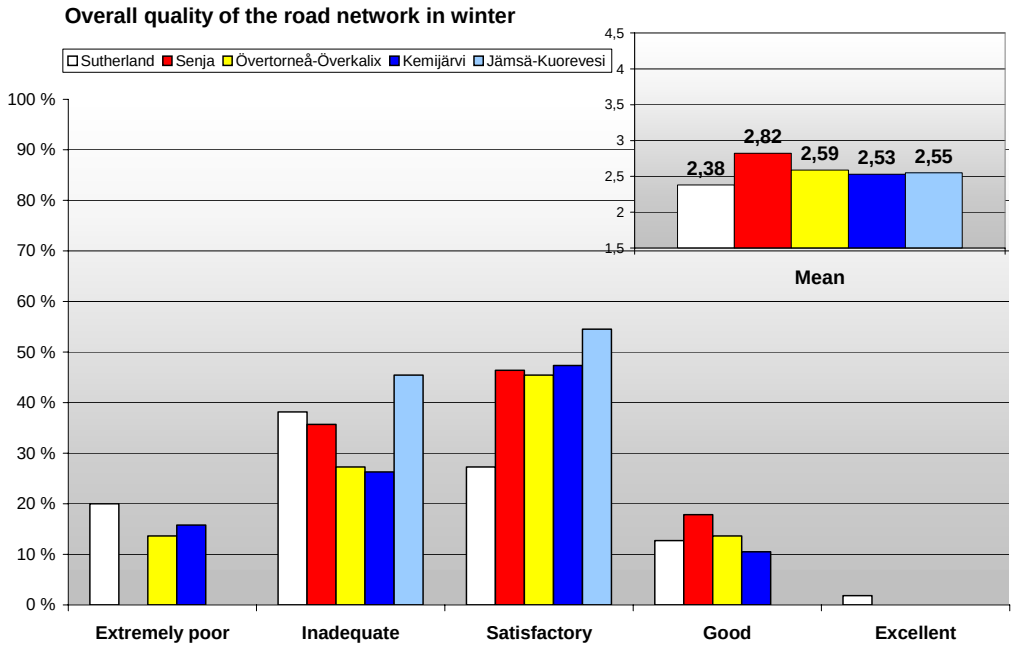


Figure 35. Summary of the answers for the question,"What is the overall quality of road network in your area in winter."

The majority of respondents in all other test areas except Sutherland rated the overall winter condition as satisfactory or good (table 4). Only one of all answers stated that the winter condition of roads was excellent (this also in Sutherland).

Table 4. The percentages of ratings "satisfactory/good" in each area, compared to "inadequate/extremely poor".

	'Inadequate' or 'Extremely poor'	'Satisfactory' or 'Good'
Sutherland	**58 %**	**42 %**
Senja	**36 %**	**64 %**
Övertorneå-Överkalix	**41 %**	**59 %**
Kemijärvi	**42 %**	**58 %**
Jämsä-Kuorevesi	**45 %**	**55 %**

The important economies in each area tended to give slightly better marks to winter maintenance than the other respondents on average. For example, four of the six fish industry transporters in Senja are satisfied by the quality of winter maintenance (5 of 10 in Sutherland); 6 of 9 forest industry transporters in Övertorneå-Överkalix say the winter maintenance quality is satisfactory or good. 'Extremely poor' or 'inadequate' quality was reported frequently in all test areas by construction and materials transports, and by public sector transporters.

'Extremely poor' or 'inadequate' quality was reported frequently in all test areas by construction and materials transports, and by public sector transporters.

Also, those respondents who only require access to their routes during working hours (6am to 10 pm) were, on average, more often satisfied with the quality of the winter roads than those transporters who required 24 h access to roads.

Respondents also gave many comments to explain their rating. In **Sutherland** there were a few written comments about poor gritting, but respondents also gave thanks for good winter maintenance.

In **Senja** the comments were surprisingly positive with comments like "pretty good" and "very good on average" (fish industry). Regarding critical comments, poor snow removal was mentioned most often.

In **Övertorneå-Överkalix, Kemijärvi** and **Jämsä-Kuorevesi** critical comments were quite similar and varied from poor and late snow removal to poor gritting and grading of compacted snow. In Kemijärvi poor gritting on steep hills was also mentioned.

Poor night time and weekend winter maintenance was mentioned in every survey area.

6.2 Trend in winter condition

When asked about the trend in winter condition, the two most selected answers in all test areas were: the winter condition of the roads has no change, or the condition is becoming slowly worse. The option, 'slowly worse', was selected by 52% of respondents in Övertorneå-Överkalix, and 53% in Kemijärvi. Selection of 'Rapidly worse' was highest in Kemijärvi (26%) and Sutherland (25%).

Written comments on winter maintenance trends, from Senja, Överkalix-Övertprneå, Kemijärvi and Jämsä-Kuorevesi, focused on poor snow removal and gritting. Late snow removal in the mornings was criticized by bus transporters and school buses / taxis. In Sutherland some of the respondents were sympathetic with the local winter maintenance crew and their poor resources.

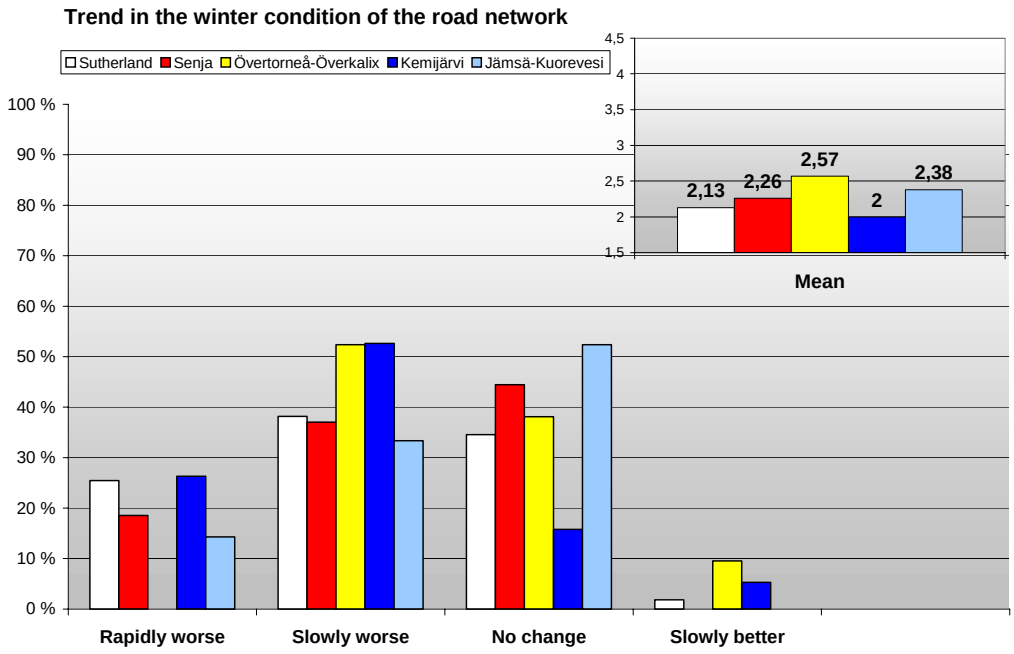


Figure 36. Summary of answers to question "What is your opinion of the general trend of the road network's winter condition in the test area? Is the condition becoming?"

6.3 Location of winter maintenance problem roads

The maps in appendix 3 show those roads in the test areas that the respondents indicated as having major problems with the winter condition. Even though the relative rating of winter maintenance quality was quite satisfactory the respondents indicated that a few roads had problems during the winter. Each regional road administration has been allowed to give their comments concerning the maps.

In **Sutherland** the problem roads were concentrated mainly in Central and Northern Sutherland, especially on roads A836, A838 and A897. Ron Munro from the Sutherland office agrees with the assessment of A836, north of Lairg, and A897 (although this route is now used as an alternative route when the A9 coastal national route is closed) but also would have expected A838, south of Durness, and A894, south of Scourie, to feature more problem sections. The A836, south of Ardgay, has snow gates that have been used recently. Poor comments regarding A838, west of Lairg, were quite surprising although this section has been closed in the past due to drifting snow.

In **Senja,** the roads with the most problems are located either on high mountain passes or in open coastal areas. The respondents' written comments focused on the time delays in these road sections, which caused extra costs and delays in transportation chains. In some comments the possibility for avalanches was also stated to be a big risk. The map makes sense with the evaluation of the Northern Region in Norway (Geir Berntsen). It was anticipated that road 252, in the Northern part of the Senja, would have more markings.

In **Övertorneå – Överkalix** the winter condition problems were primarily concentrated on the main roads 10 and 98. The main complaint was delayed snow removal, which caused compaction of snow and rutting. These ruts force trucks to decrease speed, which in turn causes delays in time schedules. In warm days poor and delayed gritting was also mentioned to cause problems. According to the Northern Region office (Johan Ullberg) roads E10 and 98 have been problem roads; road 98 has some tight bends.

Road users in **Kemijärvi** indicated that the worst road sections with winter condition problems (944 and 945) were located in areas with very steep hills and tight curves (figure 36). The main road 82, between Rovaniemi and Kemijärvi, also received several markings.

In **Jämsä-Kuorevesi,** one road in particular was commonly marked on the map and also received many comments. Main road 56, from Mänttä to Jämsä, was frequently mentioned as being very dangerous and causing stress for respondents because of delays and traffic safety risks. The main source of problems was late snow removal, which resulted in the compaction of snow on a relatively narrow road and further rutting. According to the Central Finland Road Region office (Timo Hyvönen) this road is in winter maintenance class II and salt is not used during the winter.

Figure 37. Road users in Kemijärvi stated that steep hills on road 944 caused them severe problems during the wintertime.

7 Roads to be avoided

The questionnaire asked respondents to mark on the maps those roads with such poor quality that they tried to avoid using them. The results are presented on maps in appendix 4. Respondents were also asked to explain why they tried to avoid using them.

In **Sutherland** there were two markings on the maps but several respondents gave written comments. According to the Highland Council Sutherland office (Ron Munro) there were no surprises on the maps. The A837 section is a single-track road with poor alignment through Sutherland and there are alternative better engineered main road routes to the South that are preferable to heavy haulage vehicles. Similarly A897 is single-track route with a slightly longer alternative using the A9 national route. Written statements by road users also confirmed this, as the main explanations for avoiding the roads were that they were single-track roads, too narrow for trucks and that they had potholes, bumps and weak shoulders. Some comments also referred to winter conditions.

In **Senja,** several road users marked 229. This road is a poor quality road and has alternative routes.

Road 915 in **Övertorneå-Överkalix** received two marks. This poor quality road will be rehabilitated during summer 2004 (see figure 27). In written comments, several road users stated that they tried to avoid all the gravel roads in the area.

In **Kemijärvi**, most marking were made on road 19789, which follows the east side of the Kemijoki River. This road has partially surfaced with gravel (see figure 5) and the paved sections are also in poor shape (figure 38). Forestry transporters especially mentioned uneven frost heave as a reason to avoid it.

In **Jämsä-Kuorevesi**, most markings were made on road 16571. This road is also a "museum" road with tight bends and one extremely steep hill. The other marked roads have same problems.

Several respondents in each area stated that they could not avoid using certain roads because there were no other options.

Figure 38. Road 19789 has severe deformation problems and sections with uneven frost heave.

8 Traffic Safety

8.1 Overall traffic safety in the area

Respondents were asked their opinions on the overall level of traffic safety on the road network in the test area. A summary of the results is presented in figure 38. In Övertorneå-Överkalix, Kemijärvi and Jämsä-Kuorevesi, a clear majority of the respondents felt that traffic safety in the area was satisfactory or good. Nevertheless, a significant number of respondents also saw safety as being inadequate.

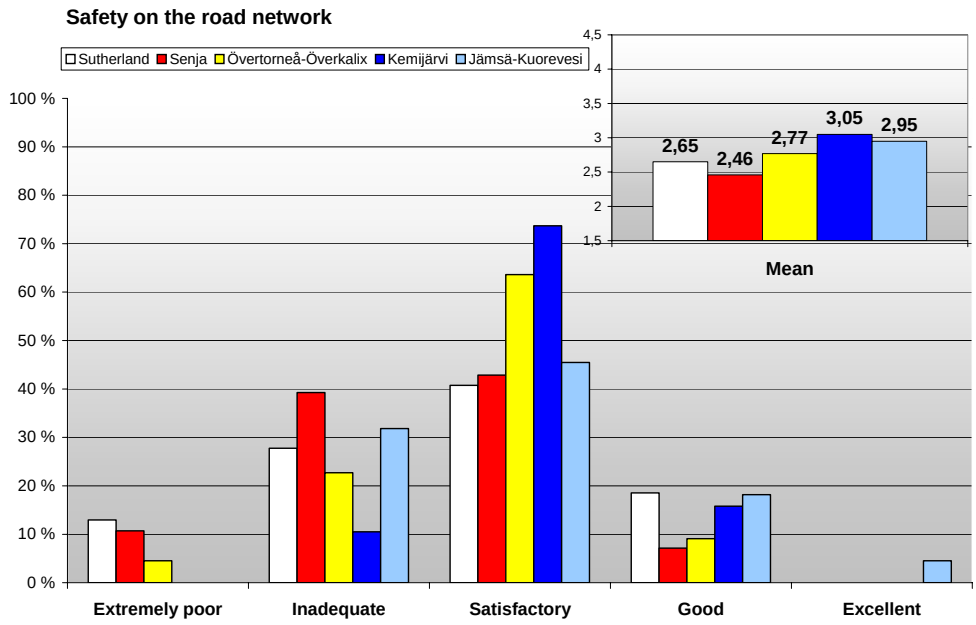


Figure 39. A summary of responses to the question: "What is your opinion of the overall level of traffic safety on the road network of the test area?"

More than 50 % of the respondents in Sutherland and Senja reported traffic safety to be inadequate or extremely poor. In written comments, road users in **Sutherland** mentioned a lack of crash barriers on bends with high embankments, but also claimed that tourists with caravans affected safety on these narrow roads (figure 39). In **Senja** the main reasons for poor traffic safety were listed as narrow roads with poor geometry, poor gritting on steep hills and fear of avalanches and landslides.

In **Övertorneå-Överkalix,** poor traffic safety ratings were mainly related to the poor winter condition of the road network. In **Kemijärvi** road users described too narrow roads and steep hills as the source for poor ratings. One particular safety problem in **Jämsä-Kuorevesi,** reported several times, was high vegetation in sharp curves obstructing visibility during summer (figure 41).

Figure 40. Respondents in Sutherland reported that single track roads with poor geometry and visibility are traffic safety risks especially in summer, when there are many tourists not used to driving these roads. Caravans especially caused problems.

Figure 41. High roadside vegetation, obstructing visibility, was a special traffic safety hazard reported by several road users in Jämsä-Kuorevesi area.

8.2 Road with traffic safety problems

Respondents were also asked to mark dangerous sections on the attached road maps. The results are presented in appendix 5. Road users were also encouraged to give written explanations as to why they marked these sections.

In **Sutherland** two short sections received three markings. According to the Highland Council the Northern red section is a notorious section on the A9 national route that climbs around 225m in 5 km . The road has a very poor geometry, so that heavy vehicles come to cross the centerline in sharp curves. It is scheduled for upgrade in 2004. The red section on the A836 has similar problems, steep gradients (up to 10% in places), tight bends and narrow masonry bridges make it difficult for heavy and long vehicles. The 2 continuous blue sections are the worst roads in Sutherland. They serve very few people and have little maintenance.

Two roads with the most markings in **Senja** were roads 86 and 275 on the West coast. These roads, which follow the coastline are narrow, have tight bends and steep hills. There is also big risk for avalanches in these areas (figure 42)

Figure 42. Road 86 at Ballesvika was singled out as having the highest traffic safety risk in Senja. The selection of this section was a surprise for road administration officials.

In **Övertorneå-Överkalix,** the biggest traffic safety hazard was marked as the bridge over the river Bön. Other roads with traffic safety risks were marked due to poor winter condition, especially for deep ruts. The poor winter condition of road 98 was mentioned in several questionnaires. Some intersections were also marked as dangerous road access points.

The respondents in **Kemijärvi** indicated several road sections that they felt were severe traffic safety risks. Most markings went to two road sections. The first section, on road 944, was a narrow poor quality embankment built over lake Kemijärvi (figure 43). This section also had old and rotten guardrails with concrete poles. This section was rehabilitated in the summer of 2003 after the questionnaire. Another dangerous road section, located on road 82 near the village of Hyypiä, was also an embankment, with tight bends, over a lake. Other road sections posing high traffic safety risks were marked on road sections with steep hills and tight curves.

In **Jämsä-Kuorevesi,** one road, above all others, received a great deal of attention. Road 56, between Mänttä and Jämsä, is a relatively high class road in Finnish road classes, but road users believed it to be extremely dangerous. The main reason for its selection was its poor condition during the winter; respondents described it as being slippery with poor snow removal and deep rutting due to compacted snow. The road was also reported to have tight bends, bad cross fall and uneven frost heave bumps.

Figure 43. The narrow and poor quality road embankment section at Luusua on road 944 was reported to be a traffic safety hazard in the area. This section was repaired in summer 2003.

9 Effect of Load Restrictions

The questionnaire asked the respondents about the effect of load restrictions in the test road network (figure 44). The answers were, surprisingly, supportive of the use of load restrictions. Even in those test areas where temporary load restrictions are used frequently, at critical times, to protect roads, a clear majority of the respondents did not believe that the removal of weight restrictions would significantly assist their operations.

The policies regarding loads normally allowed and temporary load restrictions on public roads vary from one country to another.

On **Sutherland** roads, the maximum allowed weight of vehicles is 44 tonnes on a vehicle with a minimum of 6 axles. The local Council can order traffic restrictions, if a road section is deemed to be unsafe or incapable of carrying sustained heavy vehicle transport. These restrictions have been used especially on weak single-track roads. Given this background it was quite surprising that forest industry transporters stated that it was irrelevant to remove load restrictions, while fish transporters reported that removal of load restriction would increase their competitiveness.

In the **Senja** area, where temporary load restrictions are not a normal policy but the general load allowance is comparatively low for most roads (8 / 39 or 8 / 50 tons), the majority of respondents believed that the removal of weight restrictions would significantly improve their operations. Especially road 232, with 8 / 39 ton restrictions, was reported to cause problem for transportation planning.

In Finland in **Kemijärvi** and **Jämsä-Kuorevesi** the maximum total weight of 60 tons on a vehicle with a minimum of 7 axles is allowed on almost the entire road network. The difference between the Finnish areas is that in Kemijärvi temporary load restrictions have been applied during the spring thaw weakening period on gravel roads, while in Jämsä-Kuorevesi no spring load restriction have been used and roads were simply repaired if they were damaged during the thaw period. That is why the percentage of "yes" answers in Jämsä-Kuorevesi area was lowest.

