

Study on
Northern peripheral, sparsely populated
Regions in the European Union and in Norway

Northern Peripheral, Sparsely Populated Regions in the European Union and in Norway

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Cover illustrations: - Overlay of 1x1 km grid cell populations and areas
within 60 minutes of nearest airport (fig 5.10)
- KA Hallden: Iron ore train, Kiruna municipality

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Preface

The present study was commissioned by the Executive Committee for Northern Norway, as an extension of the *Study on Northern peripheral, sparsely populated Regions in the European Union* (Nordregio report 2005:4), so as to take into account Norwegian regions facing similar challenges as those that have previously been described in Finland and Sweden. This previous report was commissioned by the North Finnish (Lapland, Northern Ostrobothnia, Central Ostrobothnia and Central Finland), East Finnish (Kainuu, North Karelia, Pohjois-Savo and Etelä-Savo) and North Swedish (Norrbotten, Västerbotten, Jämtland, Västernorrland) regions.

The purpose of the study is to make an assessment on the socio-economic impacts of low population density, peripherality and cold climate in the Northern and Eastern regions of Finland, the Northern regions of Norway and in the Northern regions of Sweden.

The study has focused on demographic sparsity as a core element for the understanding of the specific needs of these regions. Sparsity has indeed been defined as characterising regions where extremely low population densities and disperse settlement patterns create specific challenges for economic activity and public service provision. A central question is the scale at which one should approach demographic sparsity in order to give the most accurate account of economic challenges connected to low population densities.

A second main characteristic of these regions is peripherality, as reflected by the distance to the main European markets. This induces additional transport costs both for individuals and industries, and makes it difficult to access goods and services produced in European core areas.

Cold climate constitutes an additional challenge for these Northern Nordic regions, which can easily be observed at the scale of individual persons or companies. While it is generally not meaningful to seek to quantify the general macroeconomic impact of this factor, some narrower economic approaches of cold climate have been developed.

Stockholm, September 2006

1. Summary

Sparsity has been recognised as a major specificity of the Nordic peripheries in the European context, in the accession treaties and Structural Funds regulations up to 2006. These regions have been recognised as belonging to the less prosperous areas of the European Union, habitually suffering from a lack of business and social services and with a poor basic infrastructure endowment.

Sparsity and remoteness are, strictly speaking, distinct concepts – the first relating to the spread or distribution of population within a region, the latter referring to the distance between the region and the main economic centres of Europe. However in the Nordic countries sparsity and peripherality are generally coincident. The degree of remoteness corresponds to the distance to the core areas of Europe, where concentrations of people and companies create the main European markets, and where the most specialised providers of goods and services are to be found.

Even if transport costs in the narrow sense have diminished over the last decade, there is only little hope that this will outweigh the distant geographical location of these areas. Indeed, other types of ‘transaction costs’ are still in favour of agglomerations: costs to compensate for the lack of modern logistics systems, additional costs for the lack of business networks and the lack of innovative milieus, extra costs for diseconomies of scale and for the lack of the critical mass, and extra costs for the lack of specialised business-related service sectors (such as banking, lawyers, tax advisers, translation services). Instead of witnessing the death of space and distance foreseen by some (Harvey, 1989) current trends lead us towards an increasing dominance of agglomerations and central regions.

Sparse and remote Nordic regions also experience harsh climatic conditions. This implies that they are characterised by a short growing season, a soil with a reduced agricultural potential and temperatures considerably below freezing point in the wintertime. In terms of transport, harsh climatic constraints can lead to erratic variations in accessibility during the winter, and to increased costs in respect of keeping the infrastructure free from snow.

Delimitation of sparsely populated areas

Sparsity characterises regions where low population densities and dispersed settlement patterns create specific challenges for economic activity and public service provision. In other words, low regional population densities are not sufficient to characterise a region as “sparse”. Sparsity occurs insofar as the combination of low population densities and dispersed settlement patterns lead to specific challenges for economic activity.

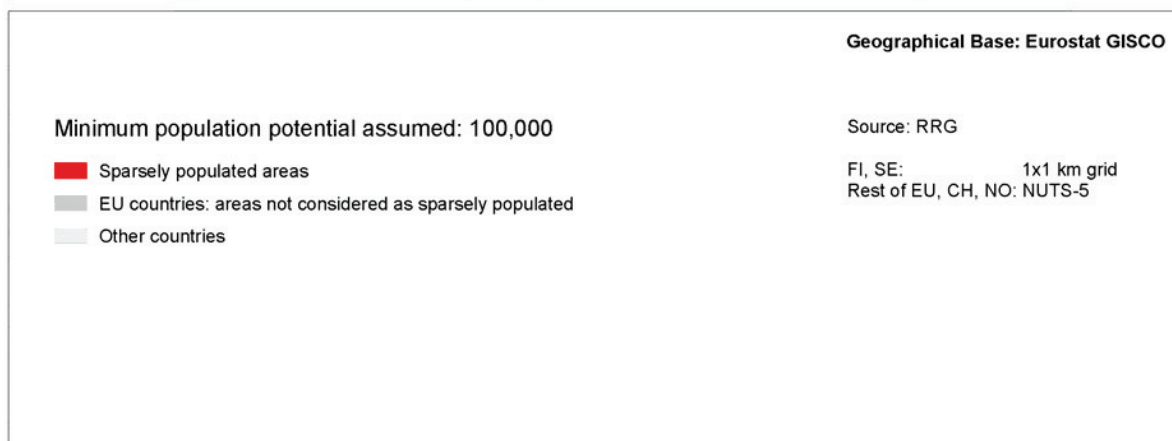
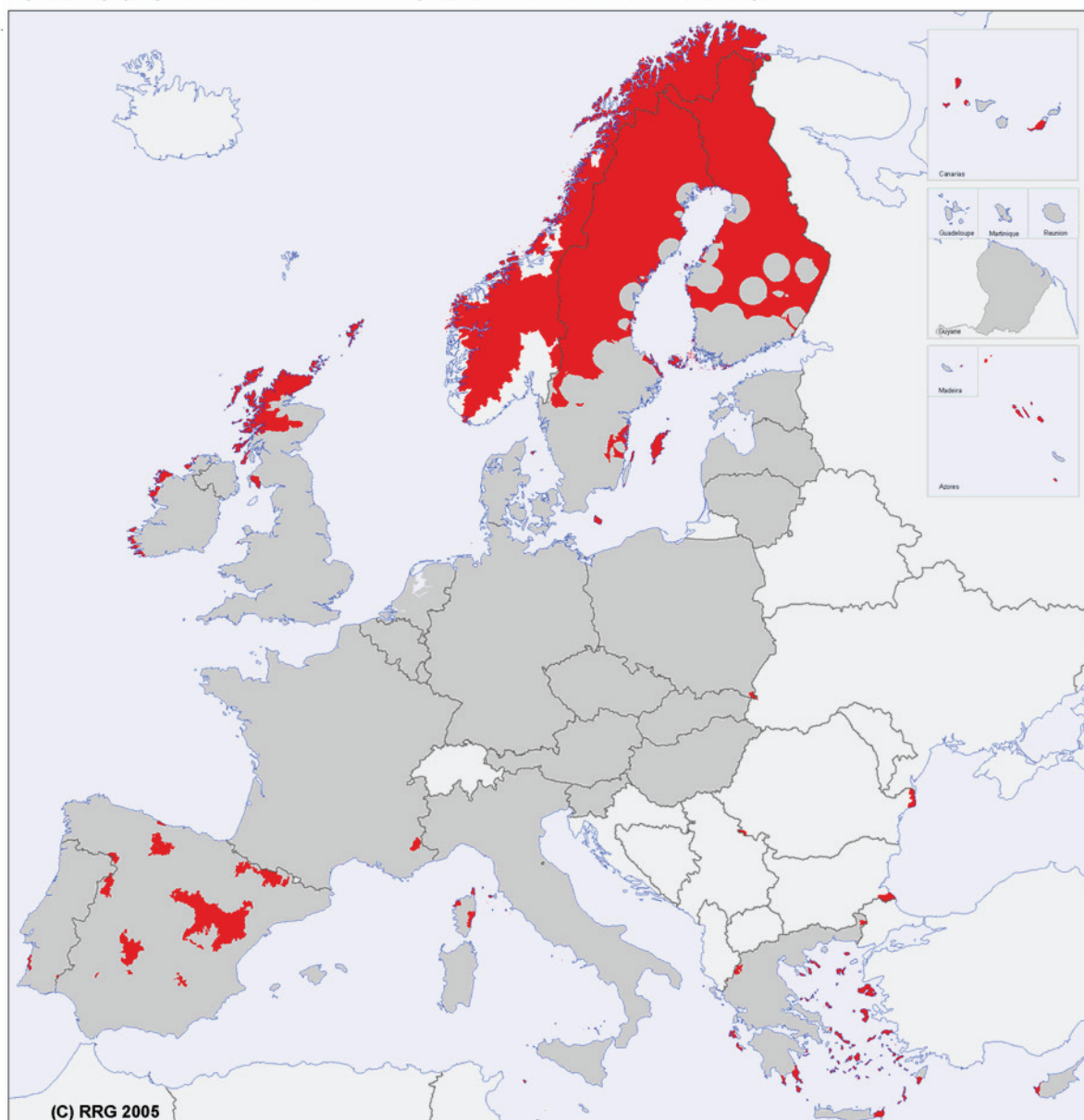
Two ideas are central in this respect: on the one hand, it is not the population of an area as such that is important, but the number of persons that can be reached. For this reason, we have calculated the population within a 50 km radius (i.e. a generally accepted maximum commuting distance) throughout the European territory. This measure corresponds to the “population potential” of each area.

On the other hand, one can hypothesise that there are certain significant population potential thresholds, above which the extent of the challenges related to low population densities and dispersed settlement patterns will increase significantly. These thresholds correspond to the critical population mass for maintaining important service functions, or for preserving a minimal width and variety in the local labour market.

For these two reasons, the appropriate method for delimitating sparsely populated areas is to use the proportion of each region characterised by population potentials below a certain threshold, rather than average population densities. This method indeed reflects the actual challenges of sparsity, is less dependent on regional delimitations and takes into account population concentrations around each region.

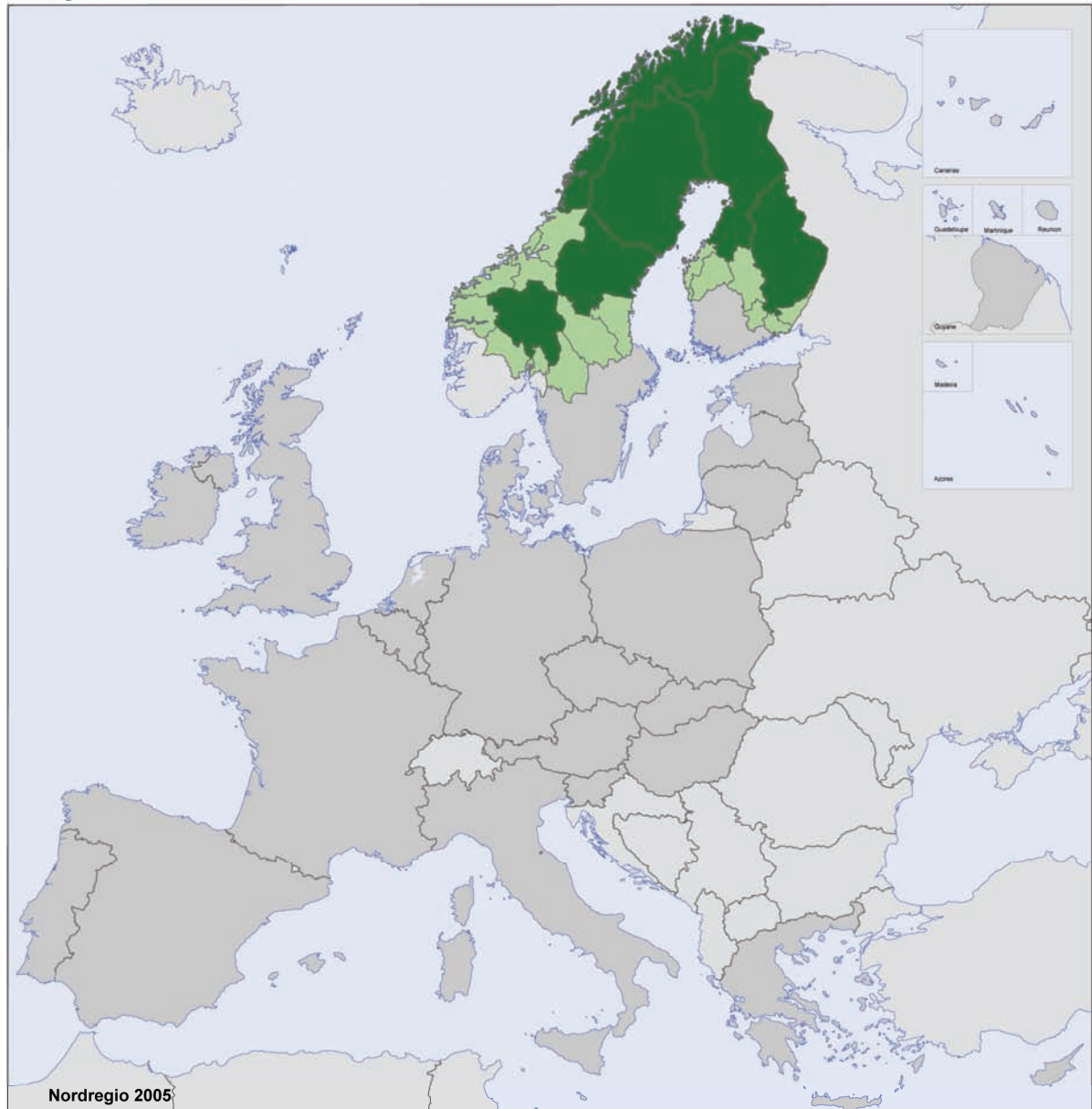
We have chosen to use the threshold of 100 000 persons within a radius of 50 km, corresponding to a population density of 12.5 inh/km². For the delimitation of the study area, we have selected NUTS 2 regions with over 75% of their area with population potentials below this threshold. Adjacent NUTS 3 regions have also been included, as a point of comparison.