Sweden and **Övertorneå-Överkalix** use axle load as the controlling parameter; the maximum allowed axle and bogie load and total weight depend on the bearing capacity classification of the road. In addition, Sweden also uses temporary restrictions during the spring thaw period especially on gravel roads (figure 45). Some roads in the areas have even had road closers. The answers in Övertorneå-Överkalix were very similar to those from Kemijärvi, criticism of load restrictions mainly came from foresty transporters.

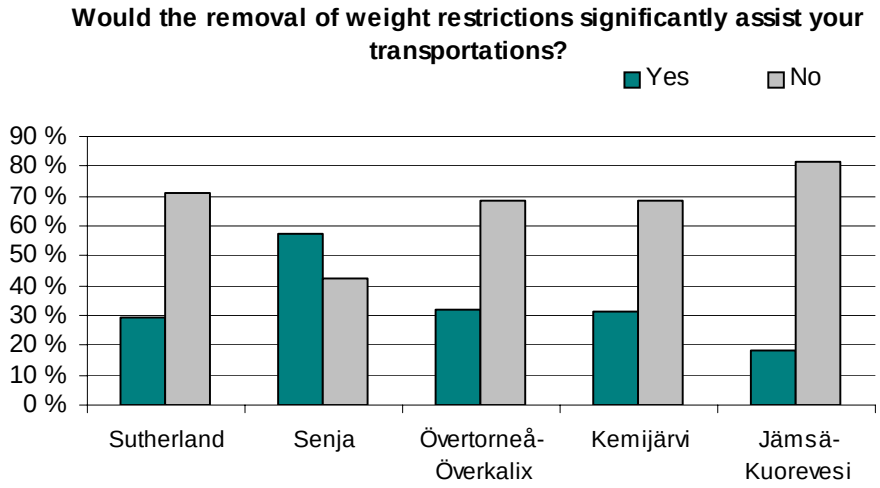


Figure 44. Responses to the question: "Would the removal of weight restrictions on the roads in the survey area significantly assist your transportation operation?"

Figure 45. Due to load restrictions, road users complained about Road 855 in Övertorneå.

10 Cooperation with Local Road Authorities

The questionnaire had several questions regarding the level of cooperation between the local road authorities and professional transporters, who use the road network.

10.1 Cooperation in transportation planning

Figure 46 below presents the results from the question: "Please rate the level of co-operation between the local road authority and users in transportation planning". The classification was: 0. no experience, 1. very poor, 2. inadequate, 3. satisfactory, 4. good and 5. excellent.

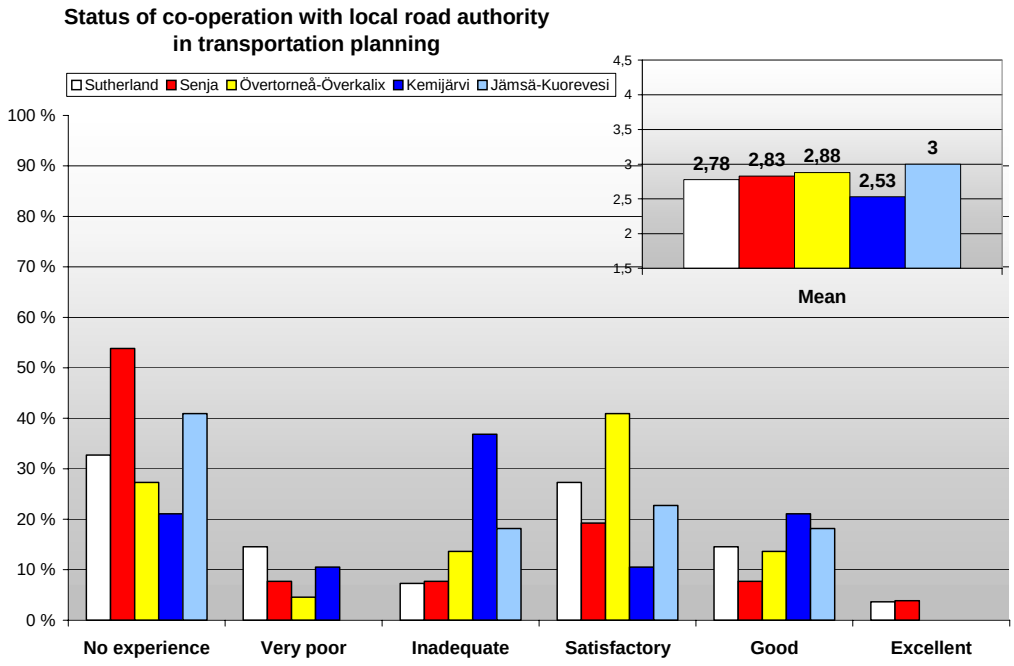


Figure 46. Summary of answers to question."Status of cooperation with local road authority in transportation planning."

Figure 47 presents the share of respondents that were satisfied (satisfied, good, excellent) with their level of cooperation with the local road authority. A notable share of respondents had no experience with cooperation of this kind; the greatest share of non-experience was 55% in Senja. On the other hand, those of the respondents who have had cooperation with local road authority were mostly satisfied with it; only Kemijärvi users, the largest answer group, claimed that the cooperation was inadequate. On the other hand the answer rate of "no experience" was lowest in Kemijärvi.

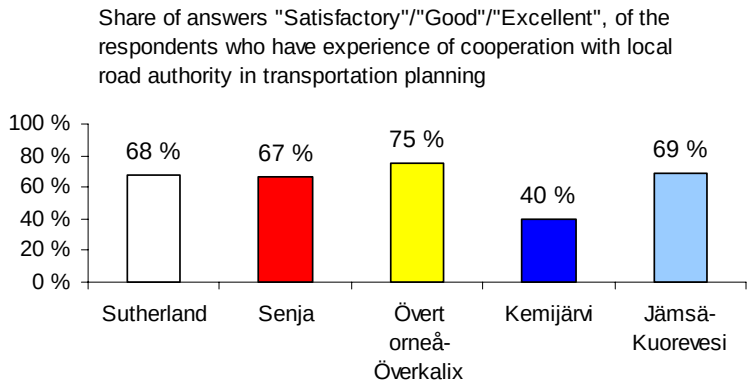


Figure 47. Share of satisfied respondents among those who have had cooperation with the local road authority in winter maintenance planning.

As a comparison to the above results, classified by test area, Figure 48 below presents the share of 'satisfied customers' and share of respondents who have no experience of said cooperation by type of activity. Here, a clear distinction can be seen in the answers from the forest industry, who seem to have had more cooperation with local authorities than other road users, and for the most part found the cooperation working satisfactory, or even better (56% of respondents).

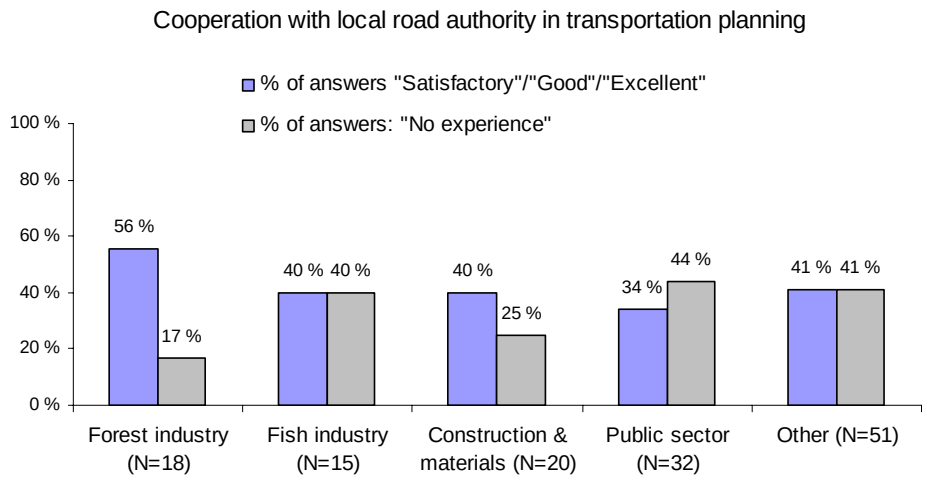


Figure 48. Cooperation with local road authority in transportation planning classified against different industries. Farming (3 answers) and Mining 2 answers) are included in the class "Other".

10.2 Cooperation in winter maintenance

Figure 49 presents a summary of the answers for the question concerning the status of cooperation with local road authority in winter maintenance. Approximately 33-50% of respondents in all other test areas, except Sutherland, claim to have had no experience of cooperation with the local road authority regarding winter maintenance. Of those respondents, who have had cooperation with the local road authority, only in Övertorneå-Överkalix did a clear majority rank the cooperation as “Satisfactory” or “Good” (figure 49). The most dissatisfied respondents came from both road regions in Finland.

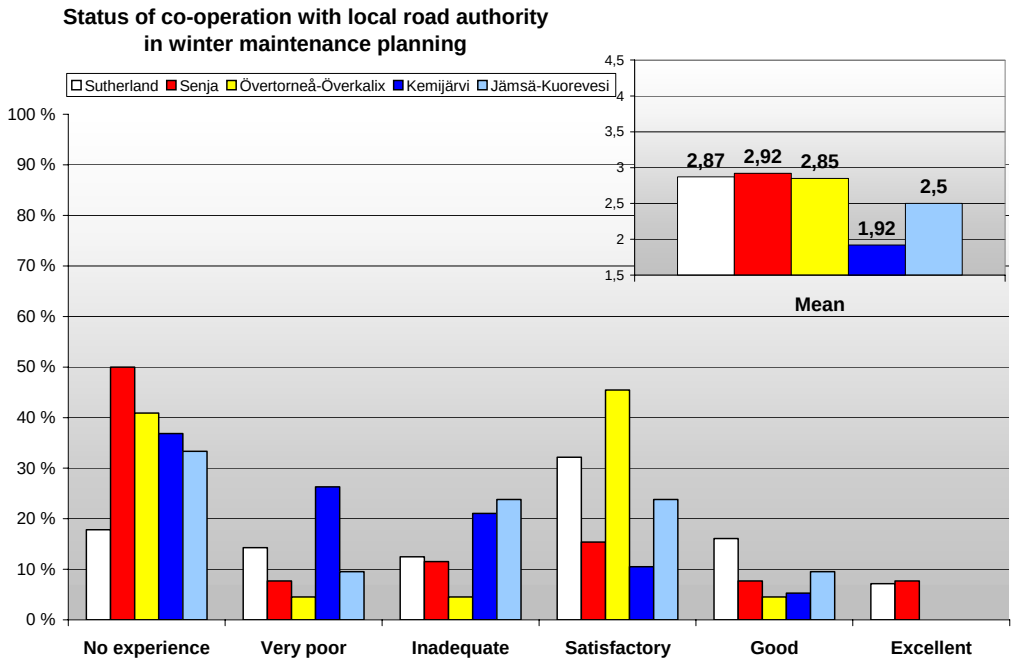


Figure 49. Summary of answers to question: "Status of cooperation with local road authority in winter maintenance planning".

A comparison between different types of activity showed, that each field of activity gave similar feedback on cooperation in winter maintenance. The respondents from the fish industry were slightly happier with the status of cooperation than respondents in other sectors (figure 50). These results may also reflect the good results from Sutherland in general, and the poorer ratings from Kemijärvi in general. (10 of the total 15 respondents in fish industry are from Sutherland; 5 of the total 18 respondents in forest industry are from Kemijärvi.)

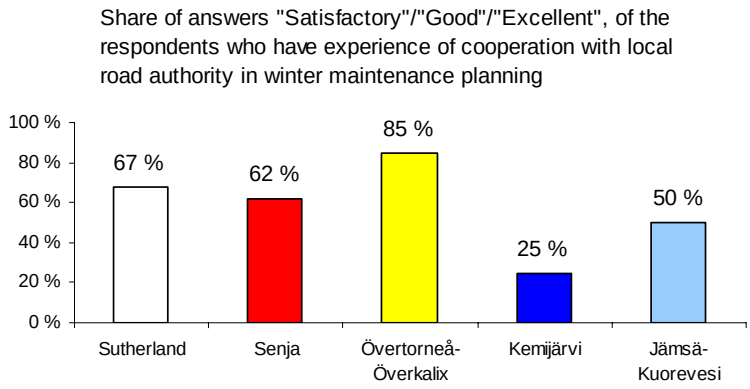


Figure 50. Share of satisfied respondents among those who have cooperation with local road authority in winter maintenance planning.

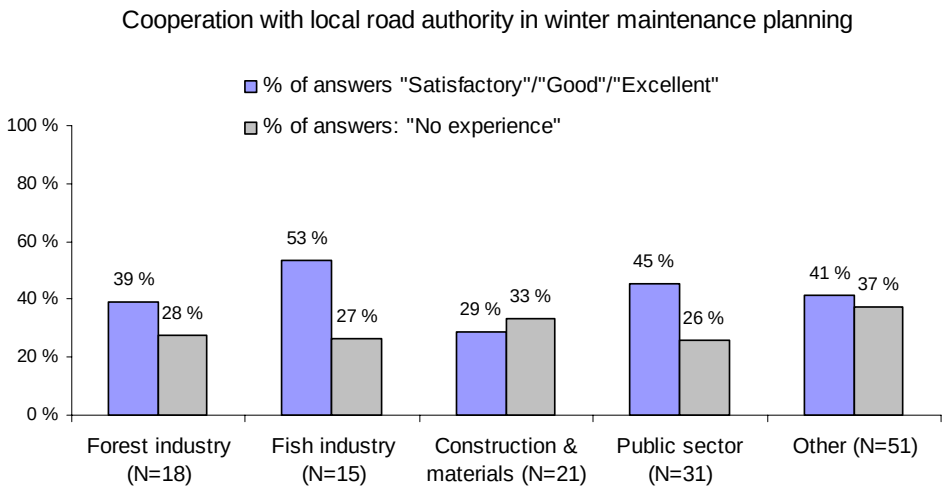


Figure 51. Cooperation with local road authority in winter maintenance classified against different industries. Farming (3 answers) and Mining 2 answers) are included in the class "Other".

10.3 Cooperation in weight restrictions planning

Figure 52 presents the results of the question: "Please rate the level of co-operation between the local road authority and road users in weight restrictions planning". The majority of respondents in all other test areas except Övertorneå-Överkalix and Kemijärvi claim to have had no experience of cooperation with the local road authority regarding weight restrictions planning. Of those respondents, who have had cooperation with the local road authority, the majority in all test areas ranked the level of cooperation as "Satisfactory" or "Good" (figure 53).

A comparison between the different types of transports showed, that forest industry transporters clearly have had the most experience with cooperation in weight restriction planning, and they were also, clearly, the most satisfied with the quality of the cooperation (figure 54).

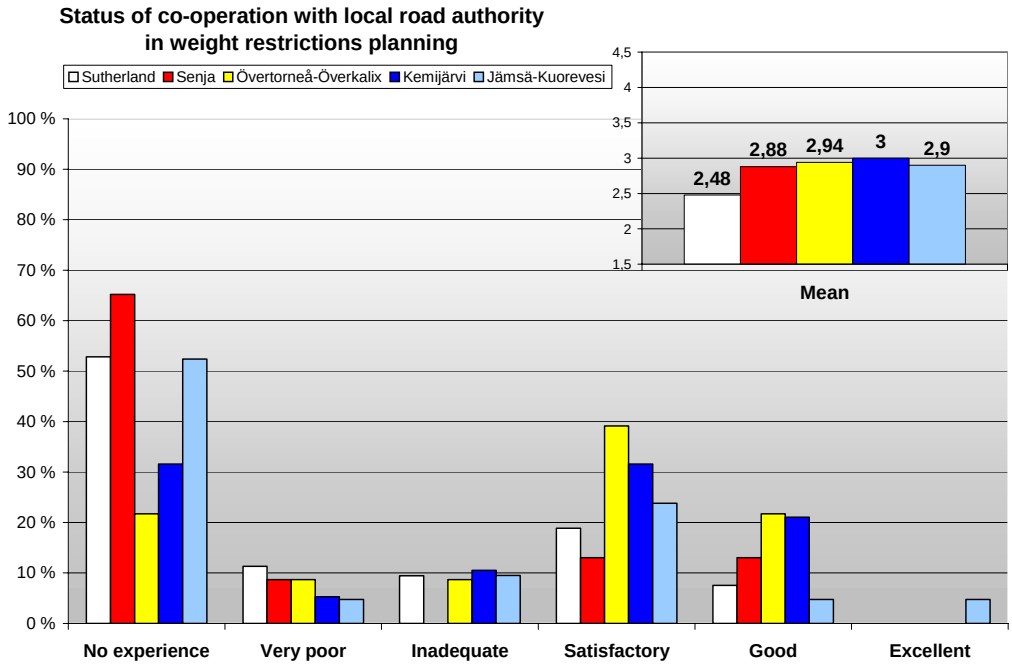


Figure 52. Summary of answers to question: "Status of cooperation with local road authority in weight restrictions planning".

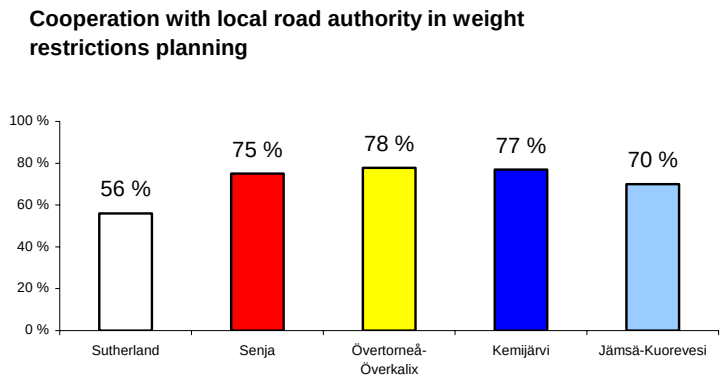


Figure 53. Share of satisfied respondents from those who had experience of co-operating with road users in weight restrictions planning.