Sparsely populated areas in Europe: Threshold of 12.5 inh/sqkm



*Figure 1.1. Areas with a population potential of 100 000 persons or less within a radius of 50 km
(corresponding to a population density of 12.5 inh/km²)*

Study area delimitation



Geographical Base: Eurostat GISCO

Study area delimitation

Source: Eurostat

Sparsely populated
NUTS 2 regions

Contiguous
NUTS 3 regions



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Figure 1.2. Study area delimitation: NUTS 2 regions with at least 75% of their area with a population potential below 100,000 inhabitants, and adjacent NUTS 3 regions.

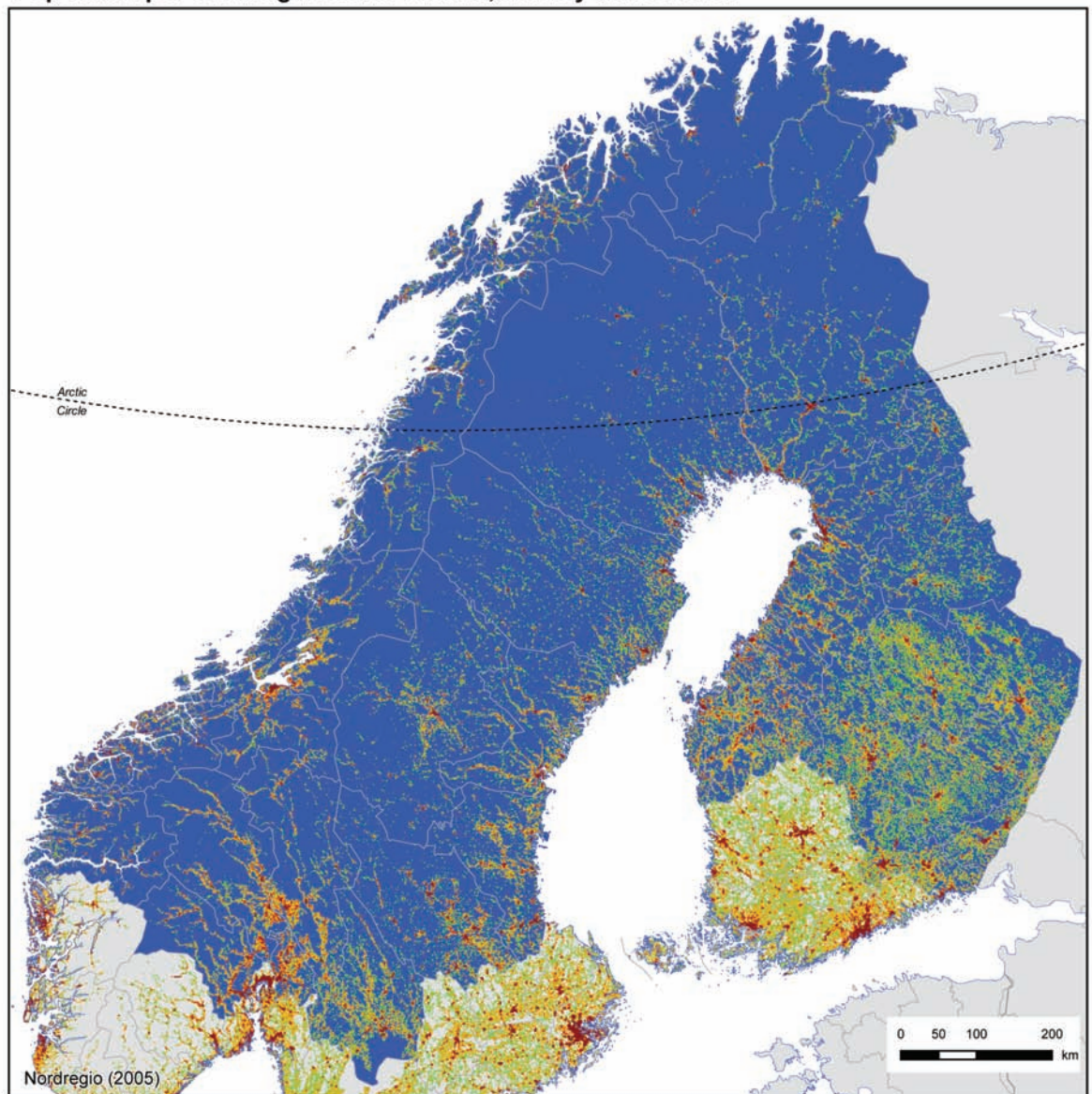
Demographic characterisation

Contrasted settlement patterns can be observed in the Nordic sparsely populated areas, as illustrated by the significant variations in the number of inhabited grid cells between regions with equivalent population densities. East Finland is in this respect the most extreme case of disperse settlement patterns, while peripheral populations in Sweden, North Finland and Norway are mostly concentrated in a few locations. Specific issues and challenges are connected to the concentrated and outspread types of settlement structures in sparsely populated areas. In the case of the more concentrated settlement structure, the few households situated outside of the main nodes and axes are particularly isolated, and social interaction may be difficult to maintain. The outspread nature of the settlement structure is on the other hand a major challenge for the provision of both public services (e.g. community nursing and home help to elderly persons) and transport infrastructure.

Observing figures from 1993 to 2002, one finds that different situations can be observed across the study area in terms of net natural change. While significant sparsely populated parts of North Finland and Norway experience natural population growth, such trends occur almost only occur in cities in Sweden and East Finland. Negative net migration, on the other hand occurs throughout the study area, outside of the main cities. The only exception in this respect would be some sparsely populated areas in inner parts of southern Norway.

Age structures reveal an ageing trend in the more sparsely populated areas, although they are significantly less accentuated in Norway. Because the sparsely populated areas experiencing decline are extensive and continuous, their lack of demographic dynamism can in general not be compensated through extended commuting trips and service provision areas around the nearest city. This makes these Nordic areas specific in comparison with other European areas experiencing population decline.

Population per 1x1 km grid cell in Finland, Norway and Sweden



Population (2002) within each 1x1 km grid cell

- 1 to 4 persons
- 5 to 50 persons
- 51 to 100 persons
- Over 100 persons

- Study area
- Other areas

Geographical Base: Eurostat GISCO

Source: Statistics Finland (2005),
Statistics Sweden (2005)
SSB - Statistics Norway (2005)



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Figure 1.3. Settlement patterns in the Nordic peripheries

Net migration change and population potential

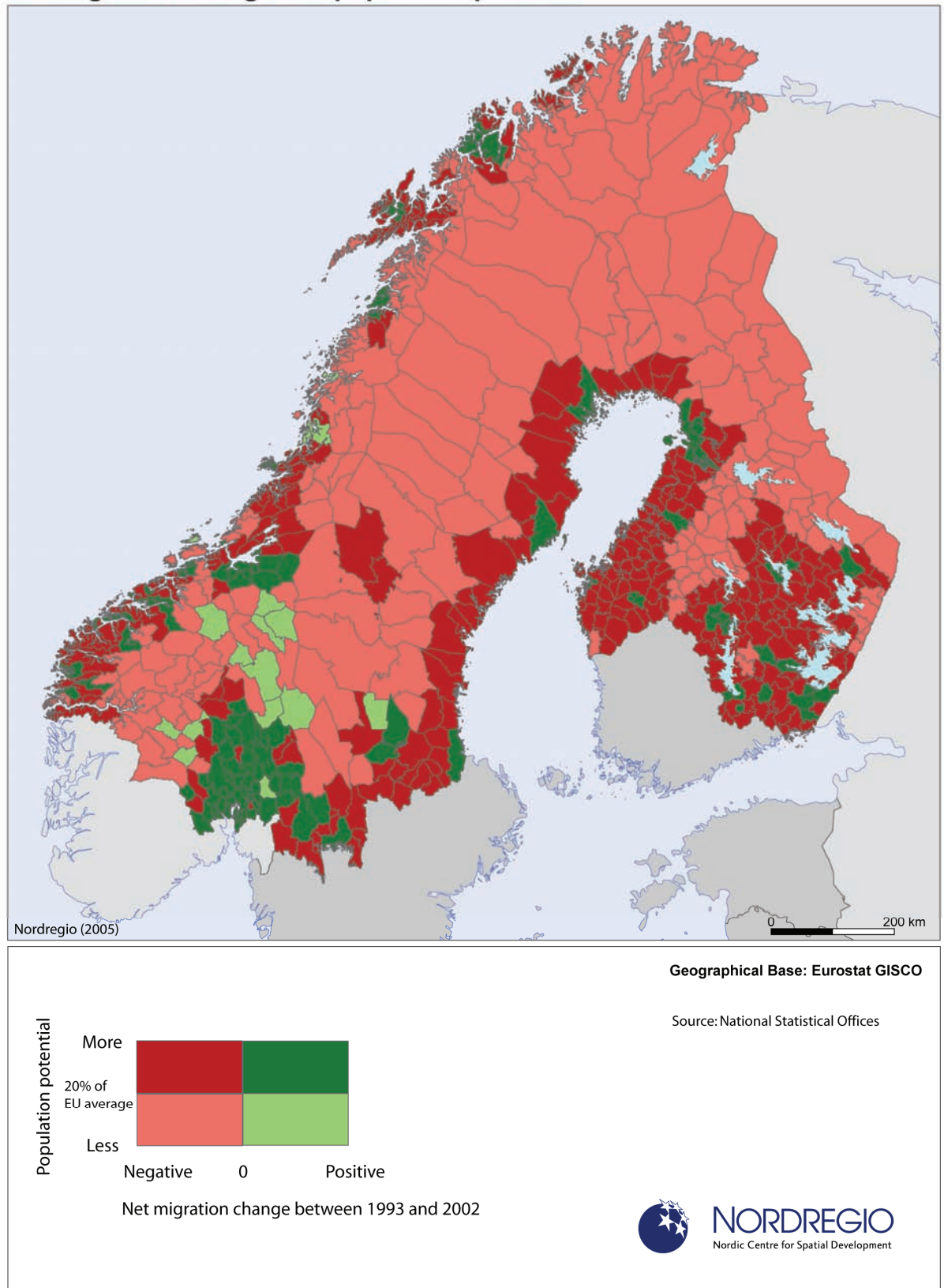
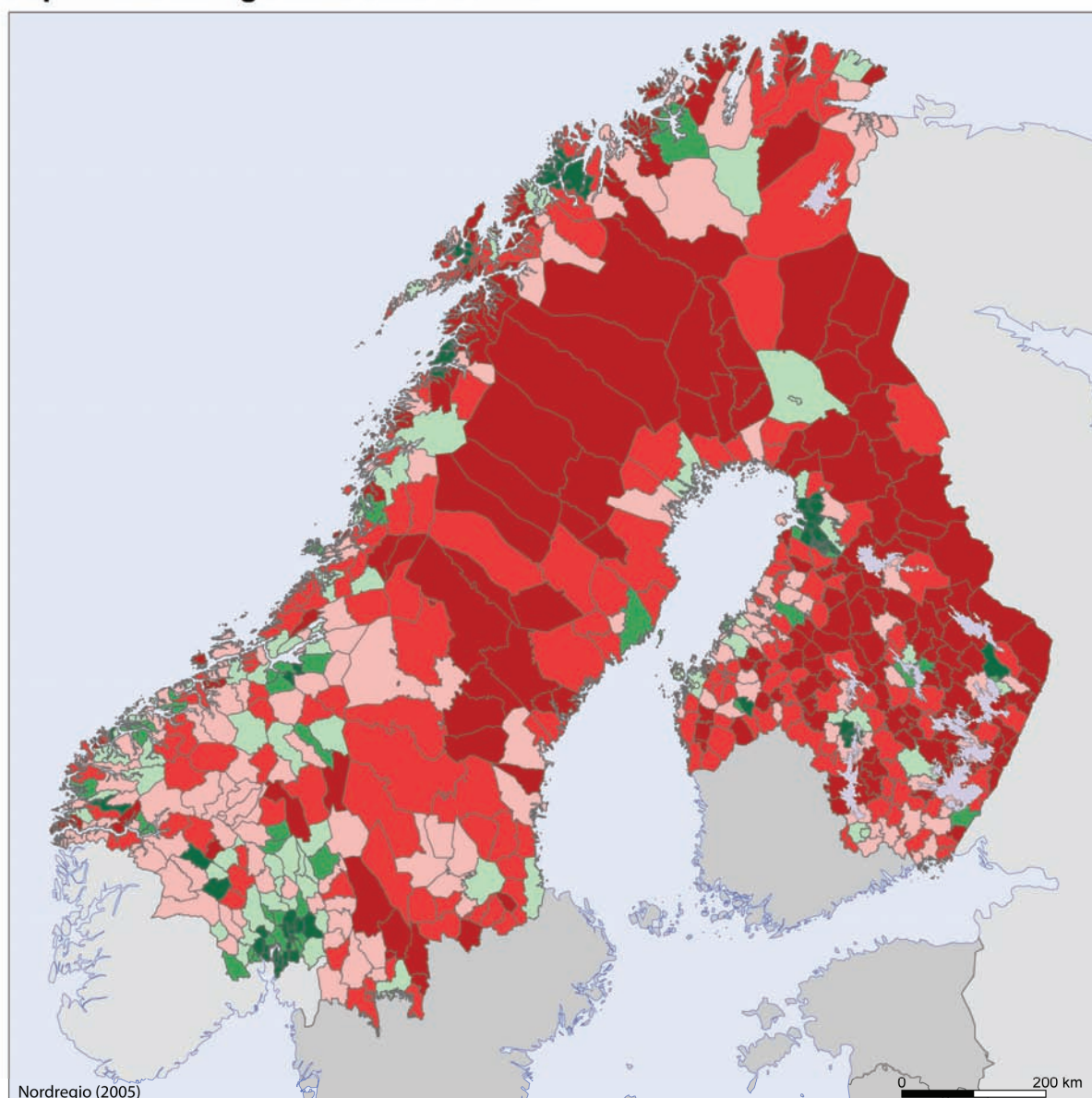


Figure 1.4. Net migration change and population potentials

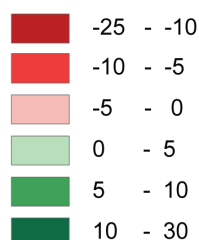
Negative net migration is highly correlated with low population potentials.