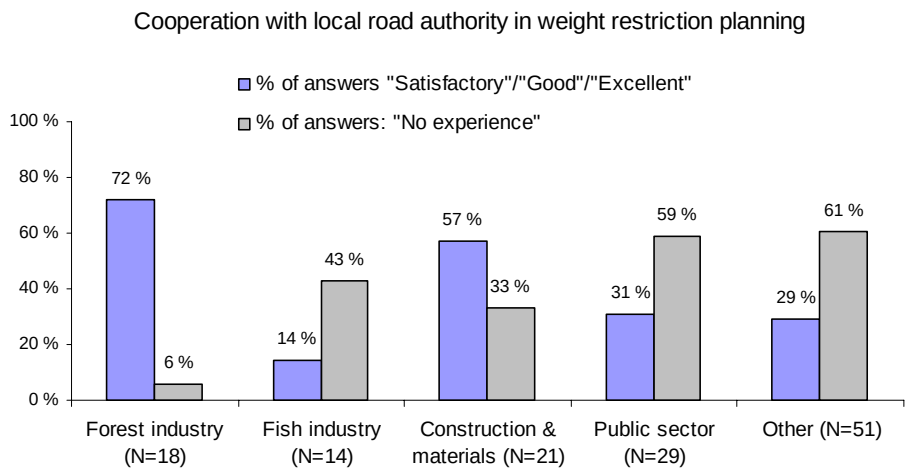


Figure 54. Cooperation with local road authority in weight restrictions classified against different industries. Farming (3 answers) and Mining 2 answers) are included in the class "Other".

10.4 Notification of road closures

Figure 55 presents the results of the question: "Please rate the quality of the public information system in cases of road closure, in winter or summer." The respondents gave a good rating for the information system regarding road closures in all test areas. In the two Finnish test areas, Kemijärvi and Jämsä-Kuorevesi, the share of respondents who have had no experience with such information system was higher than in the other areas (32% / 44%). The small number of road closures in the area can explain this. The only closures reported by respondents were due to local motor sports (rally) contests.

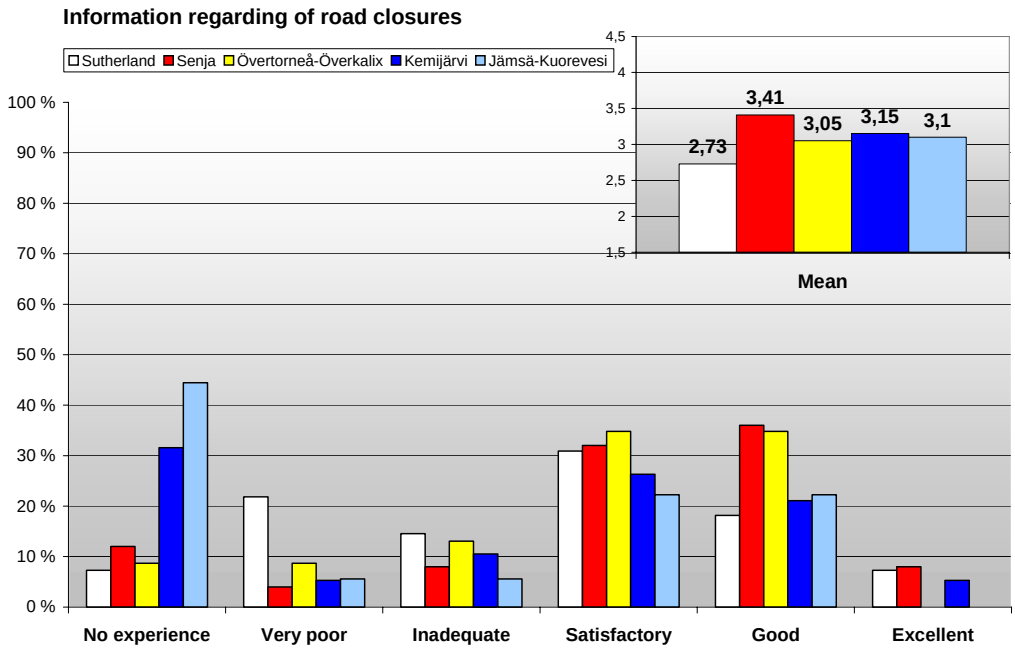


Figure 55. Summary of answers to question: "Status of cooperation with local road authority in information regarding the road closures".

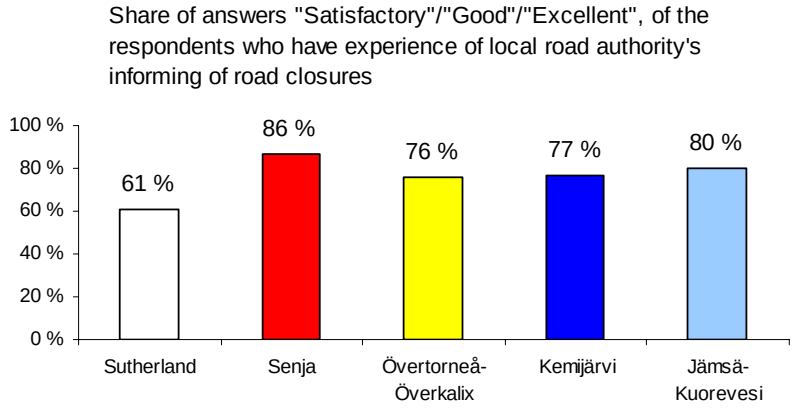


Figure 56. Share of satisfied respondents from those who had experience of co-operating with road authority with information about road closures.

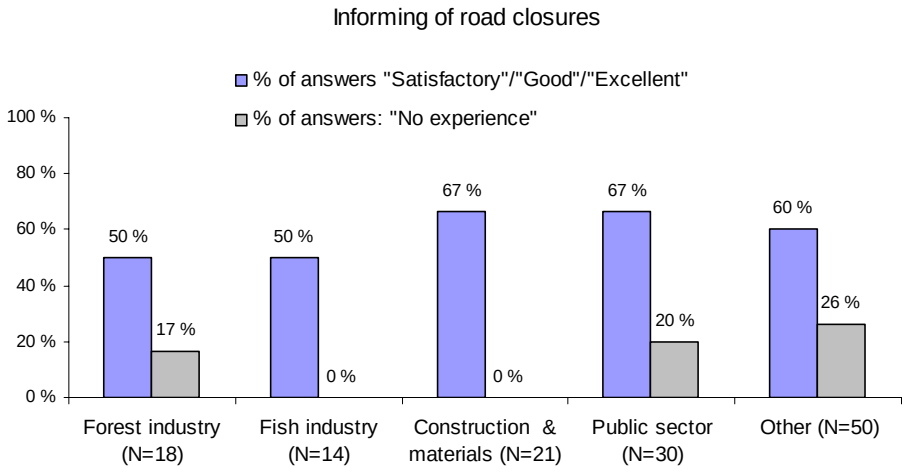


Figure 57. Cooperation with local road authority in road closures classified against different industries. Farming (3 answers) and Mining 2 answers) are included in the class "Other".

10.5 Co-operation with other road users

The questionnaire also had one question about co-operation with other road users. Figure 58 presents the results of the question: "Please rate your level of cooperation with other road users in the test area, e.g. through local hobby groups, associations, councils, etc." About 50 % of respondent in Sutherland reported not having had experience with such cooperation.

The respondents, who have had experience of cooperation with other road users, have mainly had positive experiences of it. Especially good cooperation between road users seems to have been found in the Swedish Övertorneå-Överkalix area (figure 59). There were no big differences in answers between the different types of transports from the whole respondent group, the most satisfied industry sector was the forest industry and fish industry and public sector was the least satisfied (figure 60).

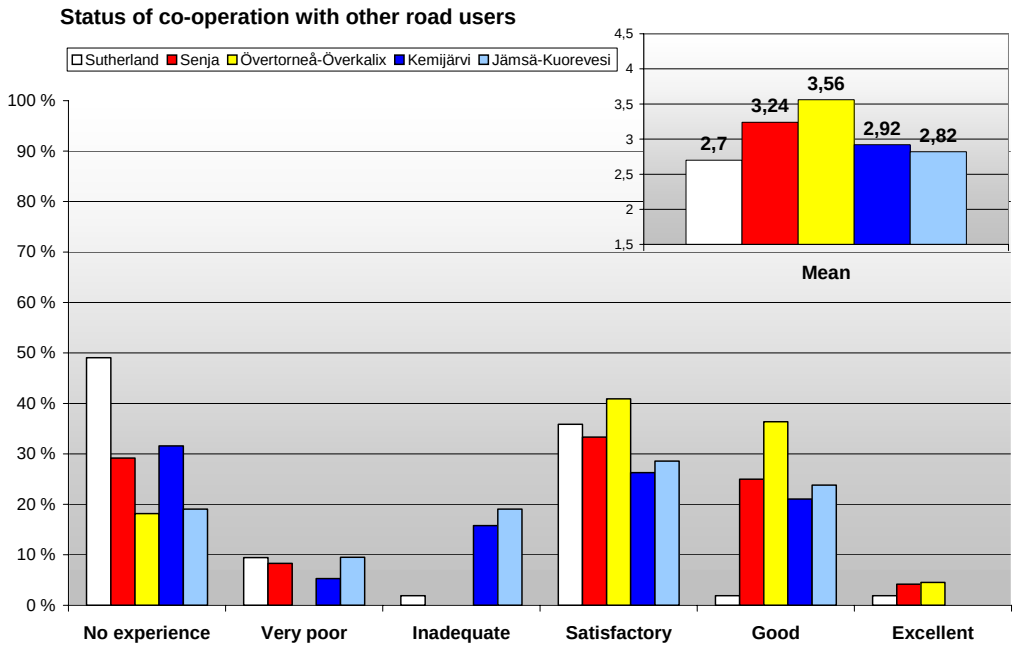


Figure 58. Summary of answers to question: "Status of cooperation with other road users".

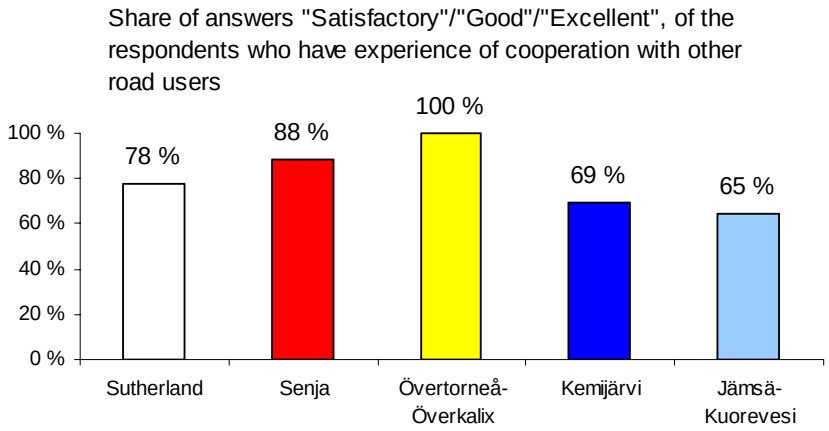


Figure 59. Share of satisfied respondents from those who had experience of co-operating with road authority with information about road closures.

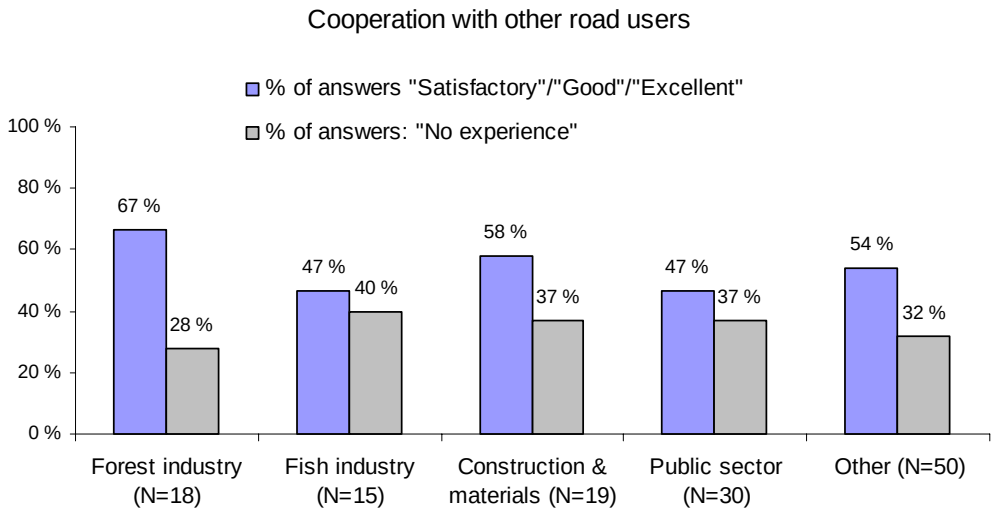


Figure 60. Cooperation with other road users classified against different industries. Farming (3 answers) and Mining (2 answers) are included in the class "Other".

11 Summary and Conclusions

The road user questionnaire and the complementing interviews of road engineers, aimed at serving the objective of Phase I in the Roadex II project: identifying the problems of low traffic roads in the Roadex partner regions, utilise both a road user's and a road maintainer's perspective in problem identification. The results of this survey did provide a set of answers, which either confirmed or completed the views of the regional road authority regarding service level and specific road network problems in each area.

The professional road users in each test area seemed to have a good understanding of the relative level of the different types of road condition problems in their area. A co-author of this report, Timo Saarenketo, visited all test areas and was able to compare summer road condition problems between them. The road users' average ratings, regarding road condition in summer and some specified problems described in chapter 5.3, were congruent with the author's ranking.

Despite small regional variations, due to history of the road network and topographical differences between the areas, road users seemed to experience road condition problems similarly throughout the Northern Periphery. There were also certain problems, for instance culverts in valley bottoms with frost heave problems (figure 61), which were causing major difficulties, especially for heavy vehicles, which at the same time could be repaired quite easily and cheaply.

The information gathered from road user profiles revealed differences between the transportation needs of the different industry sectors, the differences however could be more related to region than industry. An important explanatory factor being the different maximum loads allowed in each area; the average truckloads being much higher in the Nordic timber areas than in Sutherland and Senja. On average a surprisingly strong majority of the professional road users were happy with the current load restriction practises used to protect roads, however, a significant number of the haulage carriers in Sutherland and Senja indicated a clear desire to increase the maximum loads allowed or to change the current weight restriction policy.

This survey also provided valuable information to the road authorities of each test area concerning the location of the problem roads and where it might be worth upgrading the maintenance standards in order to provide safer and more comfortable driving conditions to those professional road users who used the road network every day.

The problem road sections, marked on the attached maps, were mainly those expected by the local road authorities. However, there were certain roads in some areas that were marked by a great number of respondents with written comments indicating that these roads caused continual stress for drivers especially in wintertime. Two good examples of such a road are road 98, between Övertorneå and Överkalix (figure 61), and road 56, between Mänttä and Jämsä, but similar roads

could also be identified in the other areas. The main source of problems on these two roads was, apparently, poor winter maintenance of relatively narrow roads that, due to delayed snow removal, allowed the snow to be compacted which led to the development of ruts. These ruts forced drivers to reduce their speed, which in turn caused delays in delivery schedules. If they maintained the speed required to meet their schedule, the heavy vehicle drivers felt that they would be causing major risks with regard to traffic safety. Regional road authorities, however, did not find any major problems with their winter maintenance categories. In Senja, a special feature causing stress for road users was the risk of avalanches and landslides.

Figure 61. Road 98 between Övertorneå and Överkalix presents a good example of a road that is causing stress for heavy vehicle drivers. In this case a steep hill and an uneven frost heave "bump" in the bottom of the valley forces trucks to break - and if the road has ruts due to compacted snow or poor friction, drivers have problems controlling the vehicle.

The road user interviews clearly showed the importance of cooperation between regional authorities and road users on different transportation issues. In those areas, where road users had sufficient cooperation with the road authority, their opinions regarding the status of problems that they were cooperating with the local authority to solve were clearly more positive. Of the different industry sectors, the forest sector appears to have had the most cooperation with road authorities, and also gave better ratings to the related road condition issues. The fish industry as well as the public transport sector were less satisfied with the level of cooperation and also gave worse ratings. From the other industries, especially some transporters in the farming industry complained in their comments that they felt road authorities were not listening to their problems. The average ratings given for the cooperation between road users and road authorities were in general the highest with regard to notification of road closures, and the lowest for cooperation in winter maintenance planning.

One way to expose problem areas in each region was the identification of "relative weaknesses", through a comparison between the test areas. Table 5 presents a summary of the different ratings in the questionnaire by test area: The first column in the table presents the average value of all answers, the symbol given for each test area presents the deviation from this average value.

Table 5. A summary of the questionnaire's results of roads users opinions regarding road network condition in summer and winter, traffic safety, and cooperation with road authorities and other road users. Explanation of the symbols: Explanation of the symbols: 1) ≡ area rating is in range of +/- 0.2 of the average, 2) ▲ area rating is > 0.2 better than average, 3) ▼ area rating is > 0.2 worse than average.

Question	average/ classes	Sutherland	Senja	Övertorneå-Överkalix	Kemijärvi	Jämsä – Kuorevesi
Road condition in summer						
general condition	2.6 / 1-5	≡	▼	≡	≡	▲
trend	2.3 / 1-5	≡	▼	▲	≡	≡
Specific problems						
rutting	3.2 / 0-5	≡	▼	▼	▲	≡
uneven. / roughness	3.4 / 0-5	≡	▼	▼	▲	▲
weak road shoulders	3.2 / 0-5	▼	≡	▲	≡	≡
road geometry	3.3 / 0-5	≡	▼	▲	▲	▼
bearing capacity	3.1 / 0-5	▼	≡	≡	▲	≡
Road Condition in winter						
general condition	2.6 / 1-5	≡	▲	≡	≡	≡
trend	2.3 / 1-5	≡	≡	▲	▼	≡
Traffic safety						
general	2.8 / 0-5	≡	▼	≡	▲	≡
Co-operation with road authorities						
transport. planning	2.8 / 1-5	≡	≡	≡	▼	≡
winter maint.plan.	2.6 / 1-5	▲	▲	▲	▼	≡
weight restr.plan.	2.8 / 1-5	▼	≡	≡	≡	≡
road closures info	3.1 / 1-5	▼	▲	≡	≡	≡
Co-operation with other road users						
general	3.1 / 1-5	▼	≡	▲	≡	≡

The respondent's views on the winter condition of the roads were often more positive than expected by the local road authority. On the other hand, the traffic safety problems were clearly more related to winter conditions than to those in summer. Professional road users who used the road at night time during the winter were critical of winter maintenance levels in all countries. Opinions regarding the summer condition of the roads, in turn, were sometimes more critical than expected by the local road engineers. In general, when the average values of the answers presented

in table 5 were compared it was quite surprising that the ratings for summer and winter condition and their trend were exactly the same (2.6 and 2.3).

With regard to the individual road condition parameters, professional road users reported roughness and unevenness of the road surface as the biggest problems, followed by road geometry, weak road shoulders and rutting. In the following paragraphs, the survey results for each area are summarised.

Road users in **Sutherland** gave average ratings regarding the overall road condition in summer and winter, and to traffic safety as well. Concerning the specific problems, weak road shoulders and bearing capacity were rated to be worse on average than in the other test areas. The road users in Sutherland gave a better than average ranking to cooperation with the local road authority in winter maintenance planning, but on the other hand were dissatisfied with their cooperation in weight restriction planning and notification of road closures. Ratings for cooperation with other road users in Sutherland were below average.

In **Senja**, the professional road users gave the most negative feedback concerning summer road condition and its trend. Regarding specific problems, the respondents also gave poor ratings for rutting, roughness and unevenness and road geometry. Road users also gave a lower rating for the general traffic safety in the area compared to the other areas. On the other hand, the road condition in winter was given the best rating in Senja and the respondents were more satisfied, than average, with the level of cooperation with the local road authority in winter maintenance planning and notification of road closures. The questionnaire results suggest that, in Senja, the road authority has successfully focused on road condition management and road user service in winter, but at the same time road condition management during summer has received less attention.

Road users in the **Övertorneå-Överkalix** area saw the trend of summer and winter condition of the road network more positively than respondents in other test areas. However, rutting and roughness and unevenness were causing more problems for the respondents in this area than average. Road geometry and weak road shoulders were causing fewer problems for professional road users in Övertorneå-Överkalix than average. Respondents were also more satisfied with their level of cooperation with road authorities in winter maintenance planning as well as cooperation with other road users.

When the two test areas from Finland, Kemijärvi and Jämsä-Kuorevesi, were compared there were no major differences between them although road users in Kemijärvi were somewhat more critical with regard to winter maintenance issues than in Kuorevesi. In comparison with the other countries, summer condition ratings were generally higher in Finland. However, if the ratings from the Finnish test areas regarding trend in winter condition, co-operation with road authorities in winter maintenance planning and road users' comments concerning traffic safety problems during the winter, were evaluated in general terms then road users in Finland were more critical than the road users from the other countries.

In **Kemijärvi,** professional road users were, in general, more satisfied than other road users with the summer condition and traffic safety of the road network. With respect to the more specific problems, the respondents in Kemijärvi did not find rutting, roughness and unevenness or poor bearing capacity and poor road geometry to be causing them as many problems as the respondents in other areas. The respondents were more critical in winter maintenance issues, especially regarding the trend in winter maintenance. The professional road users in Kemijärvi were also more critical than average of their experiences in cooperating with the road authority in general transportation planning and in winter maintenance planning.

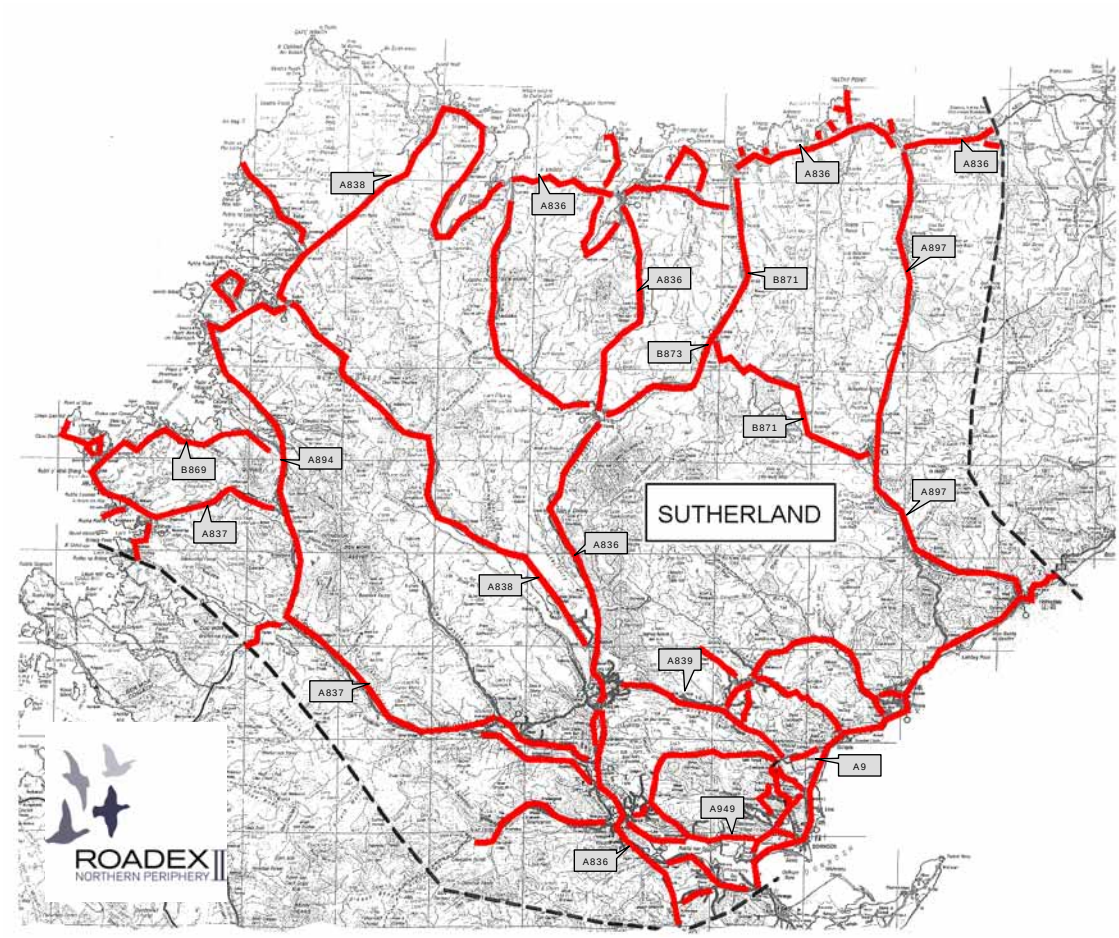
The road users in **Jämsä-Kuorevesi** gave average ratings regarding almost all of the issues in the questionnaire. They were, in general, more satisfied with the overall condition of the road network in summer and roughness and unevenness caused them less problems than average. Only poor road geometry was reported as a severe problem more often in Jämsä-Kuorevesi than in all the test areas.

The approach of using test areas in the problem identification phase of the Roadex II study proved to be an effective survey method, providing an opportunity to investigate, in detail, road user's opinions, the environmental and socio-economic settings and the prevailing conditions and problems of the local road network in each area.

The average answer rate of the road user questionnaire was 45 %, and all industry sectors of the region were represented among the respondents. Thus, the results of the questionnaire can also be assumed to represent the opinions of the professional road users in general. However, much work was required to obtain enough answers from the transporters. In the future, the best way to conduct a similar survey could be to send the questions in advance and then solicit answers to the questions through telephone interviews.

The results of this survey will be used in the planning of Phase 3 of the Roadex II Project, which aims at bringing the road authorities together with the forest and transportation industries to work as a team with the task of creating focused, innovative, fit-for-purpose road and transportation solutions for low-traffic roads. The road user questionnaire results were also reviewed by the regional road authority in each test area, this has already led to initiatives for improving the service to professional road users in the areas where they made critical comments. The information acquired in this survey will also serve in the Roadex II project's task of providing information to the decision makers regarding the options, costs and benefits of keeping the condition of the low volume road network at an acceptable level.

Appendix 1 – Maps – Routes Used by Your Company



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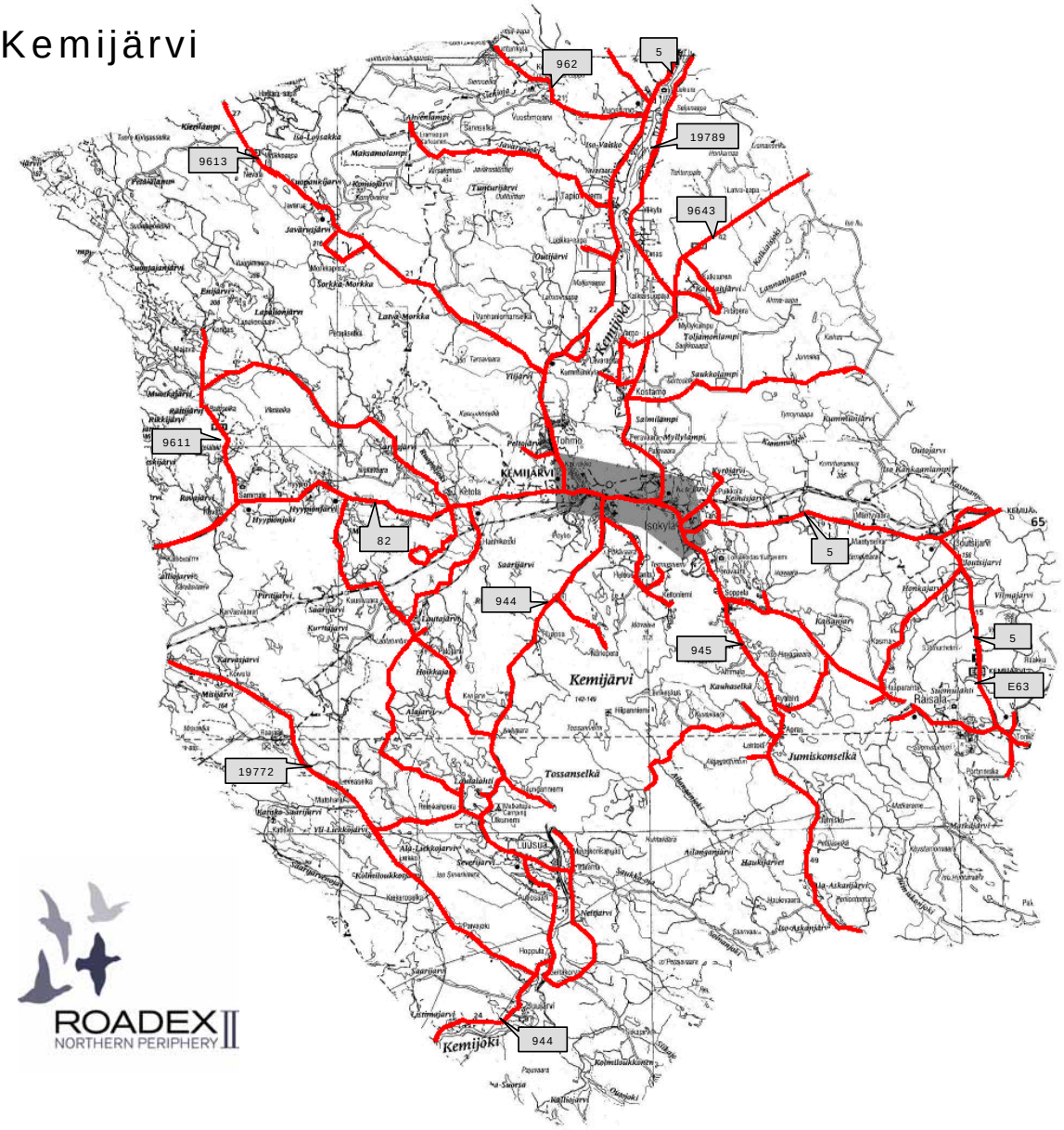
LENVIK
TRANØY
STONGLANDET
SELFJORDEN
SOLBERGFJORDEN
TRANGVIFJORDEN
ROADEX II
NORTHERN PERIPHERY

Övertorneå - Överkalix

Kemijärvi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Jumiskonselkä
Raasiaa
Kemijoki
Kemijärvi
Tornio
Kostamo
Sokylä
Ketola
Tuntsajärvi
Lana-Morkka
Sarkka-Morkka
Kiesilämpi
Ala-Lavasakka
Makamolampi
Ahvenlampi
Ala-Vaisko
Tapiolampi
Ouijärvi
Kuivajärvi
Mykkänpu
Tuljamoolampi
Saukkolampi
Salmilampi
Myllylampi
Kumpuvaara
Kumpuvaara
Kuivajärvi
Kauhaselkä
Hyypänjoki
Hyypänjärvi
Rovejärvi
Rikkajärvi
Maukajärvi
Emijärvi
Suontajärvi
Lapalankajärvi
Saarijärvi
Kurtajärvi
Kärvajärvi
Maijärvi
Ala-Liekkajärvi
Yli-Liekkajärvi
Sevärjärvi
Lammejärvi
Ala-Askanjärvi
Iso-Askanjärvi
Hauksjärvet
Aitaanjärvi
Jänkä
Ouijärvi
Kuivajärvi
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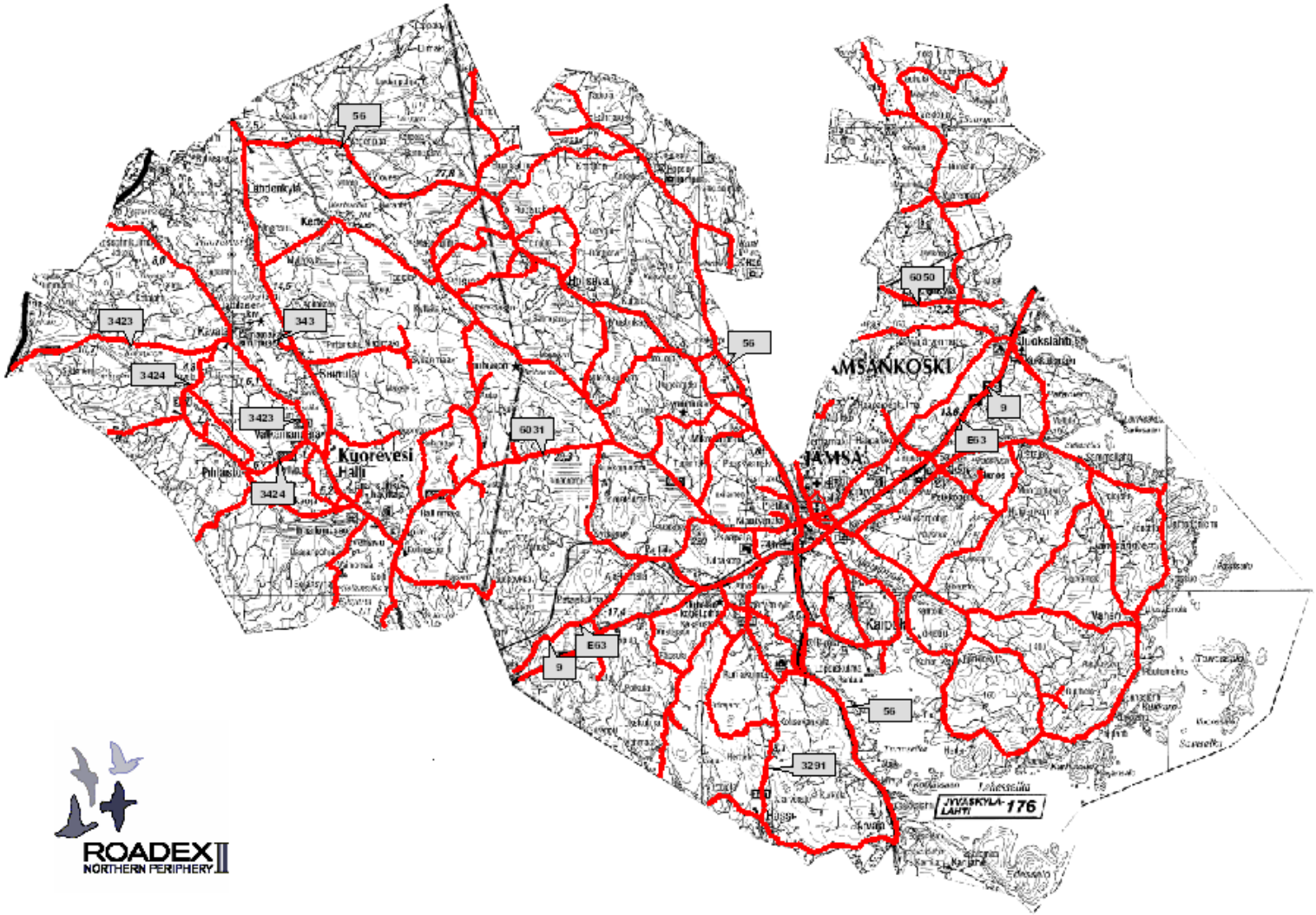
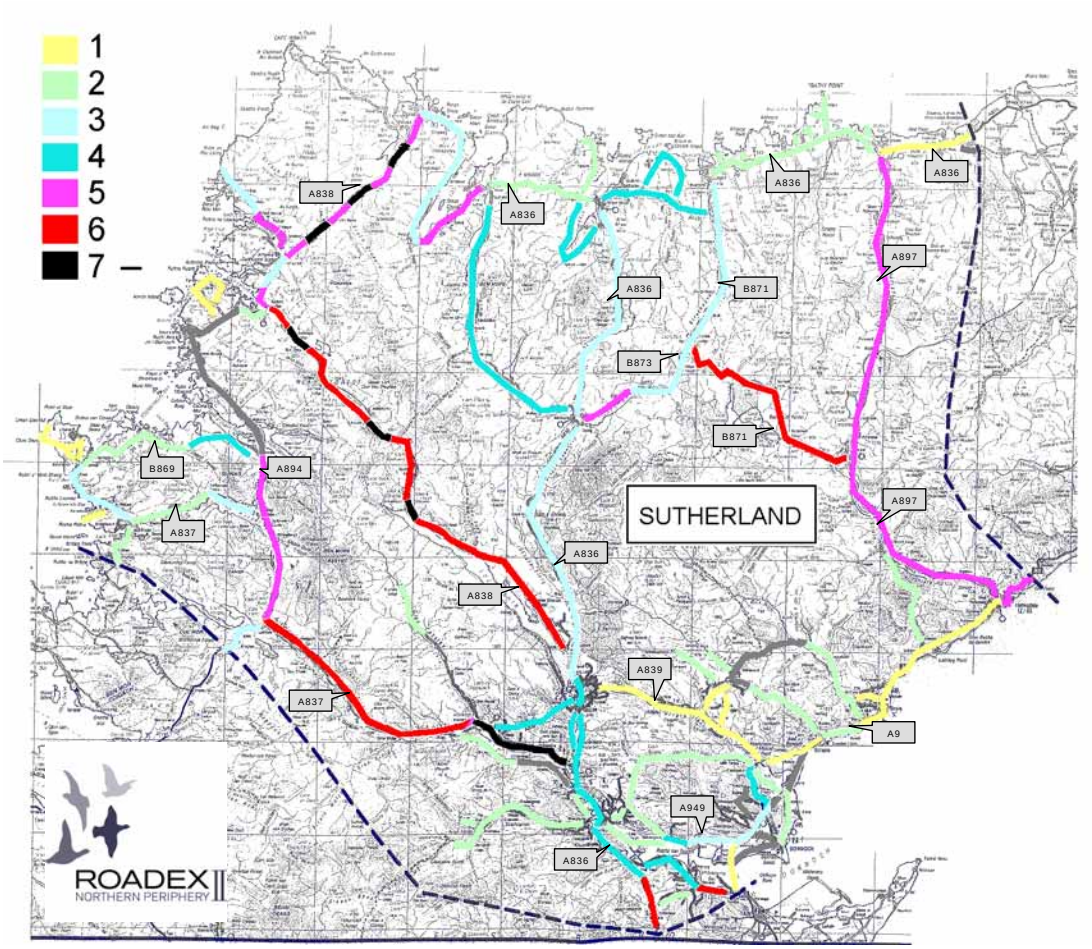
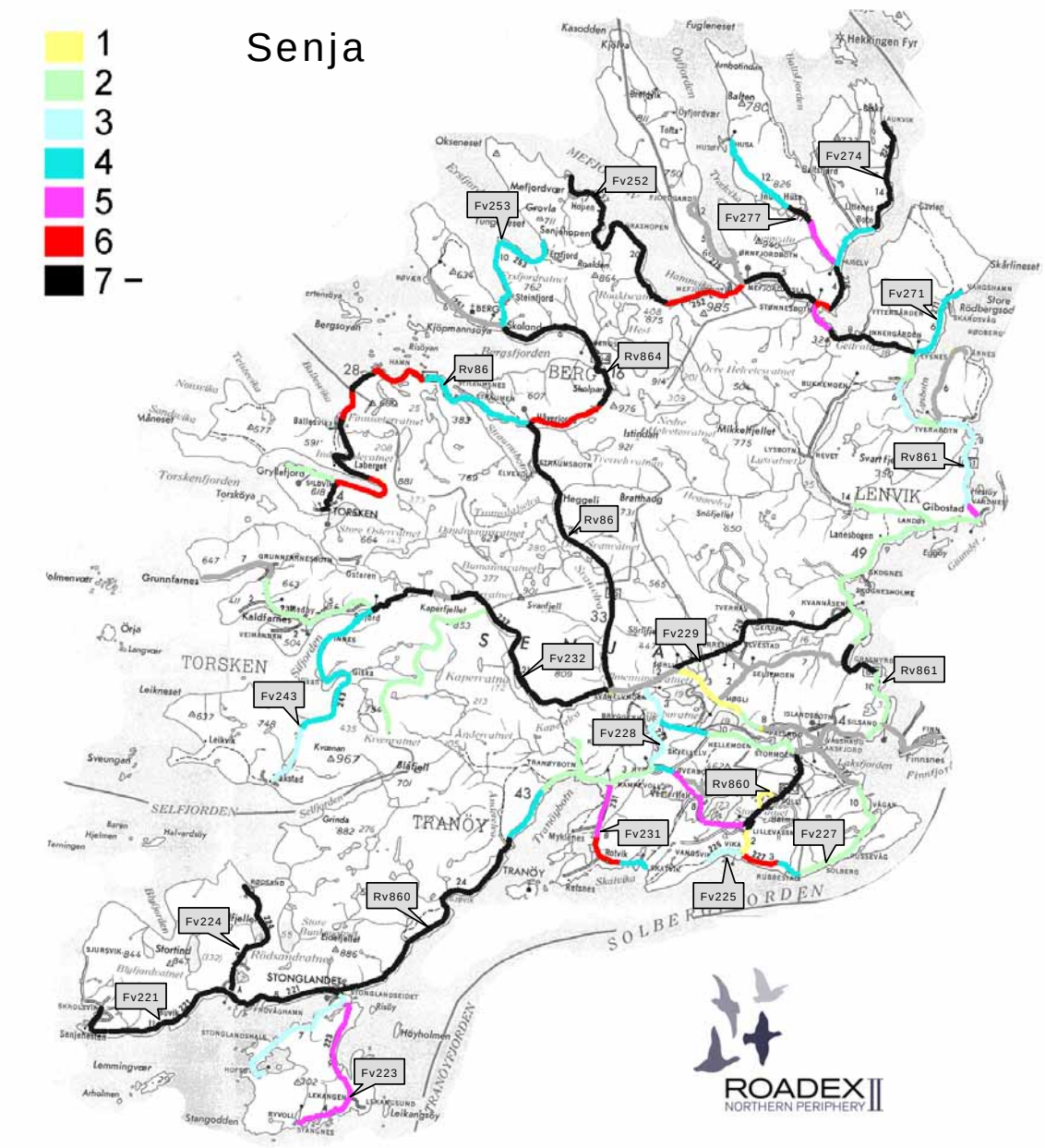
Kemijärvi