Population change from 1993 to 2002



Total population change from 1993 to 2002 (% of 1993 population)

Percentage change in population due to migration and natural change over the 10 year period



Geographical Base: Eurostat GISCO

Source: National Statistical Offices



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Figure 1.5. Population trends from 1993 to 2002

A large proportion of municipalities in Northern Sweden and Finland have lost over 10% of their population in this 10-year period. Similar trends can be observed in some Norwegian municipalities, but not over continuous areas of the same extent.

Peripherality and accessibility

Measures of ground accessibility show that Nordic peripheral regions are among the least accessible in Europe. Some measures of potential accessibility to population show a relatively favourable position for East-Finland, due to the proximity to the 10 million inhabitants of the Saint-Petersburg region (e.g. ESPON Project report 1.2.1 '*Transport trends*'¹). This however needs to be nuanced as a hypothetical opportunity for the concerned Finnish regions, as the practical, administrative and economic difficulties developing cross-border interaction in these areas are considerable. For this reason, we have developed an alternative calculation taking into account destinations in EU 27, Norway and Switzerland only.

Taking into account air transport very significantly improves the relative accessibility of areas in the immediate vicinity of an airport, but not for the rest of the regions. The current airport network across the Nordic sparsely populated peripheries provides a relatively good access. The main weak point in Sweden and Finland is the lack of transversal relations, which reduces the potential for interaction between peripheral regions and increases the dependence on the capital region. Transversal connections are more developed in Norway. There is however a general risk that deregulation in the air transport sector will lead to a reduction in the number of small regional airports.

Both in terms of roads and seaports, there are significant additional maintenance costs related to the difficult climatic conditions in the Nordic sparsely populated peripheries. The road winter maintenance costs per km driven are multiple times higher in these areas than in the countries as a whole. In the Baltic Sea, icebreakers are necessary to maintain sea traffic from November to April.

The analysis of the University network in the Nordic peripheries reflects the active policies promoting higher education outside of the capital regions, as illustrated by the high proportions of students in a number of labour markets around peripheral cities. It is important to ensure that these facilities are integrated in the local economic environment, and contribute to the development of entrepreneurship and innovation in their area.

An infrastructure strategy for the sparsely populated peripheral regions must be designed to help build and maintain wider regions with complementary functions in

¹ ESPON stands for European Spatial Planning Observatory Network. This INTERREG III programme has financed a number of research projects in view of providing a diagnosis of the principal territorial trends at EU scale and a cartographic picture of territorial disparities. More information about ESPON is available at www.espon.eu.

Potential accessibility by road to destinations in EU 27, Norway and Switzerland

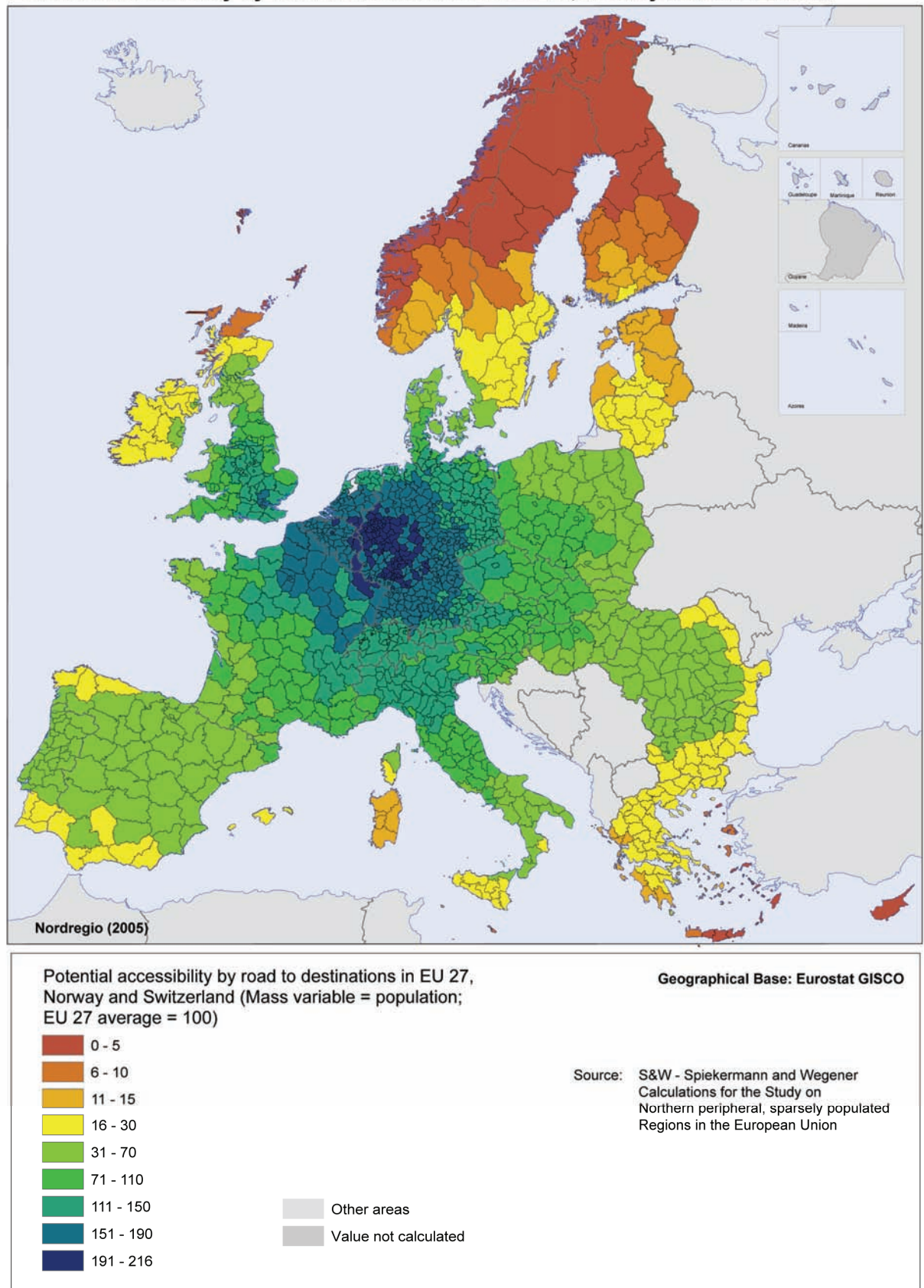
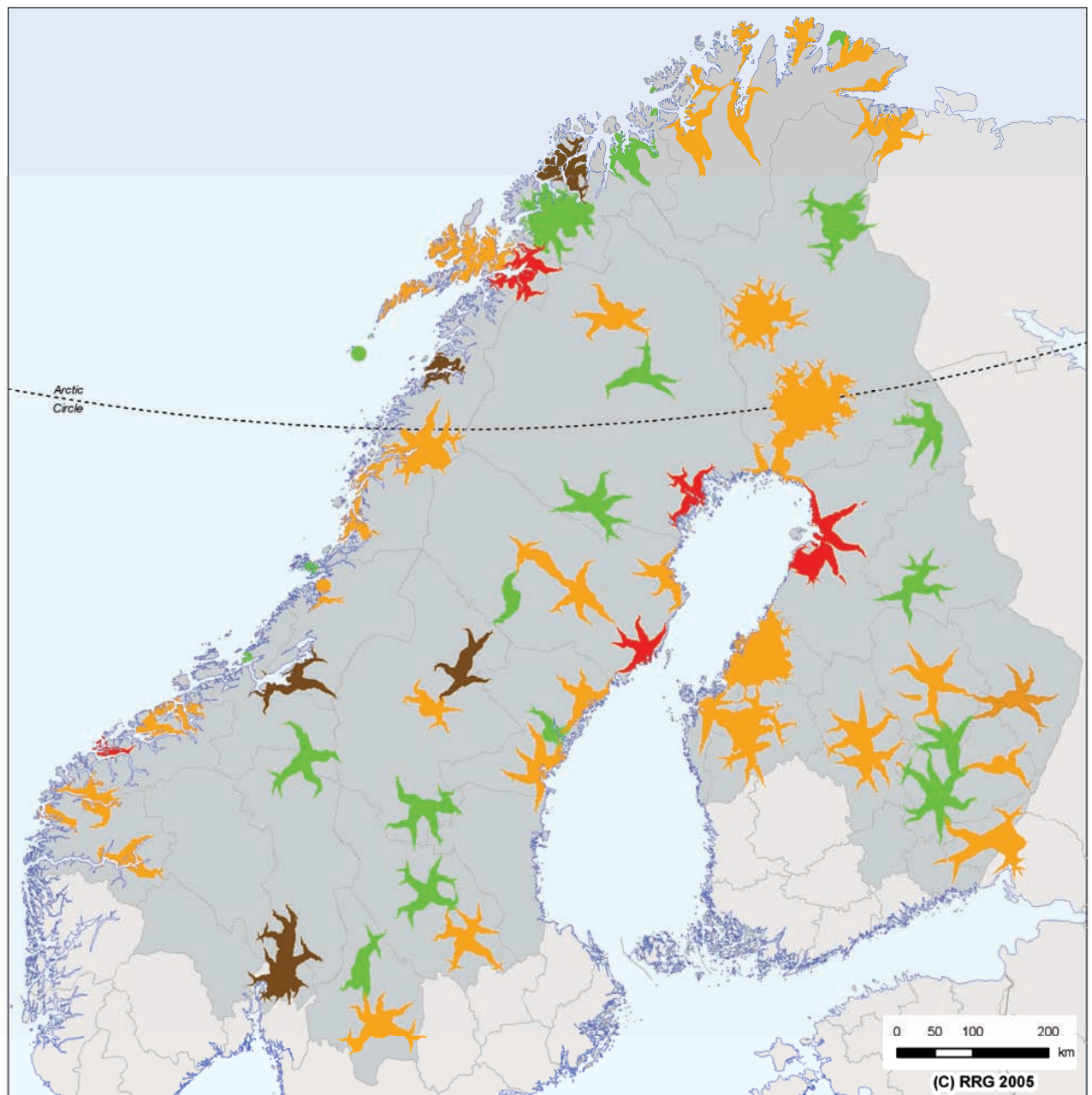


Figure 1.6. Potential accessibility by road to population in EU 27, Norway and Switzerland.

Airports in the study area: 60-minutes isochrones



Important airports in the Study Area: 60-minutes Isochrones

Airports with less than 1 landing a day excluded

- | | |
|--|---|
| ■ More than 10,000 landings | ■ Other areas |
| ■ 5,000 - 10,000 landings | ■ Non-EU countries |
| ■ 1,000 - 5,000 landings | |
| ■ less than 1,000 landings | |

Geographical Base: Eurostat GISCO

Source: RRG

*Figure 1.7. Areas within 1 hour of the nearest airport
The airports are classified according to the number of yearly landings.*

the different nodes, with the objective of reinforcing internal regional coherence. Moreover it remains important to continually highlight the fact that a focus on connections to the capital city will increase the level of dependency on that capital region unless they are accompanied by pro-active policies to preserve strategic sectors in the concerned sparsely populated peripheral regions.