Jämsä - Kuorevesi



Appendix 2 – Maps – Location of Problem Roads in Summer

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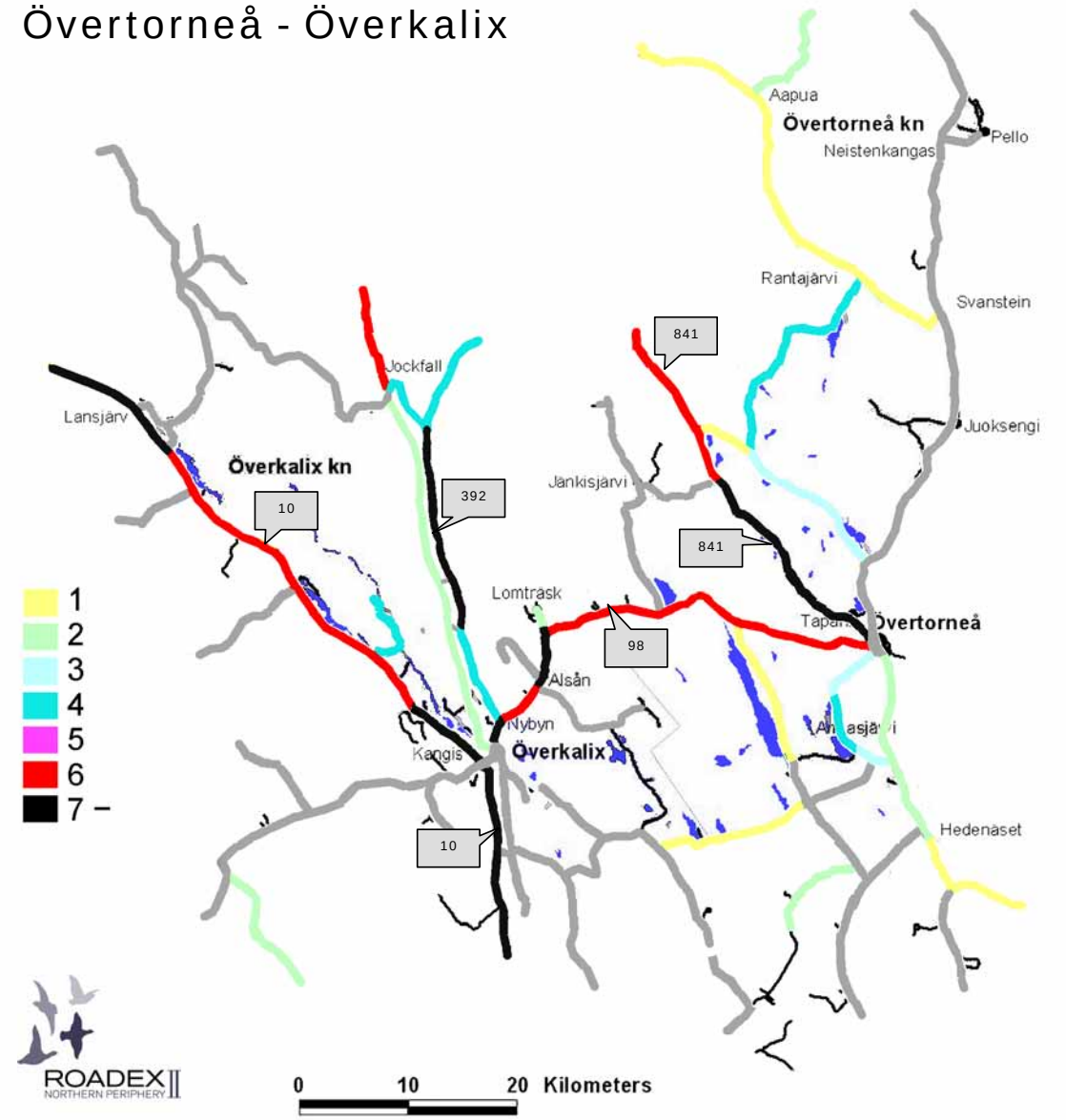
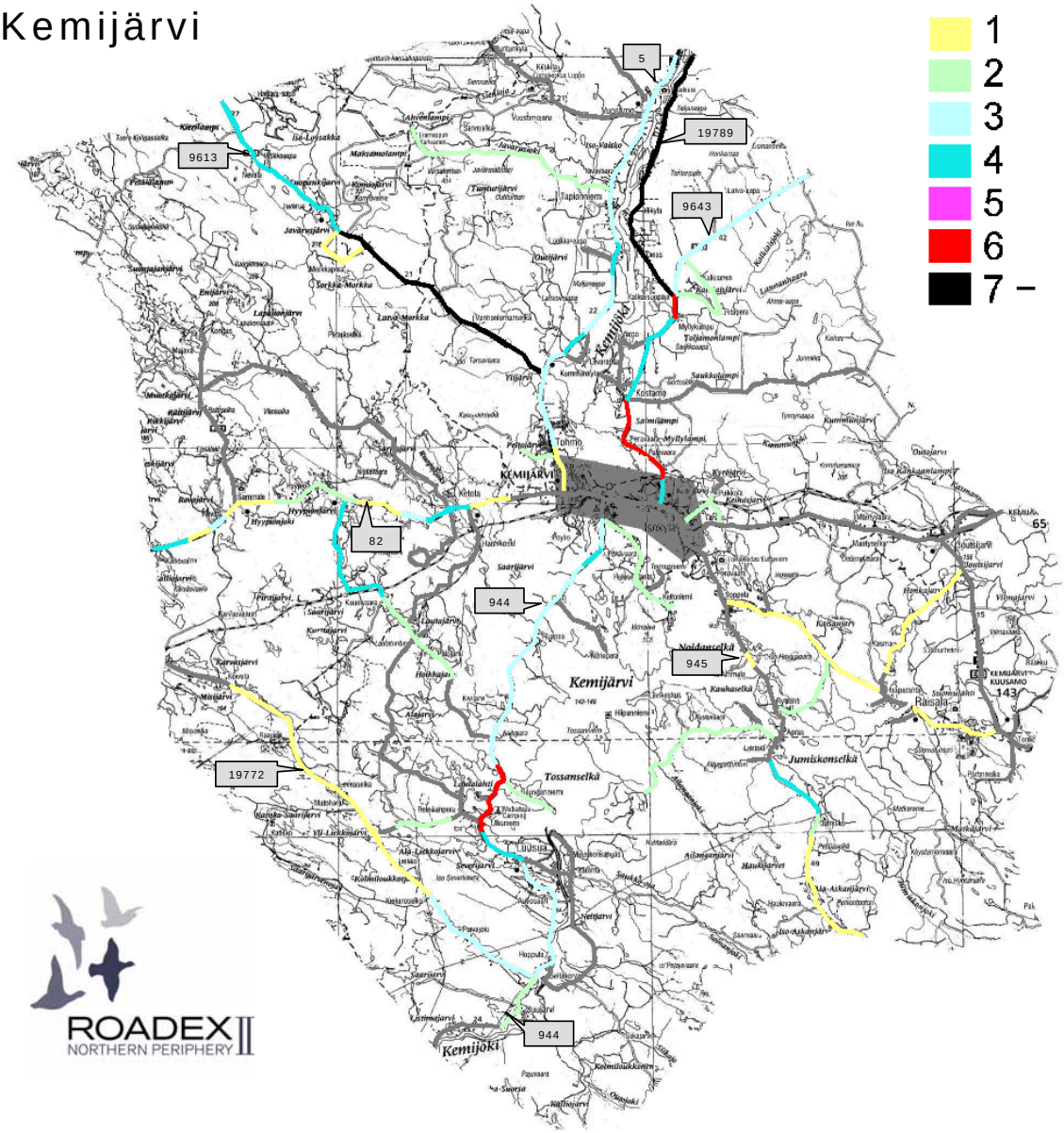
STONGLANDET
ROADEX II
NORTHERN PERIPHERY

Övertorneå - Överkalix



Kemijärvi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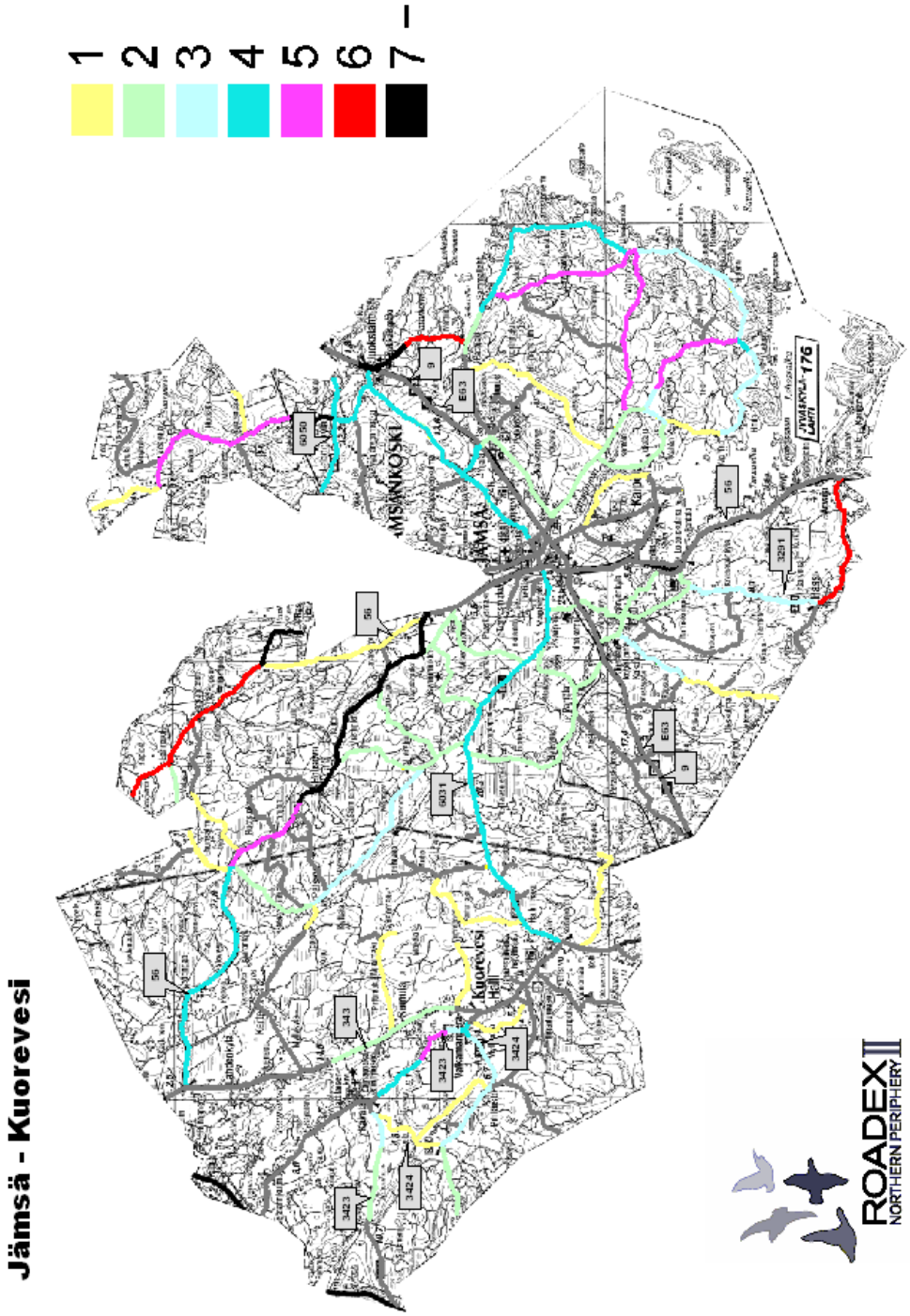
ROADEX II
NORTHERN PERIPHERY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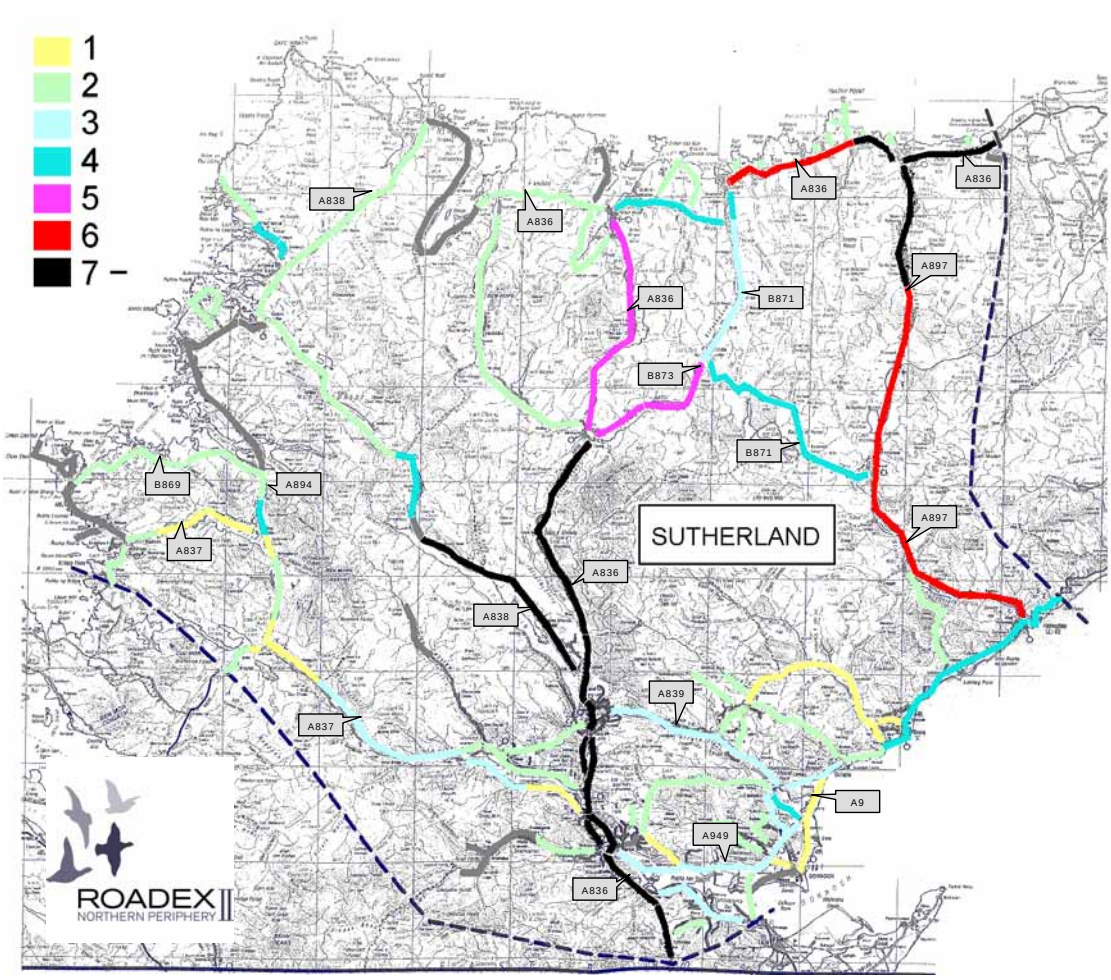
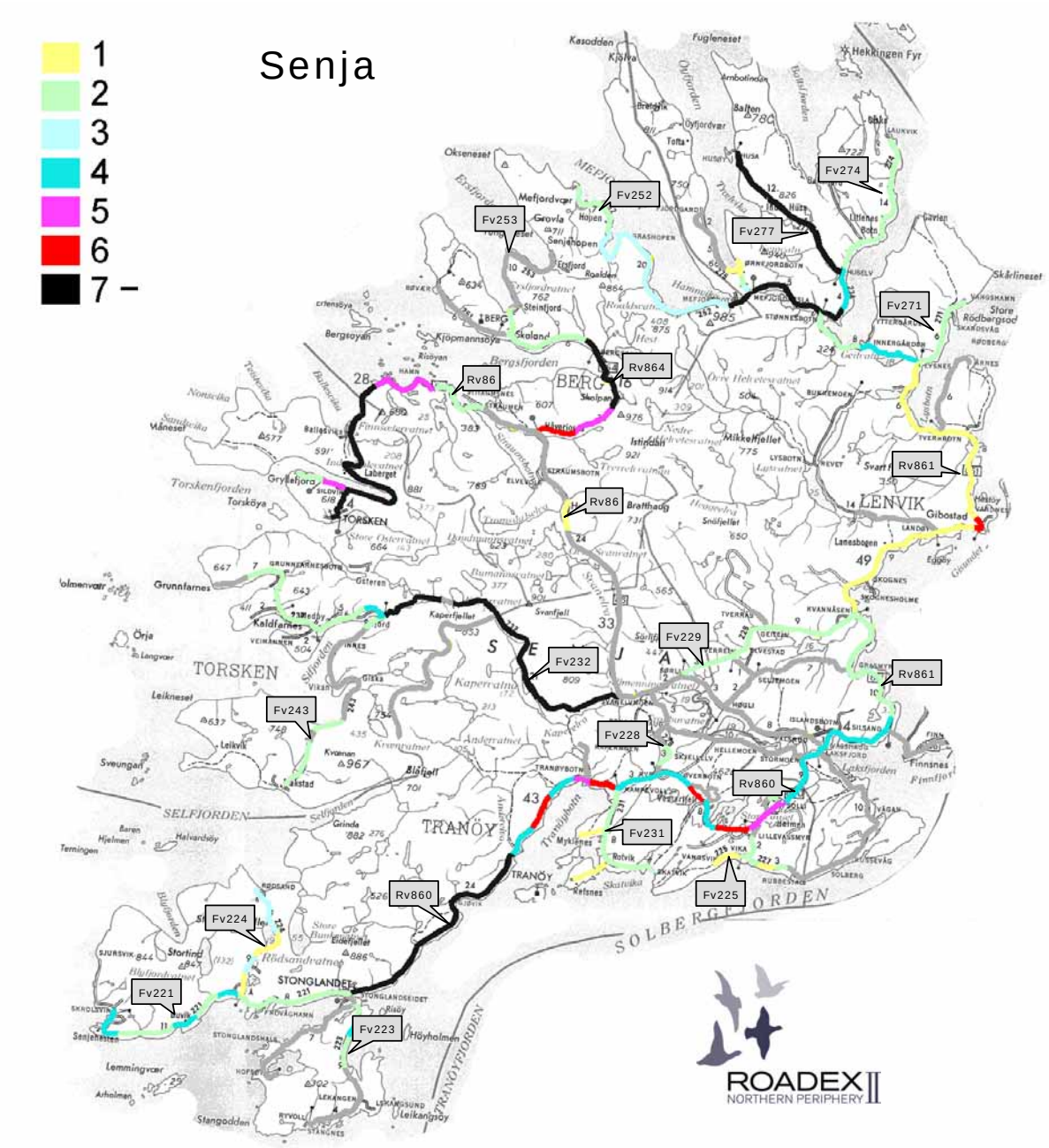
ROADEX II
NORTHERN PERIPHERY