Social and economic characterisation

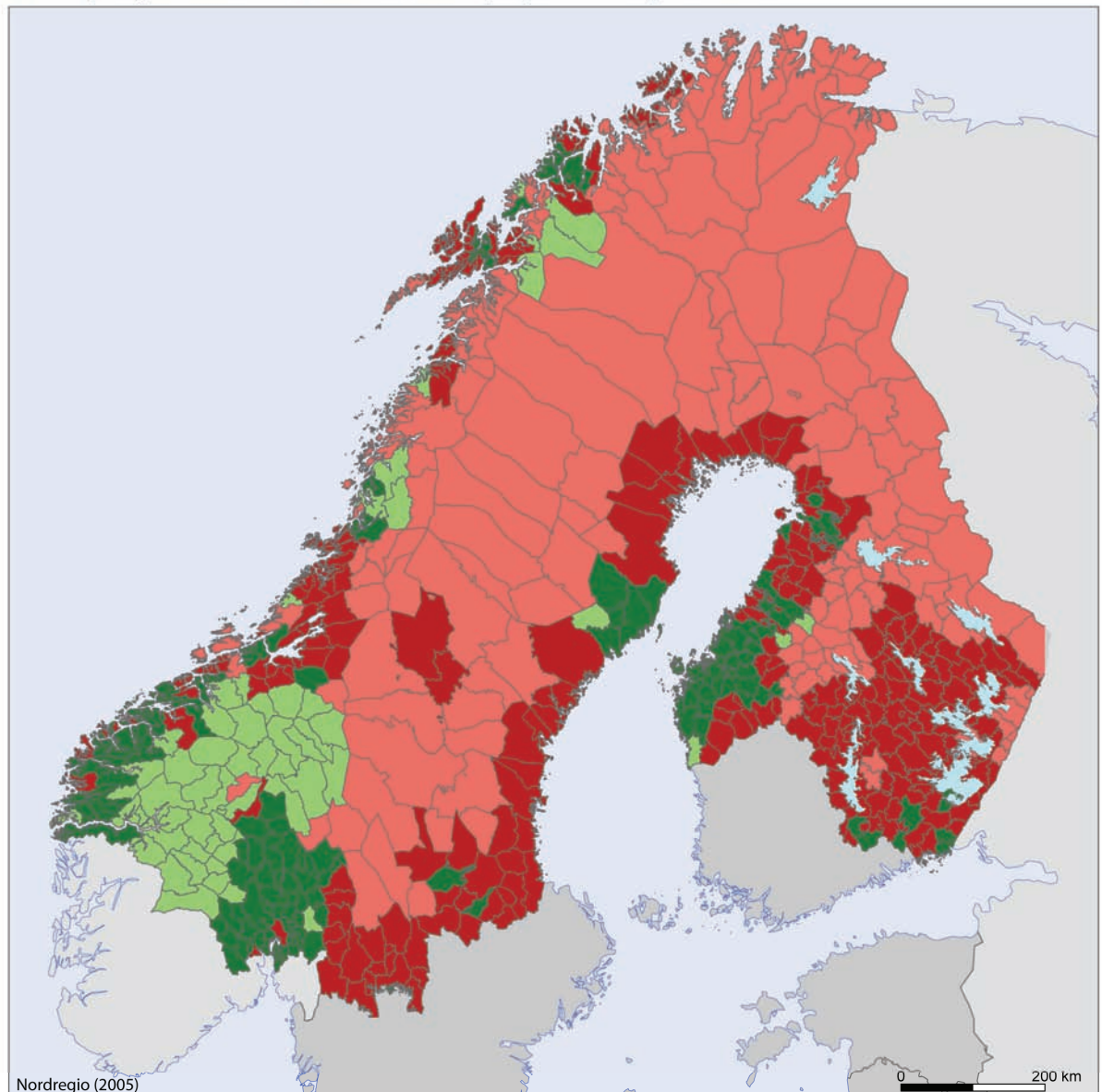
Sparsely populated areas in Sweden and Finland are characterised by higher unemployment rates than the rest of the country. The contrast between sparsest areas and the rest of the national territory has been increasing between 1991 and 2001. In Norway, sparsely populated areas South of Trøndelag have unemployment rates below national average values, while sparser areas in the North generally have higher values.

The most sparsely populated areas of Finland, Sweden and northern Norway also have activity rates that are generally below the national average, and a higher degree of dependence on public sector employment. Here again, the situation is different for sparsely populated parts of Southern Norway.

The analysis of income sources among the inhabitants of each municipality reveals significantly lower income from employment and capital per inhabitant aged 20 to 64 in sparsely populated parts of Finland and Norway. These contrasts are less accentuated in Sweden. The proportion of income from transfers (i.e. pensions, unemployment, maternity and sickness benefits) are however generally higher in sparsely populated parts of the three countries.

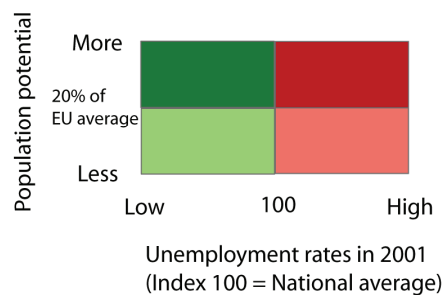
GDP rates per inhabitant in purchase parity standards (PPS) observed in the peripheral Nordic regions are generally close to the EU average (fig. 6.12 p. 142). It is however important to note that the proportion of the GDP based on primary activities such as forestry, hydraulic energy production or fishing is multiple times higher in these regions than in Sweden, Norway or Finland as a whole. These activities can have a small impact on the local economies, insofar as they employ relatively few persons. It should also be noted here that East Finland is in a particularly difficult situation within the study area, with GDP values per inhabitant below 80% of the EU average in the NUTS 3 regions of Etelä-Savo and North Karelia.

Unemployment rates in 2001 and population potential



Geographical Base: Eurostat GISCO

Source: National Statistical Offices



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Figure 1.8. Cross-tabulation population potentials and unemployment rates
Unemployment above national average values
are highly correlated with low population potentials, except in Southern Norway.

Standardised income *per inhabitant*

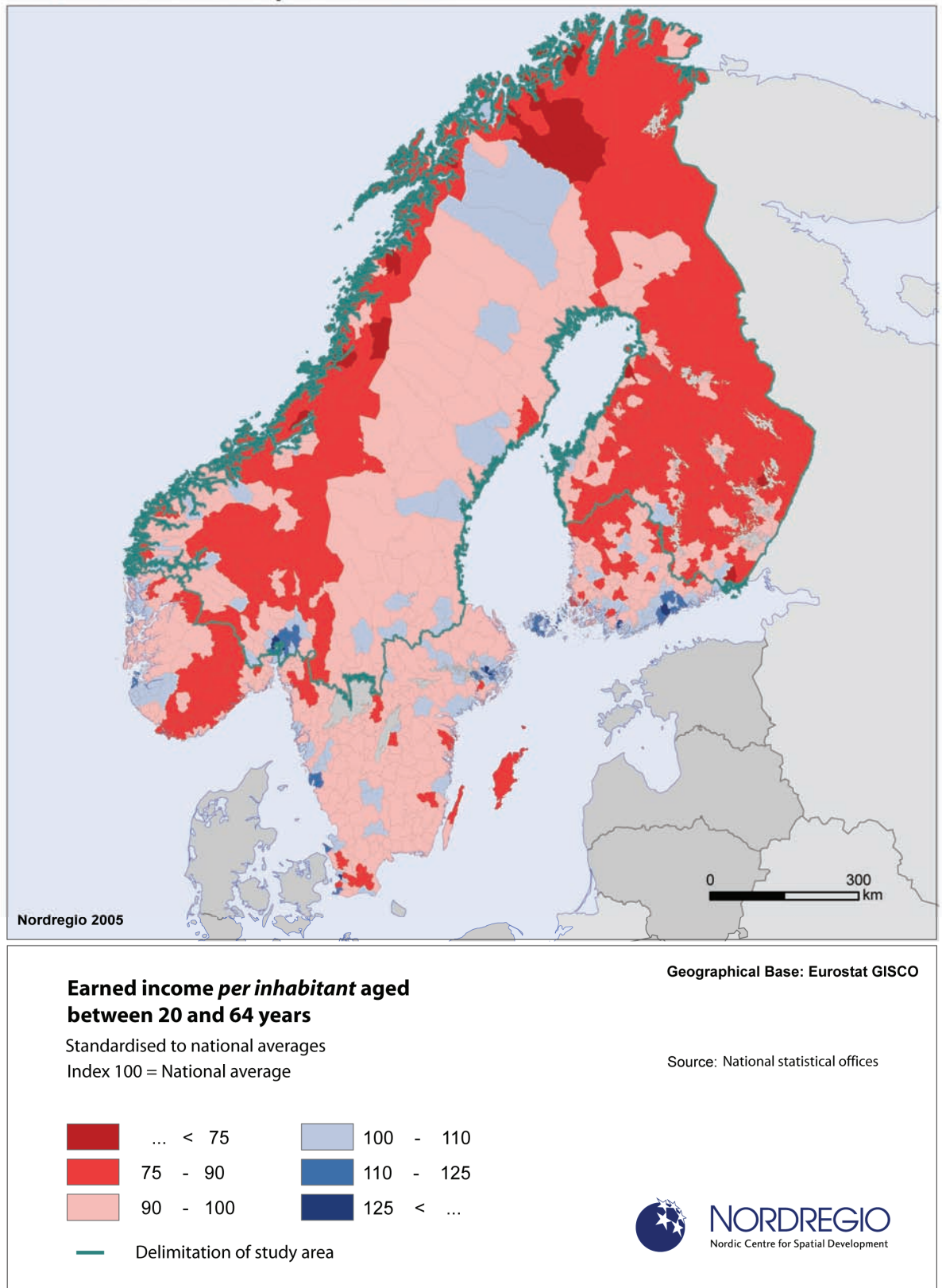


Figure 1.9. National variations in income levels

*Lower income levels are concentrated in sparsely populated parts of Finland and Norway.
The contrasts are much weaker in Sweden.*

Proportion of transfer-income out of total municipal income

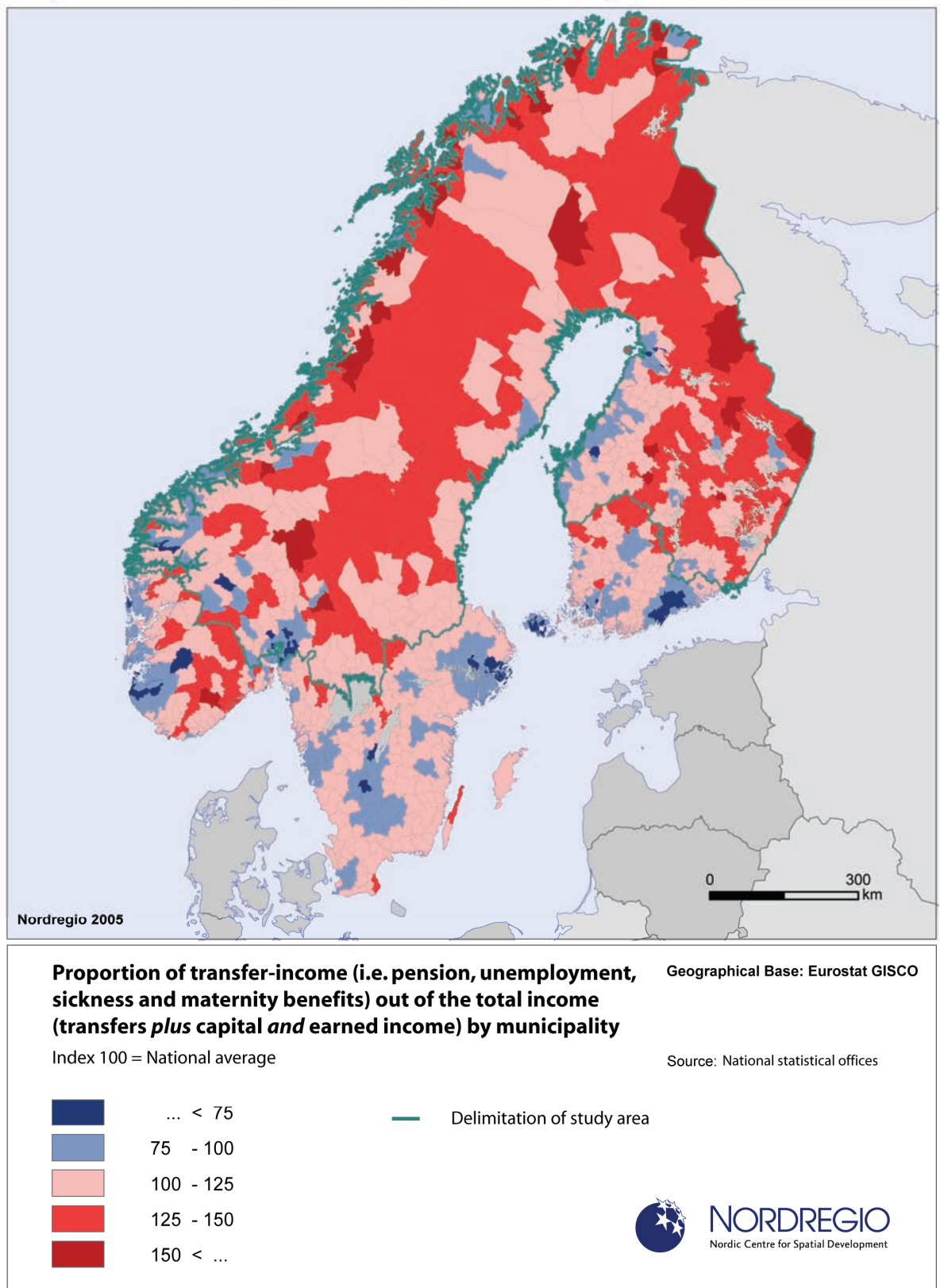


Figure 1.10. National variations in proportions of transfer-income

Areas with a high proportion of transfer income are concentrated in the sparsely populated parts of the study area.

Comparing values at NUTS 5 and NUTS 4 level for these countries with NUTS 3 values for the rest of Europe reveals strong contrasts between the main cities and the peripheries in the Finnish parts of the Study area. The contrast between the results at NUTS 3 and NUTS 4 level is particularly striking in Northern and Central Finland. In Sweden, a more complex pattern of municipalities with high and low GDP values is revealed (fig 6.13 p. 143). This shows that the production of wealth in peripheral NUTS 3 regions is often concentrated in few locations. The extent of the regions implies that the inhabitants of one part of a NUTS 3 cannot necessarily benefit from wealth production in another part.

Conclusion

In reviewing the contents of the above report it is clear that the regions of the Northern Periphery of the Nordic countries experience what may be termed a “syndrome” of disadvantage. The term is appropriate, since as in a medical syndrome, the situation is characterised by a number of associated symptoms of disadvantage, which, although they mutually reinforce the overall disadvantage experienced by these regions, are not necessarily connected in a causal sense. Thus, though sparsity, peripherality and structural weakness (i.e. dependence upon primary industries), are different problems, with distinct causes, they often co-exist, and together contribute to a very substantial cumulative barrier to regional development.

The recognition of the “syndrome” has several potential implications for policy:

- Since the syndrome is made up of several components of disadvantage, which are, to a degree at least, independent in terms of their causes, it follows that no single approach (addressing for example, sparsity, peripherality, migration, or structural issues alone) is likely to be effective.
- Some of the basic handicaps (such as climatic constraints) are clearly not mutable, and in this case it is appropriate to consider measures, directed at “softer” issues, mostly located in the centre of the diagram, (such as improving human and social capital, developing more effective business networks, better governance, and so on), which may compensate or ameliorate.
- Other “basic handicaps” such as peripherality, poor local accessibility, or sparsity exacerbated by migration, although not fixed physical characteristics (in the same

because, in a free market economy accessible regions are generally the motors for growth, drawing on resources from the periphery, and therefore always “ahead”. This too leads to the conclusion that development policy for the periphery should focus upon “soft factors” which may better equip the population and businesses to survive within their challenging environment.

- "Hard" measures such as infrastructure building are nonetheless needed in certain parts, e.g. where transport bottlenecks hampering industrial development have been identified. Such projects can also act as catalysers of improved regional cooperation and governance.
- In considering policy development for sparsely populated and peripheral regions it is important to recognise and make full use of the particular assets of such regions as locations for “footloose” economic activities. A number of Alpine and peripheral cities have already demonstrated that a favourable environment and quality of life can attract highly qualified personnel, if the appropriate structures are established in terms of public research and higher education.
- In considering policy development for sparsely populated and peripheral regions it is important to recognise and make full use of the particular assets of such regions (as locations for “footloose” economic activities) in terms of environment and quality of life.
- It is worth stressing the fact that although many of the improvements in telecommunications and information technology in recent years have tended to benefit accessible regions more than sparsely populated or remote ones, they do, nevertheless offer new opportunities for the latter. Again, providing that basic cost differentials (due to differences in market size) can be overcome by public support, the key issue is likely to be human capital (i.e., informing local entrepreneurs of the opportunities, and the training of the local workforce).

Although the above points are far from comprehensive, a basic principle is clear: In order to effectively address the effects of the basic handicaps of the Northern Periphery, it will be necessary to focus efforts upon “Intermediate/Contingent” processes, and to develop imaginative “softer” approaches to the “syndrome” of disadvantage.

By combining its strategic role as a centre of expertise for high technology products and services, as a producer of raw material and processing industry products and as a gateway for products from Russia and northern Eurasia, the sparsely populated areas of the Nordic countries hold the key to a strategic role in the European context. It is however important to ensure that these development perspectives are implemented with a focus on the interests of these Nordic peripheral regions. Coordinating regional actors and national stakeholder through appropriate transnational governance structures is therefore of primary importance.

Through the implementation of three above mentioned development strategies, the Nordic sparsely populated areas have the potential to contribute to the achievement of the Lisbon agenda, i.e. making Europe the most competitive economy in the world. Compensating for the higher relative cost of building and operating infrastructure in these areas is in other words likely to be profitable for the European economy as a whole. A European policy compensating for concentrating trends in the economy can ensure that the current and potential human capital, natural resources and strategic transport nodes within the peripheral and sparsely populated regions are made available to the European economy. A European regional policy can in other words constitute an original contribution to the Lisbon agenda, by identifying territories where current market mechanisms fail to take advantage of the existing resources. The Nordic peripheral sparsely populated areas constitute one type of such areas.

2. Introduction

2.1. European recognition of the structural weaknesses of sparsely populated areas

Sparsity has been recognised as a major specificity of the Nordic peripheries in the European context. Protocol no. 6 of the accession treaties of Sweden and Finland led to the implementation of a specific priority objective in areas with low population densities, known as “Objective 6”, until 1999. Between 2000 and 2006 these areas with low population densities have been preserved within the context of the Structural Funds, as extensive parts of North Finland, North Sweden, Mid Sweden and East Finland were defined as “Objective 1” areas. In other words, these regions have been recognised as belonging to the less prosperous areas of the European Union, habitually suffering from a lack of business and social services and with a poor basic infrastructure endowment.

Extracts from Protocol no. 6 of the accession treaties of Sweden and Finland

Article 1

Until 31 December 1999, the Structural Funds, the Financial Instrument for Fisheries Guidance (FIFG) and the European Investment Bank (EIB) shall each contribute in an appropriate fashion to a further priority Objective in addition to the five referred to in Article 1 of Council Regulation (EEC) No 2052/88, as amended by Council Regulation (EEC) No 2081/93, which Objective shall be:

- to promote the development and structural adjustment of regions with an extremely low population density (hereinafter referred to as ‘Objective 6’).

Article 2

Areas covered by Objective 6 shall in principle represent or belong to regions at NUTS level II with a population density of 8 persons per km² or less. In addition, Community assistance may, subject to the requirement of concentration, also extend to adjacent and contiguous smaller areas fulfilling the same population density criterion. Such regions and areas, referred to in this Protocol as ‘regions’ covered by Objective 6, are listed in Annex 1.

[...]

Article 142

1. The Commission shall authorize Norway, Finland and Sweden to grant long-term national aids with a view to ensuring that agricultural activity is maintained in specific regions. These regions should cover the agricultural areas situated to the north of the 62nd Parallel and some adjacent areas south of that parallel affected by comparable climatic conditions rendering agricultural activity particularly difficult.

2. The regions referred to in paragraph 1 shall be determined by the Commission, taking into consideration in particular:

- the low population density;
- the portion of agricultural land in the overall surface area;
- the portion of agricultural land devoted to arable crops intended for human consumption, in the agricultural surface area used.

2.2. Three separate handicaps

Three main constraints on economic activity characterise peripheral regions of Finland, Norway and Sweden, namely remoteness, cold climate and sparse population.

The degree of remoteness corresponds to the distance to the core areas of Europe, where concentrations of people and companies create the main European markets, and where the most specialised providers of goods and services are to be found.

Cold climate can be seen as a general constraint on human settlement, but the most distinct economic impacts concern primary activities such as agriculture and forestry and the transport sector. Areas with a cold climate will generally be characterised by a short growing season, a soil with a reduced agricultural potential and temperatures considerably below freezing point in the wintertime. In terms of transport, harsh climatic constraints can lead to erratic variations in accessibility during winter, and to increased costs in respect of keeping the infrastructure free from snow.

Sparsity characterises regions where low population densities and dispersed settlement patterns create specific challenges for economic activity and public service provision. In other words, low regional population densities are not sufficient to characterise a region as “sparse”. Sparsity occurs insofar as the combination of low population densities and dispersed settlement patterns lead

to specific challenges for economic activity. This point is further elaborated in Chapter 6.

An important point to make is that strictly speaking, sparsity and remoteness are distinct concepts – the first relating to the spread or distribution of population within a region, the latter referring to the distance between the region and the main economic centres of Europe. However in the Nordic countries sparsity and peripherality are generally coincident. It is perhaps worth noting also, that if there is any causal relationship between them it runs from remoteness to sparsity (and not the other way round).

There are however clear similarities in the ways these two dimensions affect economic activity – both result in increased costs and difficulty of doing business (especially for primary and manufacturing sectors), as well as to the increasing cost of, and difficulty in providing public services.

This is quite helpful in fact: There is some literature relating to the handicap of peripherality, and much more to the advantages of agglomeration, but very little on the impacts of sparsity. We can however reasonably assume that these related discussions could tell us a lot about the business environment of sparsely populated areas. To put it another way, it is reasonable to infer that the benefits of agglomeration/central location define what is missing from the economic environment of both sparsely populated and peripheral regions. A brief account of theories around these structural weaknesses will thus be developed below.

2.3. Theoretical accounts of the main disadvantages associated with Sparsity/Peripherality

Increased cost of material inputs, due to higher transport costs

This argument dates back to the earliest writers on the geography of industrial location – perhaps the best known being Weber (1909), with a more recent summary being provided by David M Smith (1971). The basic argument here is that *ceteris paribus*, the optimal location for a manufacturing business that assembles material inputs from various sources will be where the cost of assembling those inputs is minimised. Generally speaking, because many of the required inputs are produced by other firms sparsely populated areas tend to be sub-optimal in this respect. However, it has to be said that the evidence for this is inconclusive: - transport costs are generally a minor element of total production costs these days (Vickermann 1991) and businesses in remoter areas do not seem have a higher transport related costs (PIEDA 1984, 1987, Chisholm 1995). However this may simply reflect a natural selection process favouring businesses that are less sensitive to transport costs in peripheral or sparsely populated areas.

The more optimistic proponents of (transport and communications) infrastructure investment and new technologies (including IT) have gone as far as to argue for the “death of distance” as a constraint to economic activity. However there is plenty of anecdotal evidence to suggest that costs associated with distance from the main hubs of economic activity are still perceived to be a major constraint in the periphery (see for example Copus 2004, Chapter 6). It is also worth pointing out that infrastructure improvements may have a perverse effect on some service industries in peripheral/sparsely populated regions, as they open them up to competition from other regions (the so called “pump effect”).

Absence of Agglomerative Advantage

The concepts of “agglomerative advantage” and “external economies of scale” also have a long history. Fujita et al (1999) have termed the conventional view of agglomerative advantage “Marshall’s trinity” after Alfred Marshall (1930), who first described them. The three elements are:

- a. Proximity to suppliers of intermediate inputs and purchasers of intermediate outputs
- b. The benefits of “labour pooling” (i.e. sharing a common labour market characterised by development of appropriate skills etc)
- c. Rapid transfer of information between firms.

Agglomerative advantage was a key concept for a group of regional development theorists of the late 1950s, including Myrdal (1957), Hirschmann (1958) and Friedmann (Wight 1983), who argued that regional disparities in economic performance were a natural consequence of processes of “cumulative causation”, which tended to favour densely populated central regions at the expense of sparsely populated peripheral ones.

More recently a group of academics sometimes referred to as the “New Economic Geographers”, the most well known being Paul Krugman have worked extensively on this issue, and have succeeded in providing “buttoned down, mathematically consistent analysis” (Krugman 1994) to show that agglomerative advantage can derive solely from Marshall’s first factor. They have also argued that reduced transport costs and population growth will both (*ceteris paribus*) result in increasing regional differentiation. This is not good news for sparsely populated and peripheral regions.

Exclusion from the benefits of modern logistics systems

In recent years a number of writers have noted that technological changes in transport and communication infrastructures have resulted in a more intense and complex use of logistics. Rapid transport and computerisation of stock

management have allowed the majority of activities to take advantage of just-in-time (JIT) delivery and therefore to reduce stock levels and hence capital requirements and perhaps also waste. (Rietvelt and Vickermann 2004) However scale economies mean that modern logistics systems tend to be best developed in more densely populated, central regions. Sparsely populated and peripheral regions tend to be linked into these systems through attenuated (and slower) links. This constitutes a significant new element of economic disadvantage for such regions.

Attenuated business networks hamper the development of “innovative milieu”

Innovation has long been recognised as a key driver of regional economic growth (Marshall 1930, Schumpeter 1934). The sort of innovation that drives regional development is not necessarily driven by exogenous technological breakthroughs, equally important here are factors such as the incremental and endogenous, “learning by doing”, through which “tacit knowledge” is accumulated within localised networks of firms, institutions and individuals. Thus, for instance, Nijkamp (2003 p402) writes; “local inter-firm networks may be seen as supporting mechanisms for new forms of creative entrepreneurship....”

The assumed connection between well developed and localised networks (bound together by both formal transaction linkages and by informal “non-market” social contacts or familial ties) is the foundation for several strands of research and a very large combined literature, including the Italian “industrial districts” school, “milieu innovateur”, clusters, local/regional innovation systems, and “learning regions”.

Although several writers have argued that effective networking can provide benefits analogous to agglomerative advantage for dispersed firms (Perry 1999 p3, Johansson and Quigley 2004 p165), others (Copus and Skuras 2005) have suggested that firms in remote, sparsely populated regions tend to lack the type of intense, localised network patterns which foster endogenous innovation processes and facilitate regional growth processes.

Lack of Critical Mass and Diseconomies of Scale

Finally, sparsely populated regions suffer from the disadvantage that their population (and therefore the demand for both public and private services) is often too small to allow for economies of scale and cost effective provision. There is generally a maximum range beyond which consumers are either not prepared to travel (due to travel cost) or are unable to travel (perhaps for safety reasons, as in the case of many medical services). In many sparsely populated areas services are (perforce) provided at locations determined by such “range” considerations, but at a very much lower scale than would be optimal, due to the lack of population within range.

Although these basic ideas owe much to Central Place Theory, the recent academic literature is in itself rather sparse. An interesting policy orientated analysis was recently carried out by consultants for Highlands and Islands and Argyll and Bute Councils in Scotland (Paula Gilding Consulting 2004). The analysis compared the cost of providing a range of services (education, cultural, environmental, roads and transport, planning and development and social work) in sparsely populated areas with more densely populated “control” areas. An accounting methodology was developed to enable the additional cost of providing the specified services within the sparsely populated areas (compared with what it would cost if the sparse areas were more densely populated). In the case of Highland Council, for instance the additional cost of providing services in the sparsely populated areas amounted to more than £12m *per annum*. In addition to this it was estimated that because certain services were not offered in the sparsely populated areas to the same standard as elsewhere, a further £0.8m would be required to bring them to the level of the rest of the region.

Additional Infrastructure and Operating Costs

In addition to the diseconomies of scale described above, harsh climatic conditions lead to further additional costs in Nordic sparsely populated regions. These span from operating costs for icebreakers in order to keep the Baltic seaports open in the winter months, to additional domestic and industrial heating expenses and specific technological constraints building and running a water supply system that can resist extreme negative temperatures.

Local government and service providers in sparsely populated areas will also incur additional costs in terms of road maintenance (where this is a regional responsibility), and in terms of the travel/transport element of the cost of operating across the range of services. Where public transport is subsidised, provision will inevitably be more expensive (on a per passenger-mile basis) where traffic volumes are relatively low.