Appendix 3 – Maps – Location of Problem Roads in Winter

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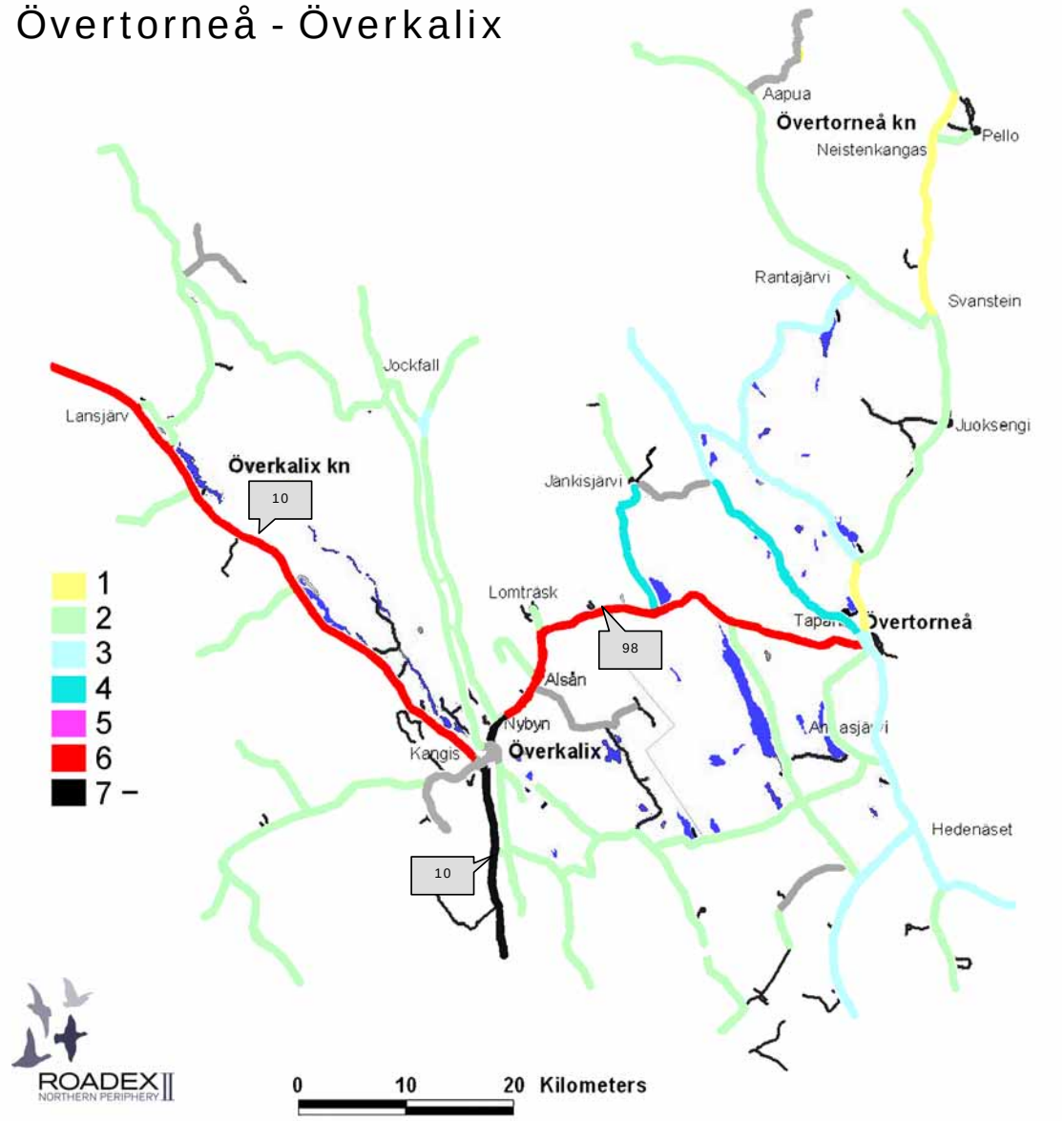
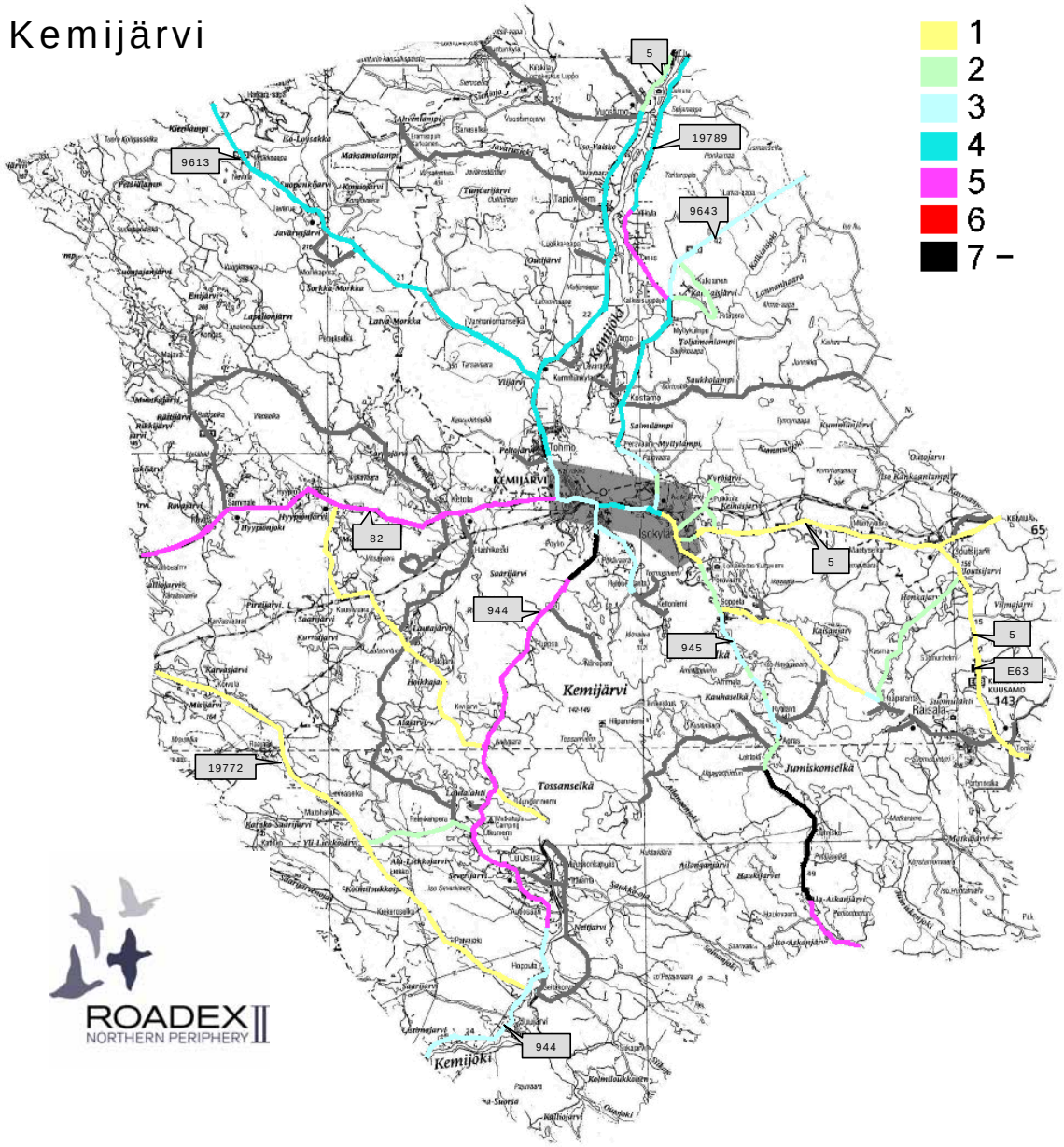
ROADEX II
NORTHERN PERIPHERY

Övertorneå - Överkalix



Kemijärvi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Juniskonselkä
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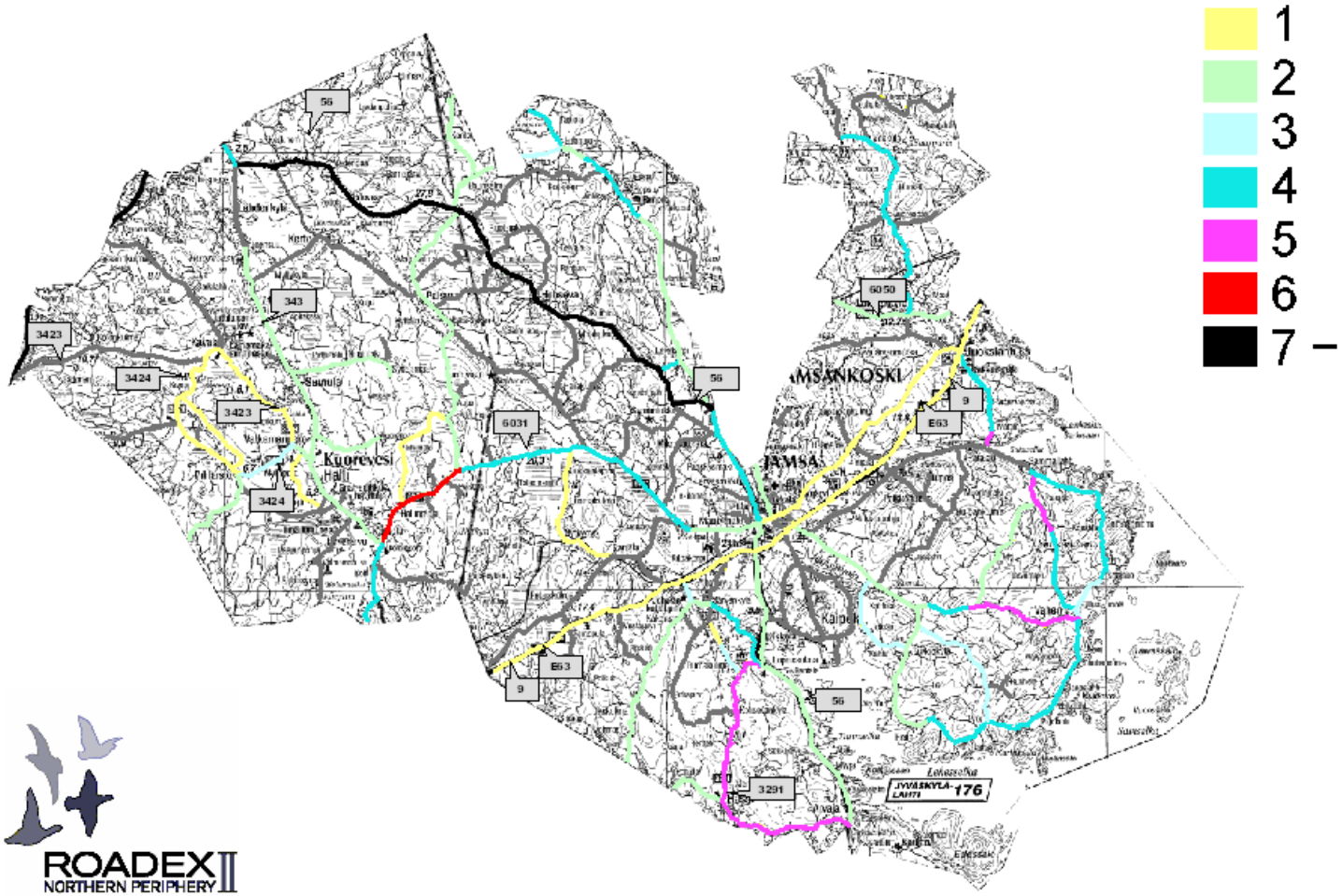
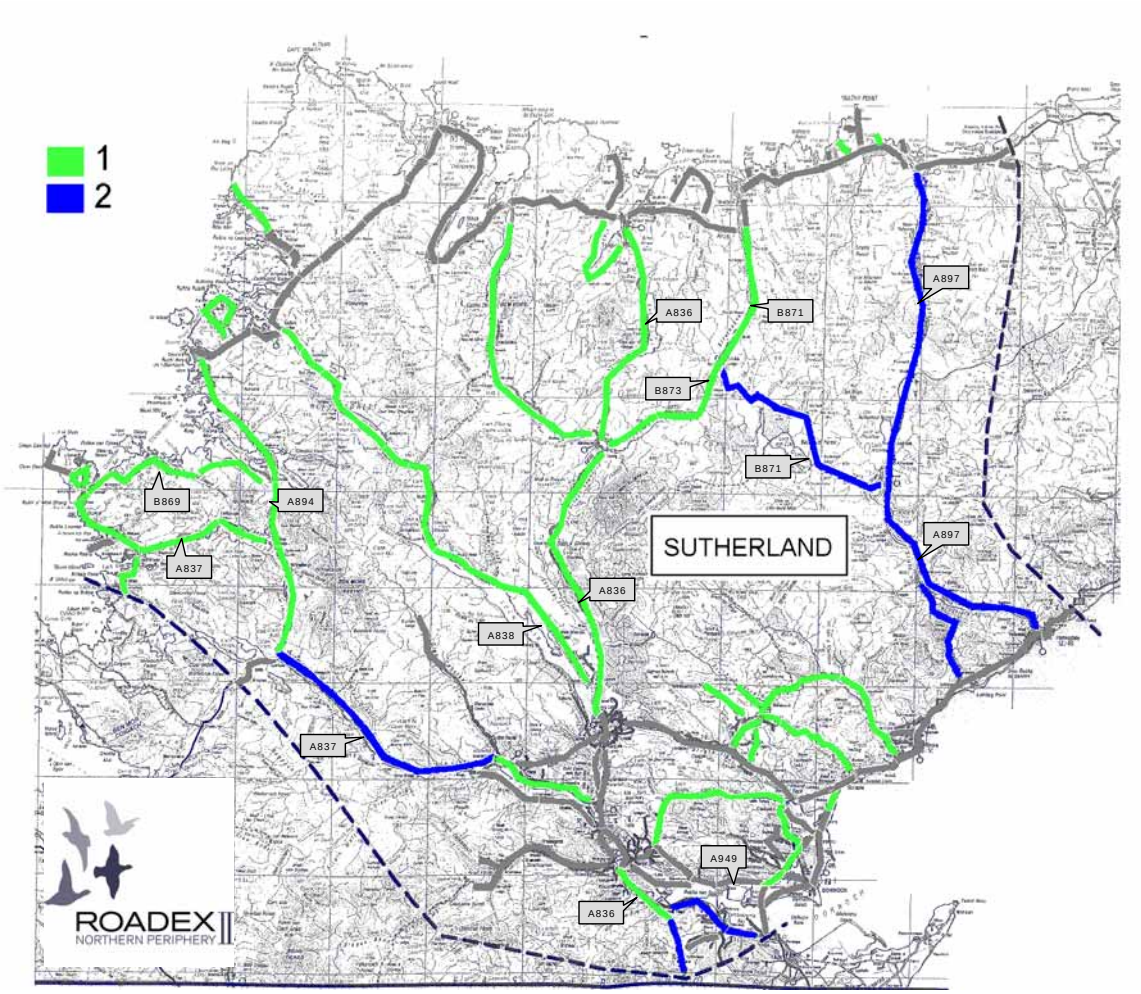
ROADEX II
NORTHERN PERIPHERY