Even if transport costs in the narrow sense have diminished over the last decade, there is little hope that this will outweigh the distant geographical location of these areas. Indeed, other types of ‘transaction costs’ (mentioned above) still favour agglomerations: costs to compensate for the lack of modern logistics systems, additional costs for the lack of business networks and the lack of innovative *milieus*, extra costs for diseconomies of scale and for the lack of critical mass, and extra costs for the lack of specialised business-related service sectors (such as banking, lawyers, tax advisers, translation services). Instead of witnessing the death of space and distance foreseen by some (Harvey, 1989) current trends lead us towards an increasing dominance of agglomerations and central regions.

3. Delimitating sparsely populated areas in the European Union and in Norway

Delimitating sparsely populated areas is a necessary prerequisite for a policy addressing sparsity, and is commonly done using methodologies based on average population densities. These however do not necessarily reflect the social and economic issues of sparsity, as they do not take into account the settlement structures within each region. For this reason, they are of little help in identifying areas where it is difficult or impossible to establish a level of basic service provision to the population, or where labour markets are too small for companies to find the competences they need. In the present chapter, we will attempt to define a delimitation method that would better reflect the issues of sparsity.

3.1. Delimitation according to NUTS 2 and NUTS 3 average densities

When dealing with sparsity, the accession treaties referred to above as well as other European regulations refer to average population densities at the NUTS 2 or NUTS 3 level¹. Ranking lists resulting from the currently used thresholds (8, 12.5 and, more recently 50 inh/km²) are presented in tables 3.1 and 3.2. Land areas without main lakes have been compiled for Finland, Sweden and Norway. These however only change the classification of one region, namely Norra Mellansverige.

Figures 3.1 and 3.2 represent NUTS 2 and NUTS 3 regions with the lowest average population densities. At both scales, Northern and Eastern regions of Norway, Sweden and Finland are among the least densely populated areas in the EU. At the NUTS 2 level, both Eastern Finland and the Norwegian region of Trøndelag are however more densely populated areas than the Scottish Highlands and Islands (Table 3.1). Zooming in to the NUTS 3 level, one finds that Kainuu is the only region with a population density below 8 inh/km² in Eastern Finland (Table 3.2). The other three NUTS 3 within the Eastern Finland NUTS 2 have densities varying from 9.75 inh/km² to 11.77 inh/km², which are comparable values to those encountered in the three least densely populated Spanish

¹ NUTS is a French acronym that stands for Unified Nomenclature of Statistical Territories. The NUTS 3 level corresponds to *fylke* in Norway, *län* in Sweden and *maakunta* in Finland, while NUTS 2 areas are groups of NUTS 3 with no specific administrative status in all three countries (Eurostat 1995; 1999a; 1999b; 2004).

NUTS 3 regions, namely Soria, Turel and Cuenca. Trøndelag is characterised by a strong contrast between its northern and southern parts, with an average population densities of 5.7 and 14.1 inh/km², respectively.

More generally, the approach based on average NUTS population densities fails to take into account the geographical structure of the population within these regions. Municipalities with low population densities in the periphery of a region comprising a major city are not taken into account. Even if one can understand the need for a simple approach to define the geographical scope of Structural Funds and for the Regional Aid Guidelines at the European level, alternative approaches need to be developed as a basis for negotiating local adaptations of these rules. These approaches may contribute to justify “swapping” weak areas situated outside officially defined “low population density regions” against stronger areas within them. This may in turn allow for the continued application of the current Objective 1 delimitation in areas where this is considered to be politically desirable.

Table 3.1. Lowest NUTS 2 average population densities in Europe (inh/km², 2002)

Name	Density (inh/ km²)	Population
Guyane (FR)	2.1	175 400
Övre Norrland (SE)	3.3	509 200
Nord-Norge (NO)	4.1	462 908
Pohjois-Suomi (FI)	4.7	628 300
Mellersta Norrland (SE)	5.2	373 000
Hedmark og Oppland (NO)	7.1	371 200
Highlands and Islands (UK)	9.3	368 200
Itä-Suomi (FI)	9.6	674 500
Trøndelag (NO)	9.6	393 780
Norra Mellansverige (SE)	12.9	828 100

Sources: Eurostat and Statistics Norway

Table 3.2. Lowest NUTS 3 average population densities in Europe (inh/ km², 2002)

Name	Density (inh/ km ²)	Population
Finnmark (NO)	1.5	73 732
Pohjois-Pohjanmaa (FI)	1.5	369 000
Lappi (FI)	2.0	188 500
Guyane (FR)	2.1	175 400
Jämtlands län (SE)	2.6	128 300
Norrbottens län (SE)	2.6	254 200
Kainuu (FI)	4.1	87 900
Västerbottens län (SE)	4.6	255 000
Nord-Trøndelag (NO)	5.7	127 457
Sogn og Fjordane (NO)	5.8	107 280
Troms (NO)	5.9	151 673
Nordland (NO)	6.2	237 503
Hedmark (NO)	6.9	187 965
Caithness and Sutherland, Ross and Cromarty (UK)	6.9	88 300
Lochaber, Skye and Lochalsh, Argyll and The Islands (UK)	7.0	100 700
Oppland (NO)	7.3	183 235
Comhairle Nan Eilan (Western Isles) (UK)	8.4	26 200
Soria (ES)	8.8	90 800
Teruel (ES)	9.2	136 300
Pohjois-Karjala (FI)	9.6	170 300
Dalarnas län (SE)	9.8	276 800
Evrytania (GR)	10.5	19 500
Telemark (NO)	10.8	165 710
Aust-Agder (NO)	11.2	102 945
Västernorrlands län (SE)	11.3	244 700
Etelä-Savo (FI)	11.4	163 900
Cuenca (ES)	11.8	200 900
Huesca (ES)	13.2	207 400
Keski-Pohjanmaa (FI)	13.5	70 800
Sør-Trøndelag (NO)	14.1	266 323
Grevena (GR)	14.2	32 400
Lozère (FR)	14.3	74 100
Etelä-Pohjanmaa (FI)	14.6	194 300
Guadalajara (ES)	13.9	178 800
Lääne-Eesti (EE)	14.9	164 700
Pohjois-Savo (FI)	15.3	252 400
Gävleborgs län (SE)	15.4	277 600
Shetland Islands (UK)	15.4	21 900
Baixo Alentejo (PT)	15.6	131 800
Värmlands län (SE)	15.7	273 700
Kesk-Eesti /EE)	15.9	143 000
Inverness and Nairn, Moray, Badenoch and Strathspey (UK)	15.8	111 900
Keski-Suomi (FI)	15.9	264 900

Sources: Eurostat and Statistics Norway

Average population densities at NUTS 2-level

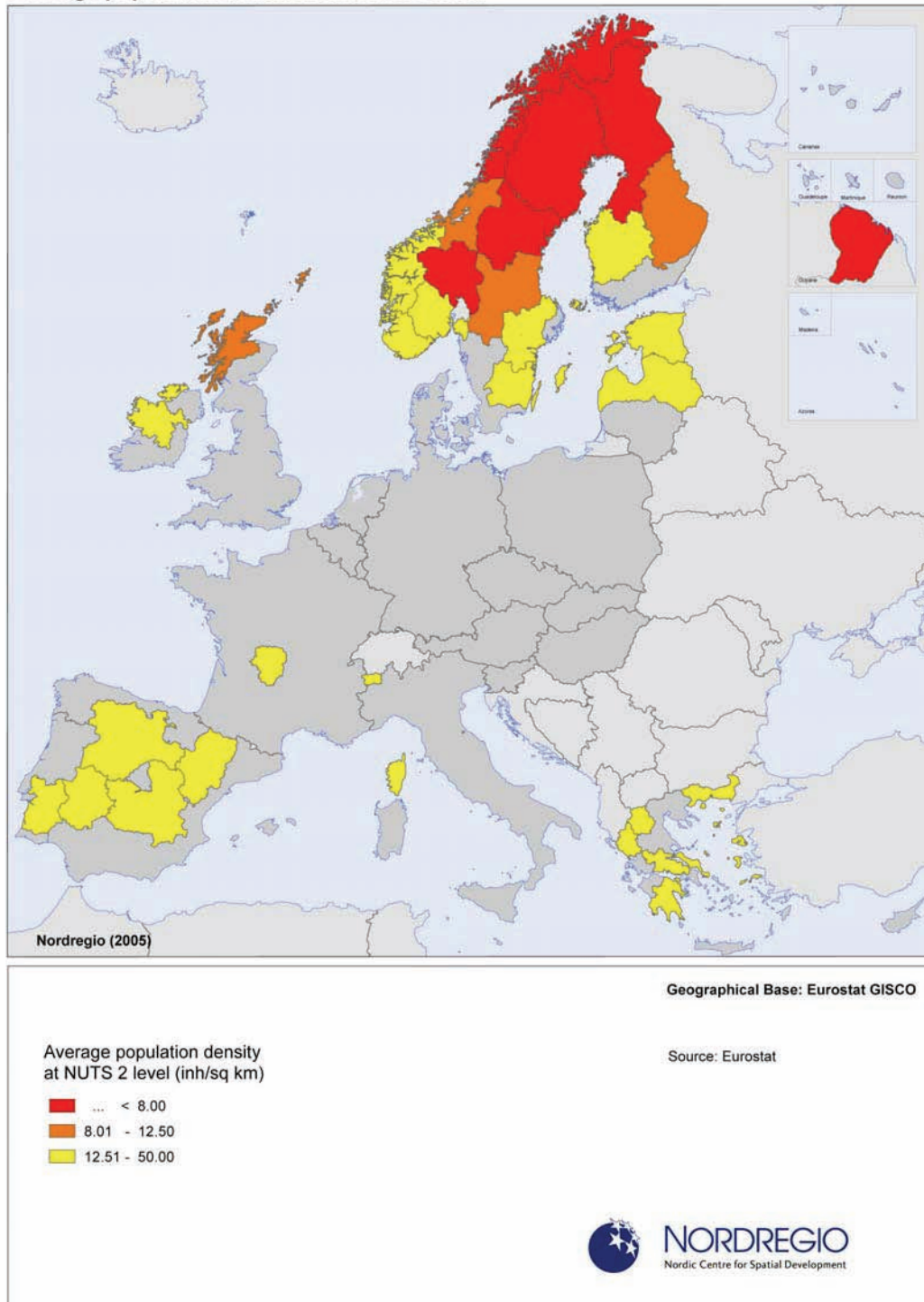


Figure 3.1. Average population densities at NUTS 2 level

North Sweden, North Finland, North Norway, Hedmark and Oppland (NO) and Mid-Sweden have the lowest average population densities at NUTS 2 level, while East Finland is in the same category as Trøndelag (NO), Central Sweden and the Highlands and Islands (UK).

Average population densities at NUTS 3-level

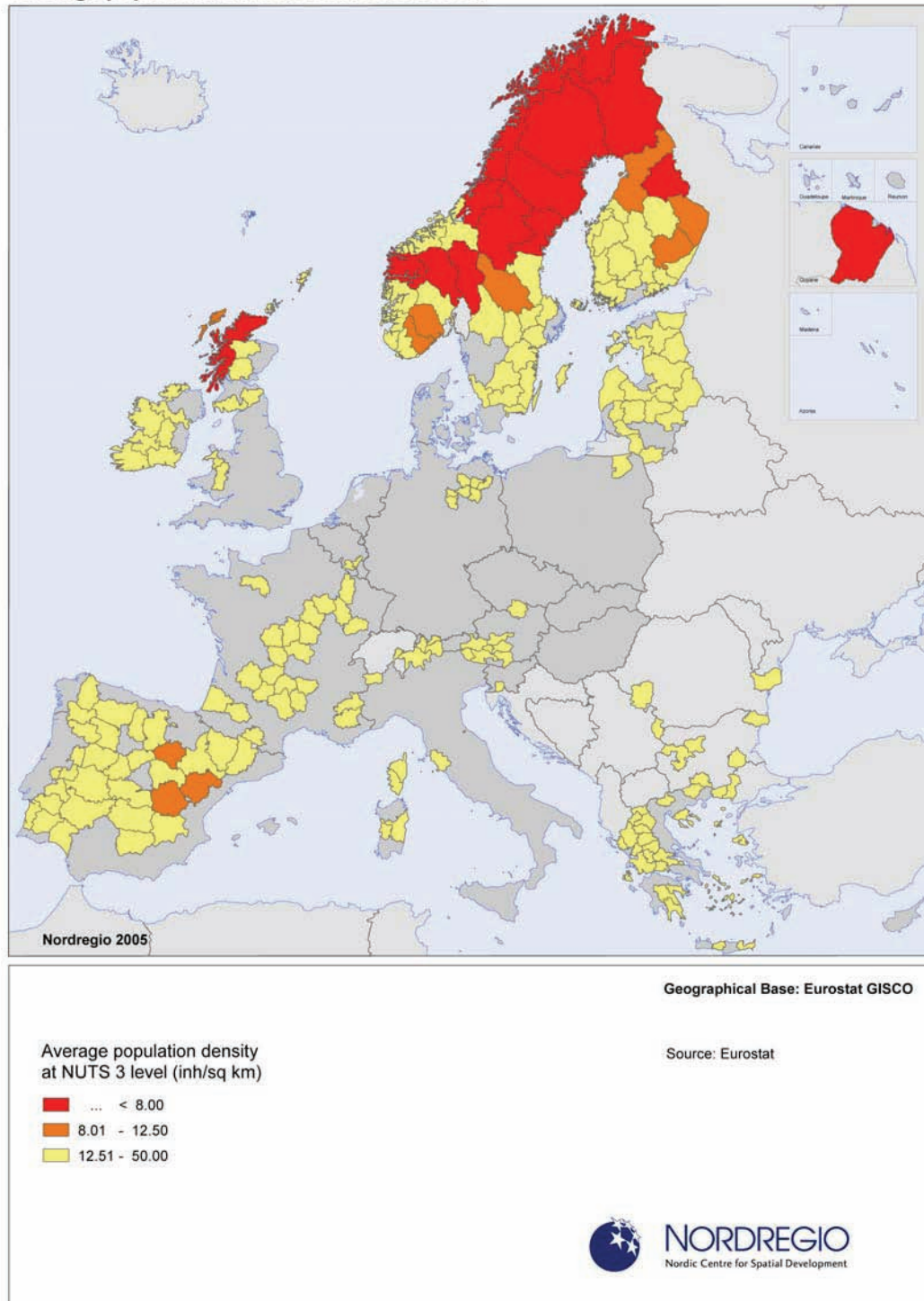


Figure 3.2. Average population densities at NUTS 3 level.

The geographical pattern is relatively different from that observed at NUTS 2-level.

In Mid-Norway, the map illustrates the contrast between Nord-Trøndelag (5.7 inh/km²) and Sør-Trøndelag (14.1 inh/km²). Likewise, one can note that Sogn og Fjordane (5.8 inh/km²) has significantly lower population densities than the rest of West-Norway.

The NUTS 3 regions of East-Finland have average densities ranging from 4.1 inh/km² in Kainuu to 15.3 inh/km² in Pohjois Savo.

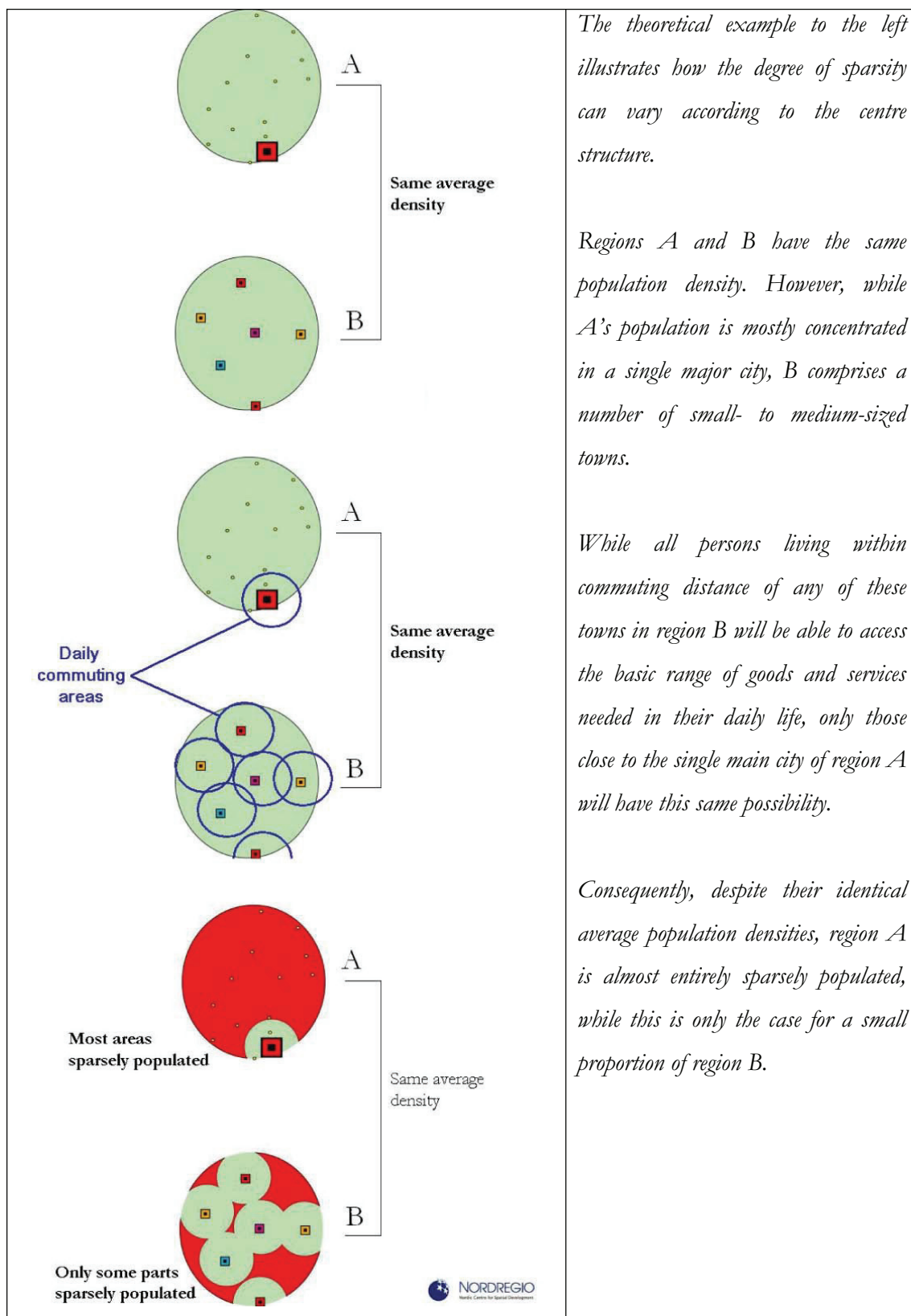
3.2 A delimitation approach reflecting the social and economic issues of sparsity

The use of regional average population densities as a proxy for sparsity is problematic in a number of respects. First, these measures are to a large extent determined by the scale and delimitation of regions. Average population densities are in fact constructed when one draws the limit between two regions.

For this reason, the geographical extent of areas characterised as sparsely populated on the basis of average population densities can vary significantly when administrative boundaries are modified. Results are furthermore not comparable from country to country, depending on the size of NUTS areas and on the way they are constructed: according to some delimitation rationales the rural and urban parts of a region are identified as two separate entities.

But most importantly, average population densities do not reflect the possible problems and challenges linked to sparse population. For the inhabitants of a specific region, the question is whether they can find the services, goods and competencies they need to uphold the living standard they expect. These will generally be present insofar as the demographic potential will be sufficient to make them profitable. Entrepreneurs will want to be able to recruit the personnel they need. They must therefore have access to a sufficiently wide and diverse labour market. The issue is therefore not linked to average regional population density, but to the total number of persons situated within commuting distance of a given point.

Figure 3.3 illustrates the relationship between sparsity and average population densities. This theoretical example is based on two regions, A and B , which have the same population density. However, while A 's population is mostly concentrated in a single major city, B comprises a number of small- to medium-sized towns. While all persons living within commuting distance of any of these towns in region B will be able to access the basic range of goods and services needed in their daily life, only those close to the single main city of region A will have this same possibility. Consequently, despite their identical average population densities, region A is almost entirely sparsely populated, while this is only the case for a small proportion of region B .



The theoretical example to the left illustrates how the degree of sparsity can vary according to the centre structure.

Regions *A* and *B* have the same population density. However, while *A*'s population is mostly concentrated in a single major city, *B* comprises a number of small- to medium-sized towns.

While all persons living within commuting distance of any of these towns in region *B* will be able to access the basic range of goods and services needed in their daily life, only those close to the single main city of region *A* will have this same possibility.

Consequently, despite their identical average population densities, region *A* is almost entirely sparsely populated, while this is only the case for a small proportion of region *B*.

Figure 3.3. Theoretical model illustrating the effect of centre structures on sparsity

The most relevant sparsity measure should therefore reflect the number of persons within a reasonable commuting distance. A 50 km distance threshold (measured as the crow flies, i.e. airline distance) has been used for this purpose. This radius translates into an area of about 7 854 km². The total number of persons within this area is referred to as the **population potential** of each point in space. It is calculated using population figures provided for 1x1 km grid cells for Finland, Sweden and Norway, and for municipalities in the rest of Europe.

Based on the arguments presented above, one can reasonably assume that the relationship between the population potential and the intensity of constraints linked to sparsity is not a linear one. This relationship is rather determined by a number of thresholds corresponding to the minimum degree of profitability for the provision of each kind of goods and services. These thresholds in other words correspond to the critical population mass for a certain type of activity. The level of constraint will therefore rise steeply at some key levels, e.g. when the population potential is insufficient to establish an economically viable supply of foodstuff.

Within this project, it has not been possible to calculate these thresholds on an empirical basis, as this would require very ample enquiries on profitability threshold levels for the provision of different types of goods and services. Instead, a set of five different population potential thresholds were tested: Three of them correspond to population densities often referred to in the European context: 8 inh/km², 12.5 inh/km² and 50 inh/km². An additional threshold corresponds to 5 % of the European average, while the final one corresponds to a hypothetical minimum population potential to run daily services. Table 3.3 illustrates how these thresholds translate into minimum population potentials within a commuting radius of 50 km. The population potential indicated in Table 3.3. is the maximum value, above which the area is not considered to be sparsely populated.

Table 3.3. Thresholds and minimum population potential

Threshold	Minimum population potential (i.e. threshold x 7,854 km ²)	Rounded minimum population potential
8 inh/km ²	62 832	65 000
12.5 inh/km ²	98 175	100 000
50 inh/km ²	392 700	395 000
5 % of European average	14 370	15 000
Daily services	10 000	10 000

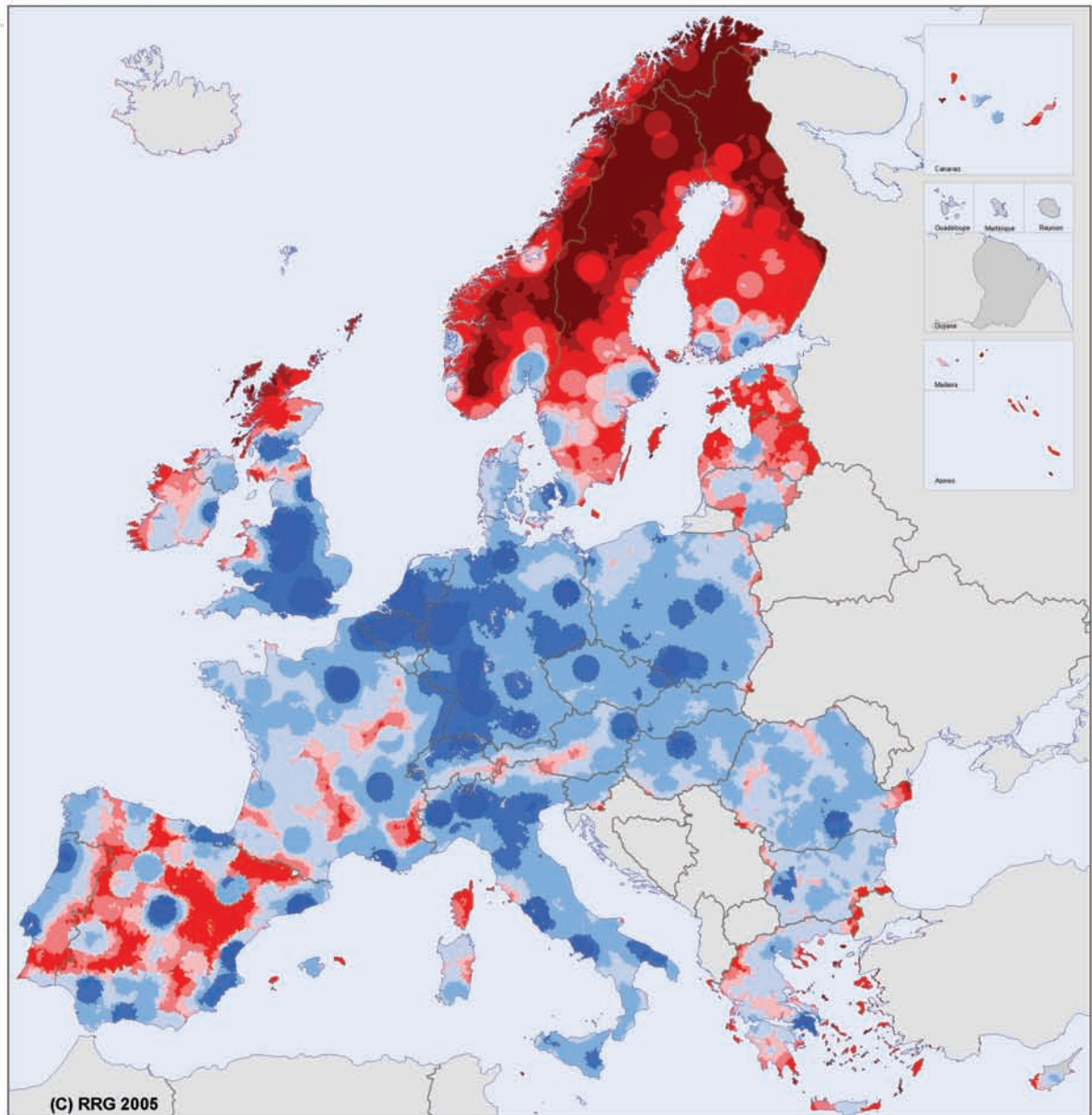
3.3. Population potentials in Europe

Figure 3.4 shows population potential within a 50 km radius standardised at the European average. The potential is defined as the sum of all people living within a 50 km radius from the origin location, measured as the crow flies.

The potentials are presented in a standardised form as percentages on the respective European average, 100 corresponding to the European average value. Areas with population potentials below 5% of the European average can only be found in Northern Scandinavia (Figure 3.4.). These areas can be found in the inner parts Sweden north of Dalarna, in Northern Norway as well in a few inner areas of Southern Norway and in the interior of Finland north of Kainuu. In the case of Eastern Finland, no areas with population potentials below 5 % of the European average can be found.

Eastern Finland is indeed mostly composed of areas with a population potential corresponding to 25 to 50 % of the European average. Comparable values can be found in the Scottish Highland and Islands, in Eastern Ireland, in central Spain, in the Baltic countries and in most of the Greek islands.