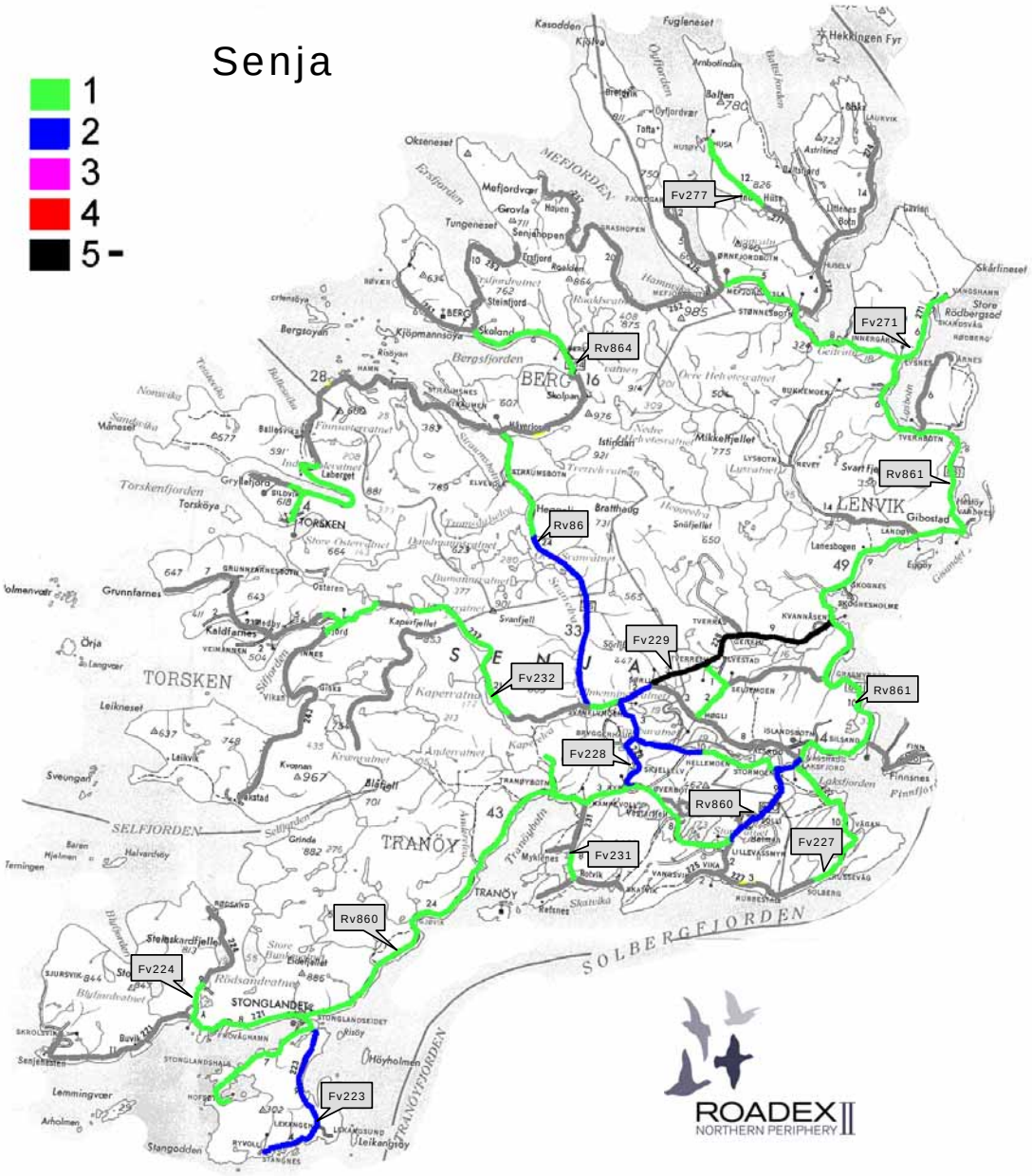
Jämsä - Kuorevesi



ROADEX II
NORTHERN PERIPHERY

Appendix 4 – Maps – Roads You Choose to Avoid

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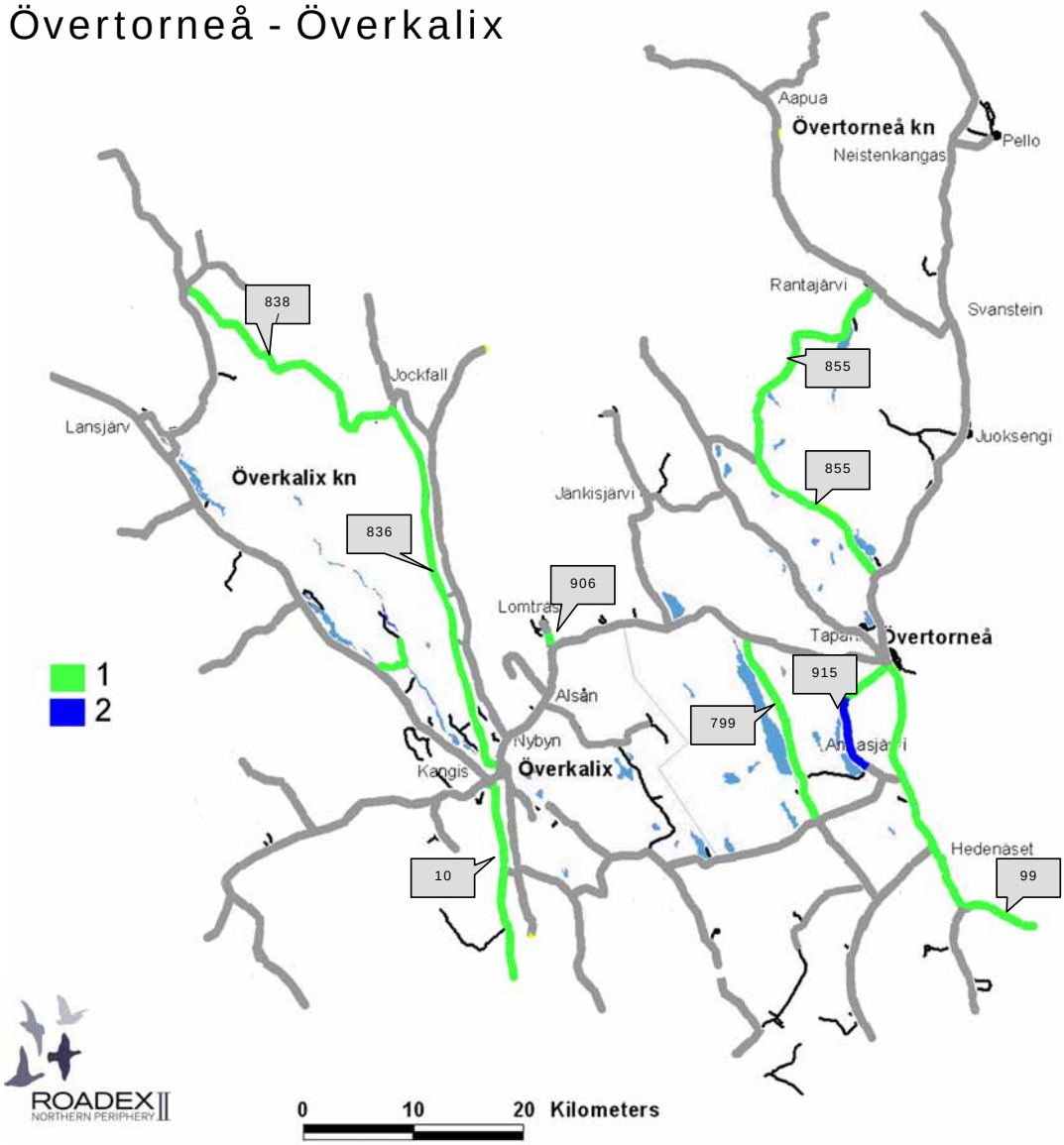
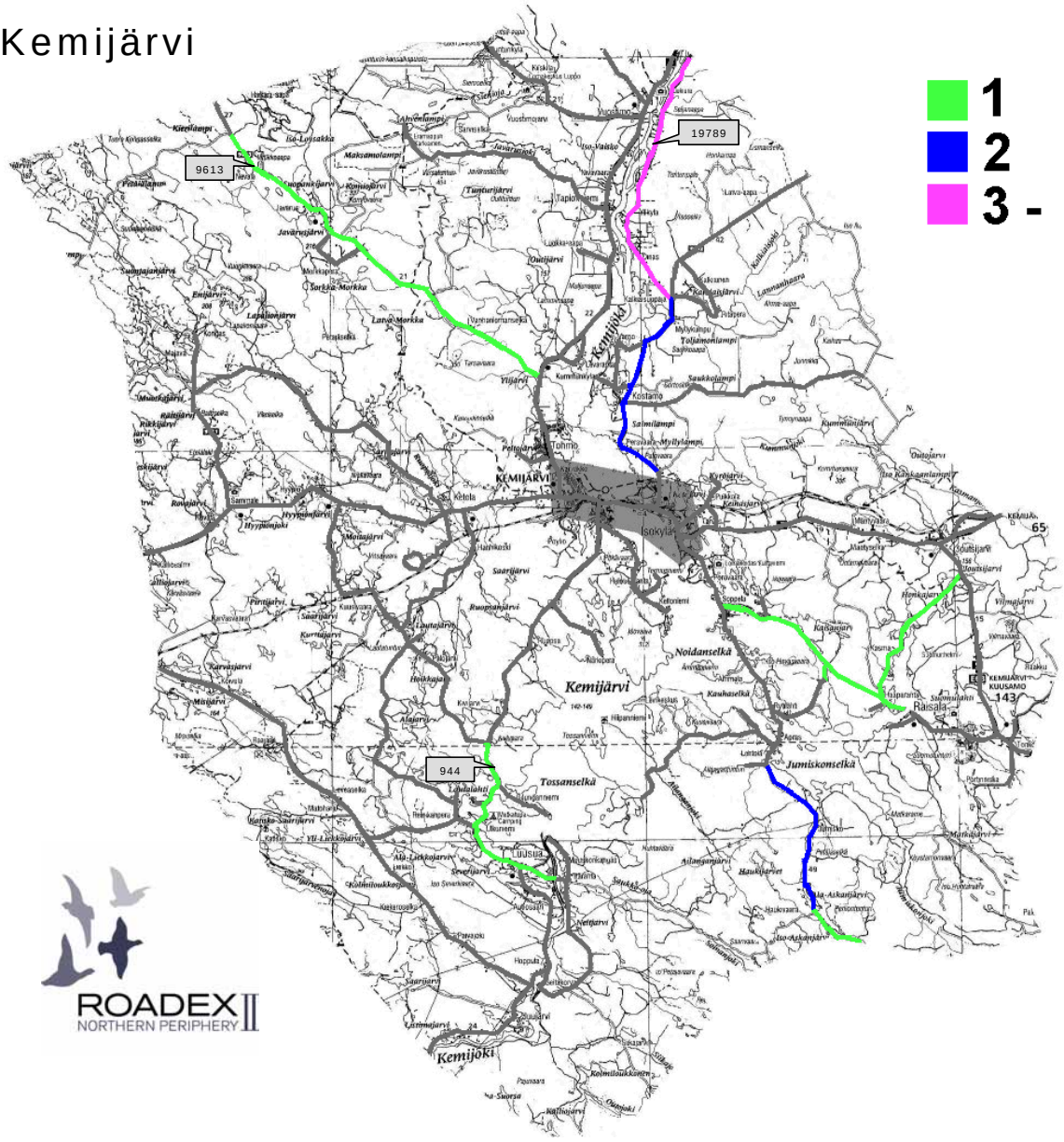
ROADEX II
NORTHERN PERIPHERY

Övertorneå - Överkalix



Kemijärvi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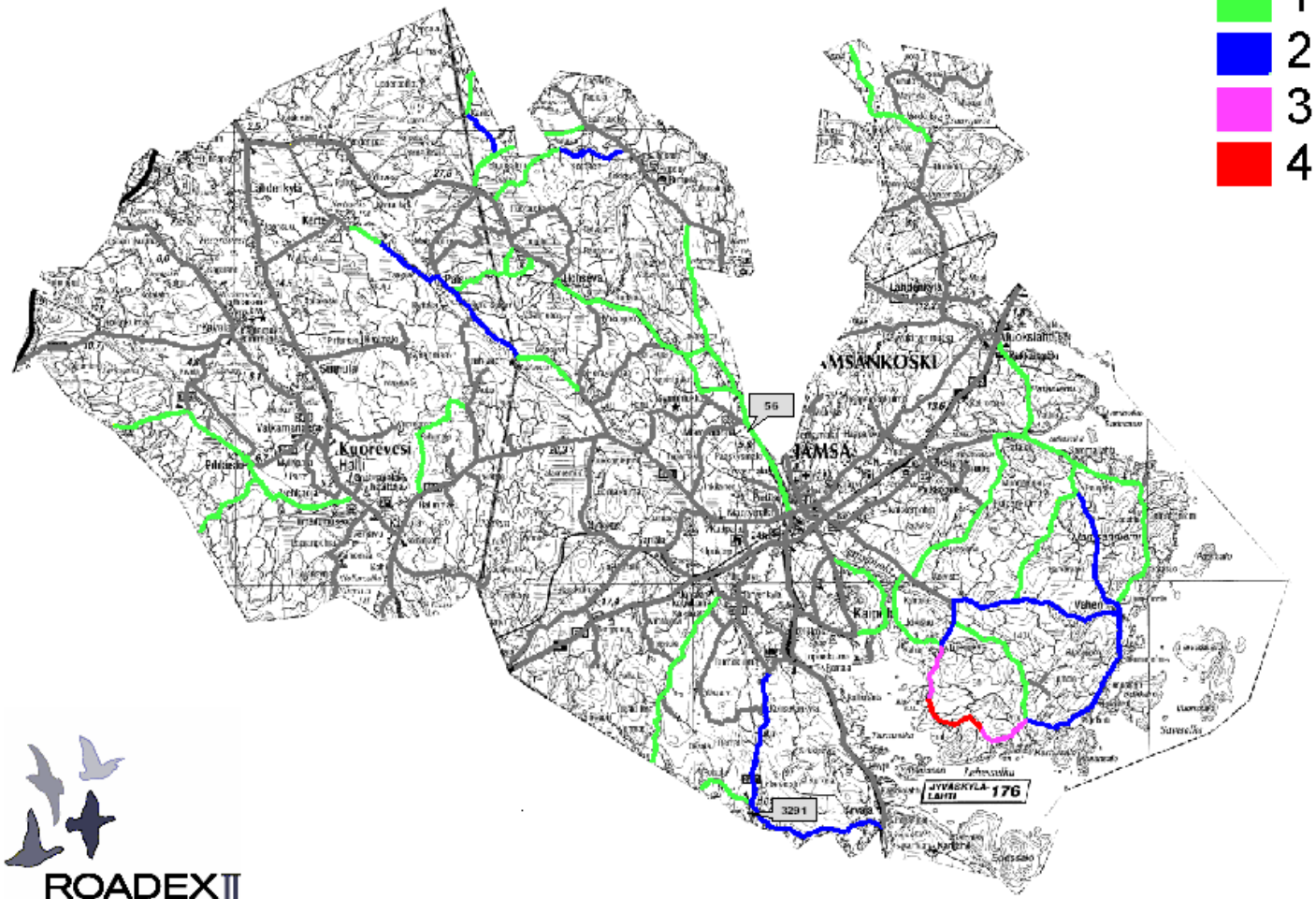
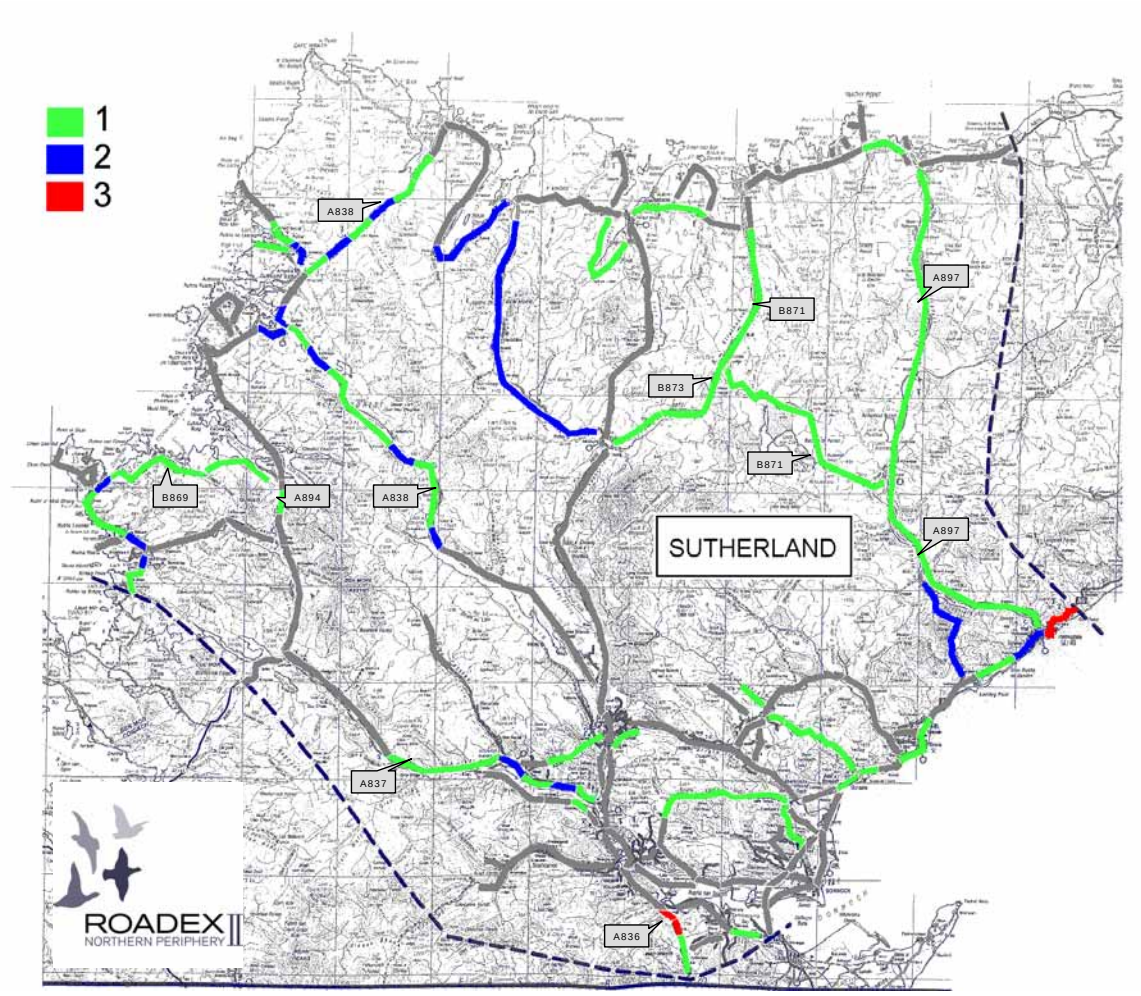
ROADEX II
NORTHERN PERIPHERY

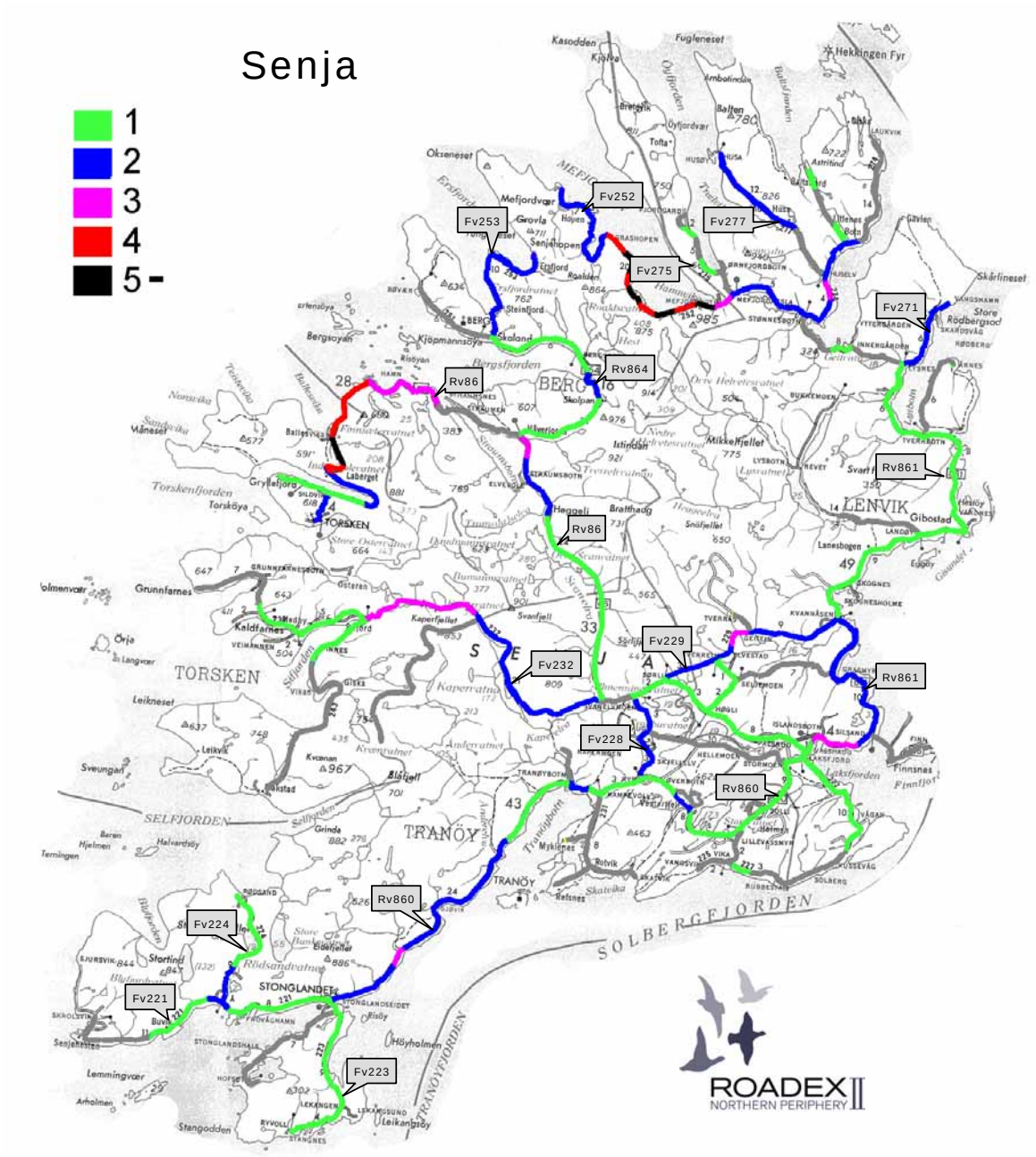
Jämsä - Kuorevesi



ROADEX II
NORTHERN PERIPHERY

Appendix 5 – Maps – Location of Dangerous Road Sections

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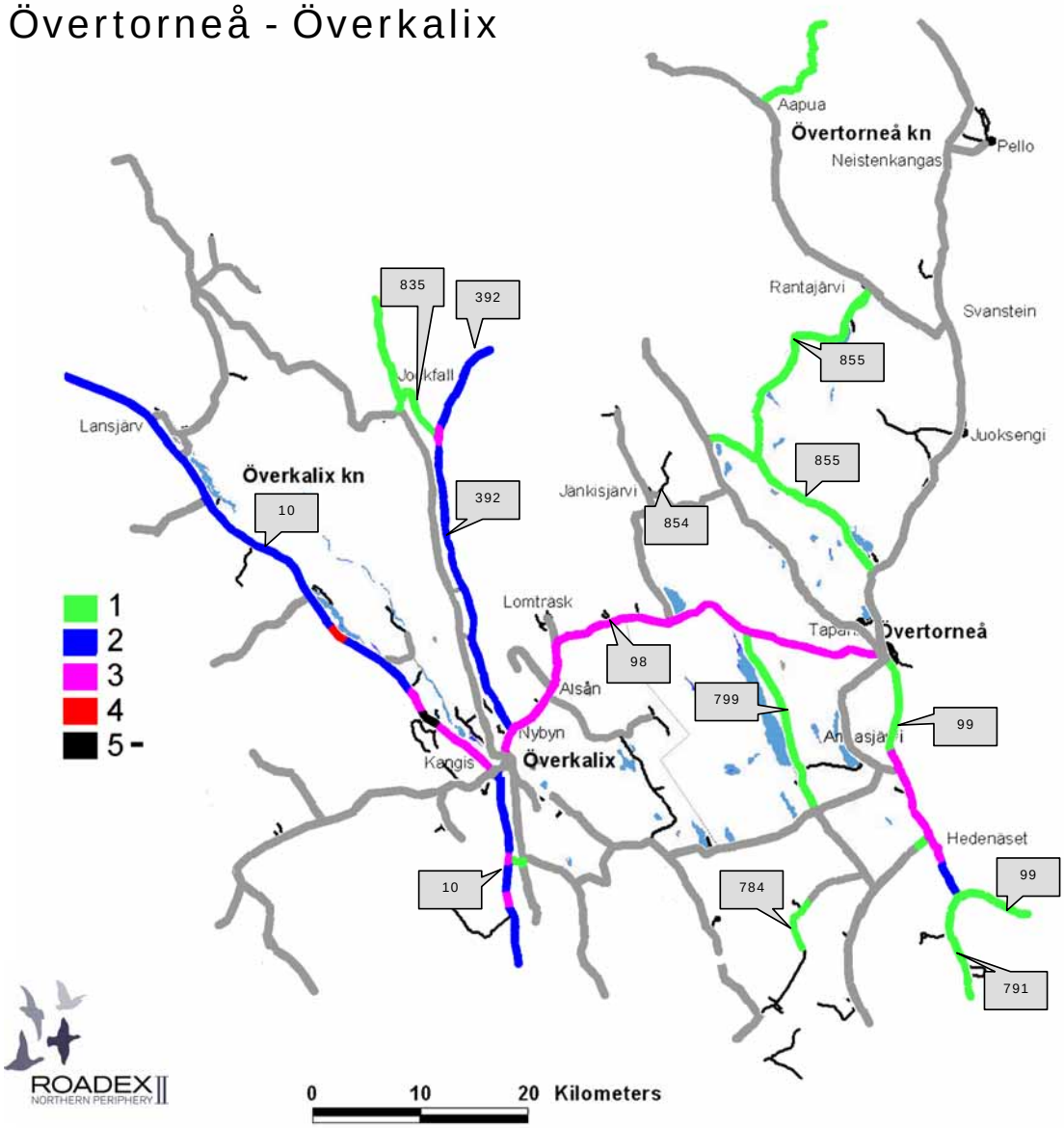
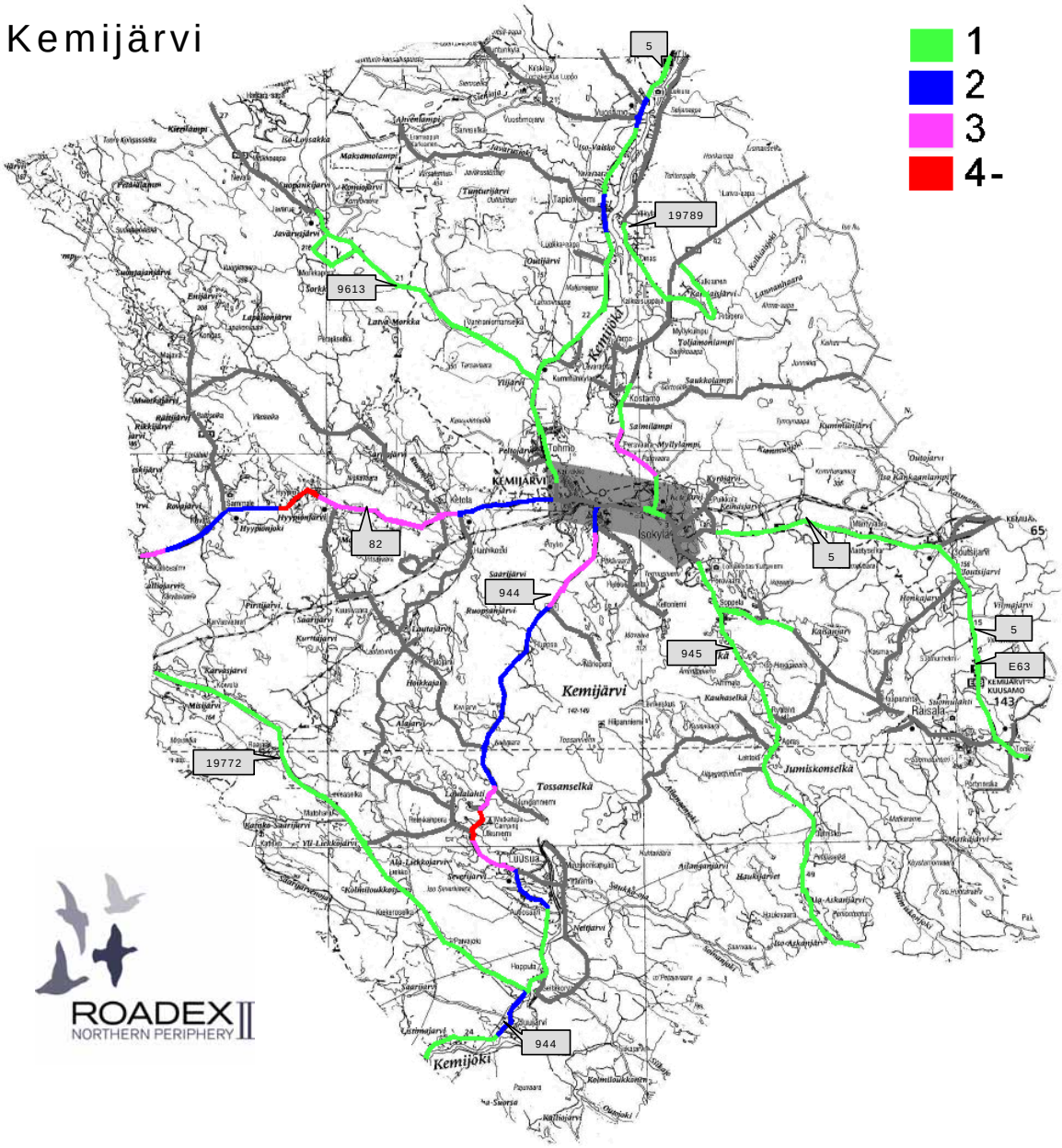
ROADEX II
NORTHERN PERIPHERY

Övertorneå - Överkalix



Kemijärvi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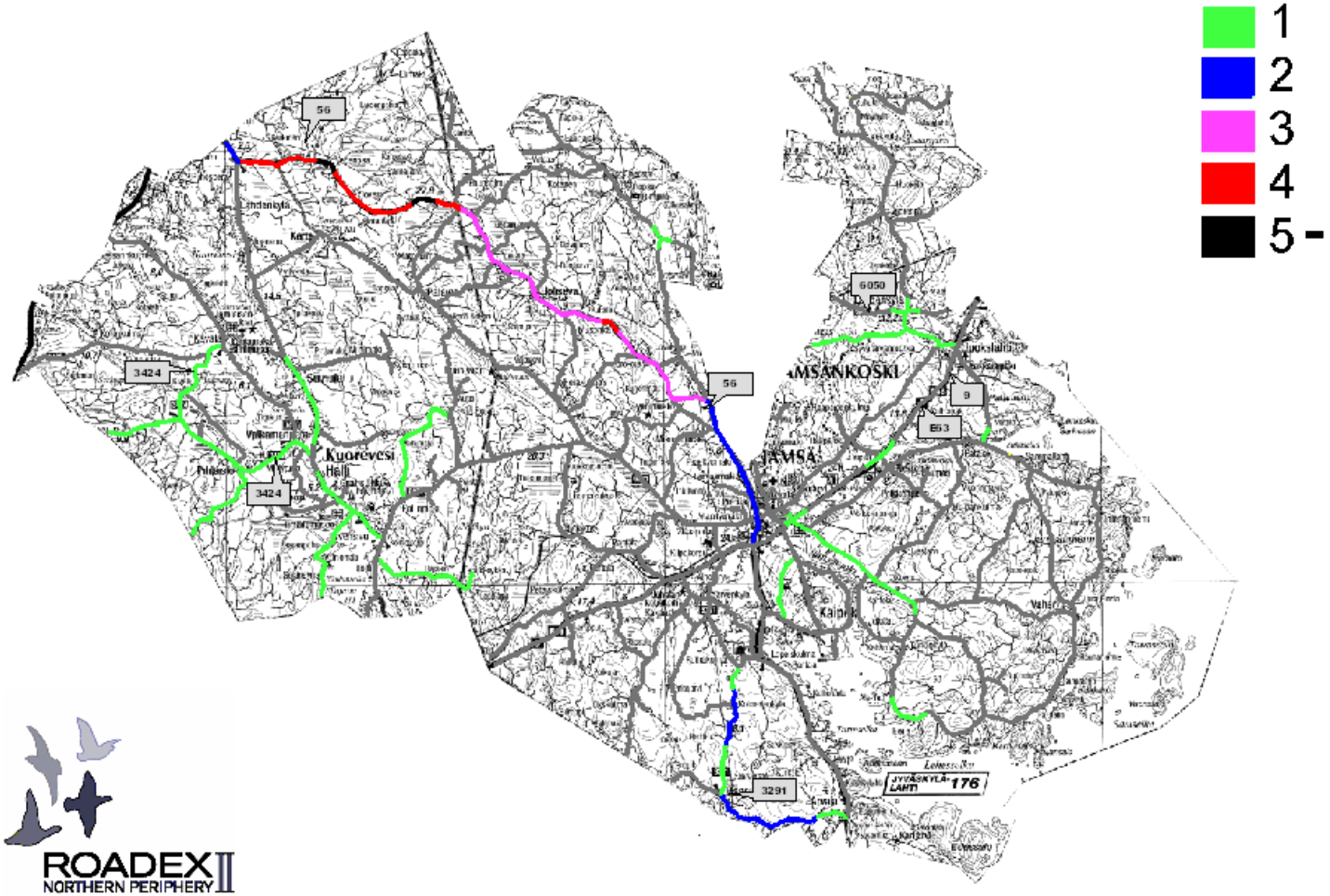
ROADEX II
NORTHERN PERIPHERY

Jämsä - Kuorevesi



ROADEX II
NORTHERN PERIPHERY

Roadex Publications

ROADEX II

- ROADEX II - Focusing on Low Volume Roads in the Northern Periphery DVD
- User Perspective to ROADEX II Test Areas' Road Network Service Level
- Permanent deformation
- New material treatment techniques
- Managing spring thaw weakening on low volume roads
- Socio-economic impacts of road conditions on low volume roads
- Dealing with bearing capacity problems on low volume roads constructed on peat
- Drainage on low traffic volume roads
- Environmental guidelines
- Environmental guidelines, pocket book
- Road management policies for low volume roads – some proposals
- Structural Innovations
- Monitoring, communication and information systems & tools for focusing actions

ROADEX I

- Roadex Multi-media CD-ROM
- Road Condition Management of Low Traffic Volume Roads in the Northern Periphery
- Winter Maintenance Practice in the Northern Periphery,
- Generation of 'Snow Smoke' behind Heavy Vehicles

ROADEX II
NORTHERN PERIPHERY

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Roadex II Lead Partner: The Highland Council, Transport, Environmental & Community Service, HQ, Glenurquhart Road, Inverness IV3 5NX Scotland.