Population potential in Europe



Geographical Base: Eurostat GISCO

Standardised population potential:
Europe (EU27+NO+CH)=100=287,407

Source: RRG

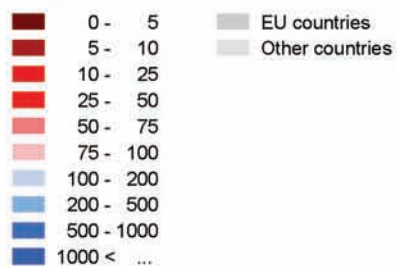


Figure 3.4. Population potential within a 50 km radius in Europe

3.4. Identification of sparsely populated areas

Based on the arguments presented above, we consider that the most valid measure of regional sparsity is the proportion of the area characterised by low population potentials. Defining which population potentials are to be considered as low depends upon which types of economic activities or public services are taken into account, as the demographic critical mass can vary according to the sector, the organisational framework or to the institutional context. Given this complexity, the choice of a threshold value can only to a limited extent be informed by empirical and scientific evidence: it thus remains a fundamentally political choice.

Population potentials corresponding to a density below 50 inh/km²

As could be expected, the least restrictive threshold of 50 inh/km² (Figure 3.5.), or 395 000 people within a 50 km radius, considered significant parts of Europe as sparsely populated. The inclusion of a large part of France, stretching from most of the South-Western regions to the Ardennes in the North-East, implies that the perspective on sparsity is rather remote from that generally envisaged in the Nordic context. The three Nordic countries Finland, Sweden and Norway are almost entirely considered sparsely populated, except for the capital city areas and the areas around Turku, Malmö, Gothenburg and Bergen. In addition, major parts of Scotland, Wales and Ireland, Spain, and eastern Portugal, as well all Greek islands except for the immediate surroundings of Heraklion, are considered sparsely populated. Another arc also emerges here crossing the inner Alps ; even the rural areas in Mecklenburg-Vorpommern and Brandenburg in Germany being considered sparsely populated according to this threshold, as are the outermost islands of Spain and Portugal with the exception of Gran Canaria and Teneriffa. Altogether, almost half of the EU27+2 area (43%) is considered as being sparsely populated (Table 3.4.) according to this scenario.

One can note that a relatively high proportion of areas situated along the terrestrial outer borders of the study area (EU 27 + Norway and Switzerland) also appear as being sparsely populated in this map. These results may be due to a statistical effect. Indeed, as we did not have access to municipal population figures outside of the study area, the

population potential figures for areas situated at less than 50km from a terrestrial are artificially reduced (e.g. along the Eastern border of Poland)

Population potentials corresponding to a density below 12.5 and 8 inh/km²

Applying the threshold of 12.5 inh/km² (Figure 3.6), or a number of 100,000 people within a 50 km radius, significantly reduces the extent of sparsely populated areas in Europe. Clearly, most parts of Finland, Sweden and also Norway remain sparsely populated, however, the southern parts of all three countries are excluded, as well as some coastal areas. Otherwise, most parts of Scotland, all of the Greek islands (with the exception of Crete) and significant regions in Spain are still considered as being sparsely populated. Islands such as Madeira and Lanzarote are however not considered as being sparsely populated. Altogether, the overall proportion of sparsely populated areas on the EU27+2 area is reduced to 18.7% (Table 3.4) under this scenario.

The difference between the threshold of 12.5 inh/km² (Figure 3.6) and that of 8 inh/km² as shown in Figure 3.7 is only marginal. Basically, the same European regions are considered sparsely populated, except that the spatial extent of all of them is reduced compared to the previous threshold. Consequently, the proportion of these areas from the total EU27+2 area is reduced to 15.2% (Table 3.4) in this scenario.

In both these maps, a number of island regions have population potentials below the envisaged thresholds. This is the case for most Greek islands, as well as for the Danish island of Bornholm and the Finnish archipelago of Åland. There is a parallel between insularity and sparsity in terms of population potential: in both cases, the population can experience the same types of problems accessing the goods and services they need in their daily life (except in cases where the island's population density is very high, as for example on Gran Canaria and Tenerife). However, as insularity is a specific type of permanent handicap in European policies (European Commission, 2001), these island regions have been disregarded in respect of the succeeding analyses.

Population potentials below 5% of the European average

In contrast, the threshold of 5 % of the European average (or in other words, 15 000 people within the 50 km radius) results in a major fall in the number and extent of sparsely populated areas in Europe. With the exception of insular areas, the areas considered as sparsely populated are now limited to Finland, Sweden and, to a smaller extent, Norway (Figure 3.8). In contrast to the previous picture, the extent of these areas in the three countries is again reduced, particularly on the Norwegian side. All coastal areas in Finland and Sweden along the Baltic Sea are now no longer considered as sparsely populated. As to be expected, the overall proportion of the sparsely populated areas in the total EU27+2 area is reduced to a mere 7 percent (Table 3.4) under this scenario.

The final threshold, based on an arbitrary level below which access to daily services would be jeopardized, of 10 000 inhabitants within the 50 km radius reveals no greater differences to the previous one, (Figures 3.9).

Table 3.4. Percentage of sparsely populated area on total area of EU27+2

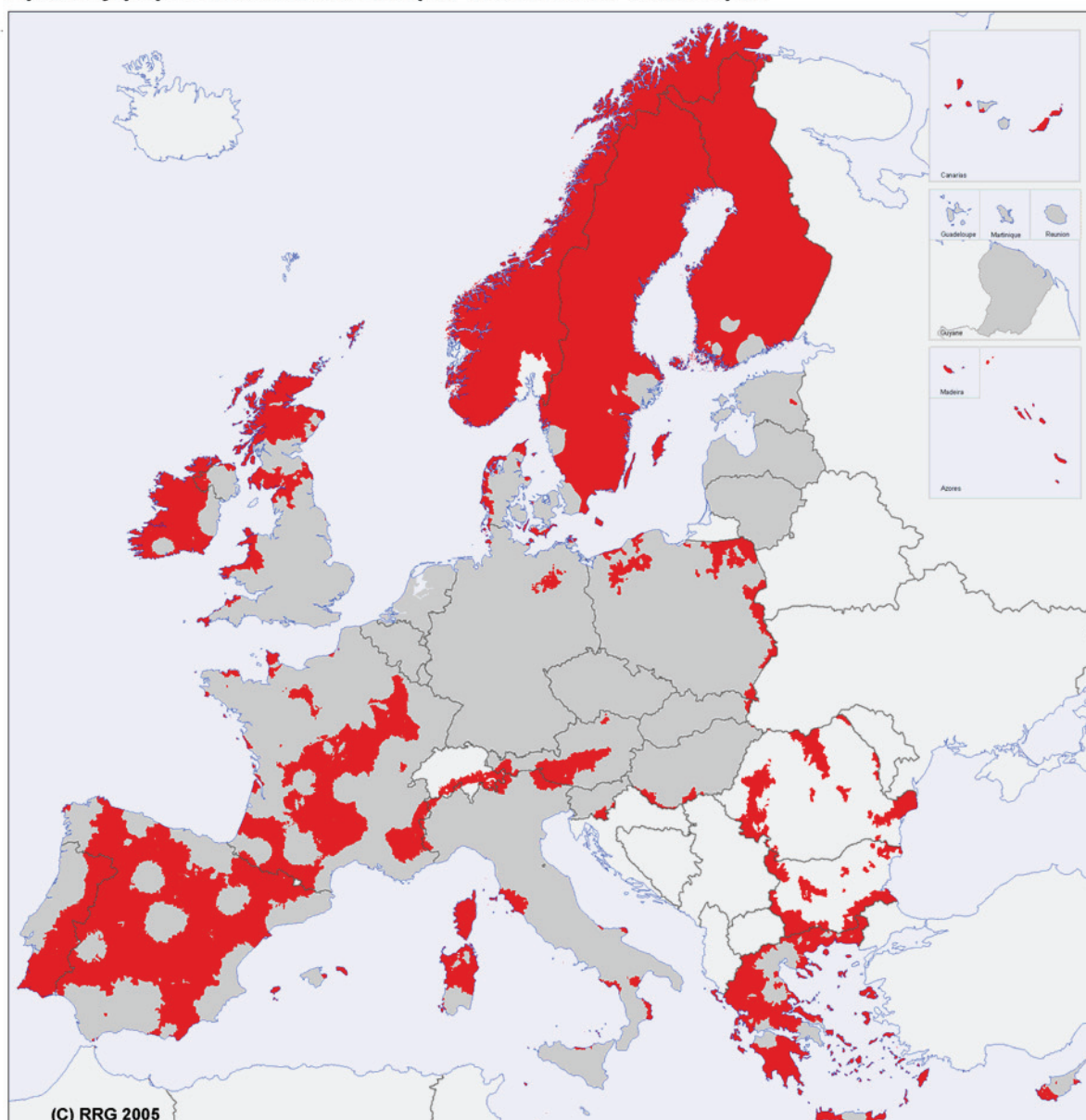
Threshold	Sparsely populated areas	
	in km ²	% of EU27+2
50 inh/km ²	2 011 264	43.0
12.5 inh/km ²	876 494	18.7
8 inh/km ²	709 529	15.2
5% European average	340 967	7.3
Daily services	251 969	5.4

EU27+2 = European Union, plus Bulgaria, Romania, Norway, and Switzerland.

Conclusion

The threshold of 12.5 inh/km² appears most adapted to the geographical focus of the present study. It furthermore corresponds to a threshold that is already embedded in European policies, as it is applied in European State aid regulations. We have consequently chosen to use this threshold in the following analyses.

Sparsely populated areas in Europe: Threshold of 50inh/sqkm



Geographical Base: Eurostat GISCO

Minimum population potential assumed: 395,000

- Sparsely populated areas
- EU countries: areas not considered as sparsely populated
- Other countries

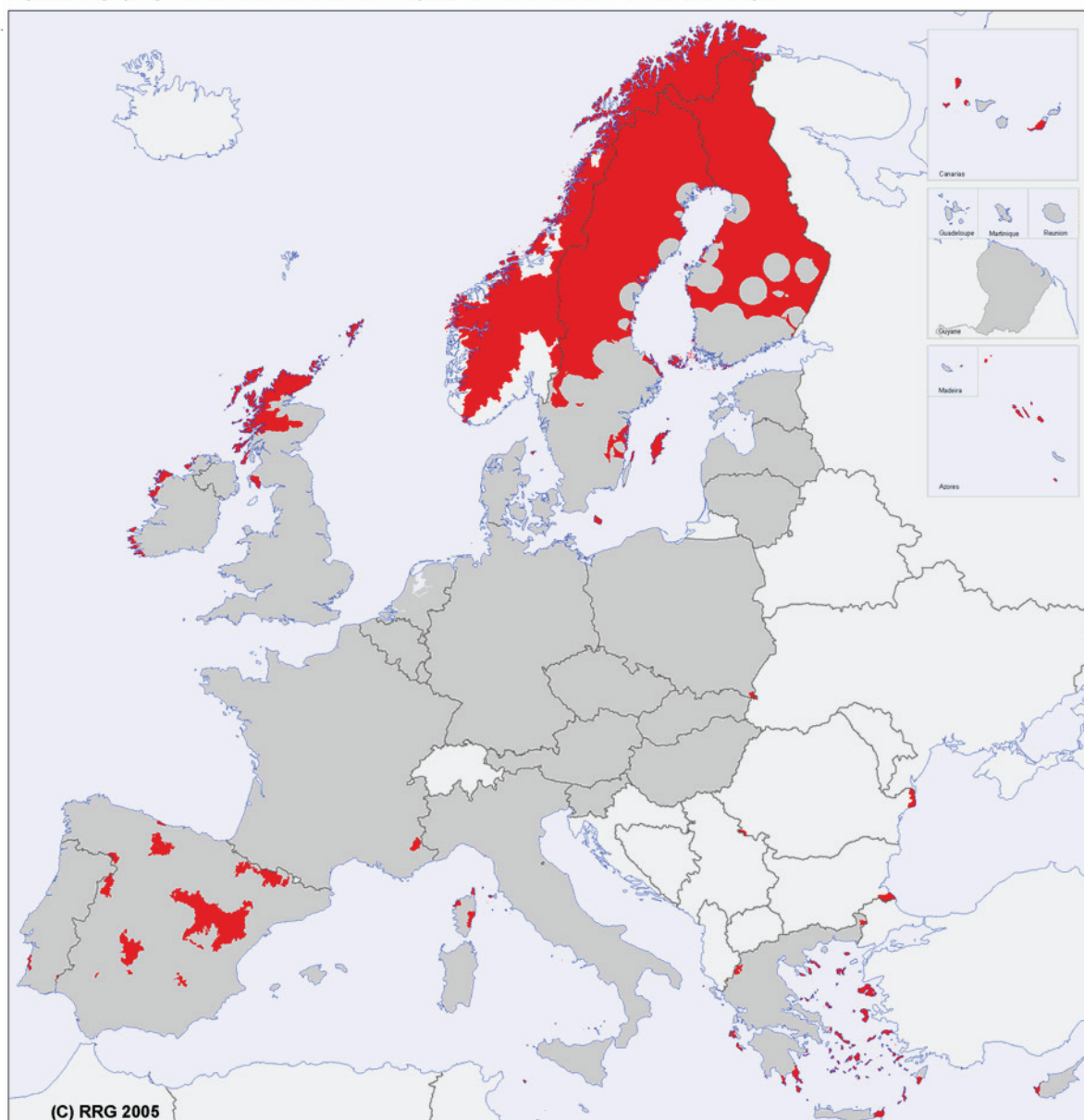
Source: RRG

FI, SE: 1x1 km grid
Rest of EU, CH, NO: NUTS-5

Figure 3.5. Sparsely populated areas in Europe - threshold of 50 inh/ km²

In all red areas, the number of people living within a 50 km radius is lower than 395 000.

Sparsely populated areas in Europe: Threshold of 12.5 inh/sqkm



Geographical Base: Eurostat GISCO

Minimum population potential assumed: 100,000

- Sparsely populated areas
- EU countries: areas not considered as sparsely populated
- Other countries

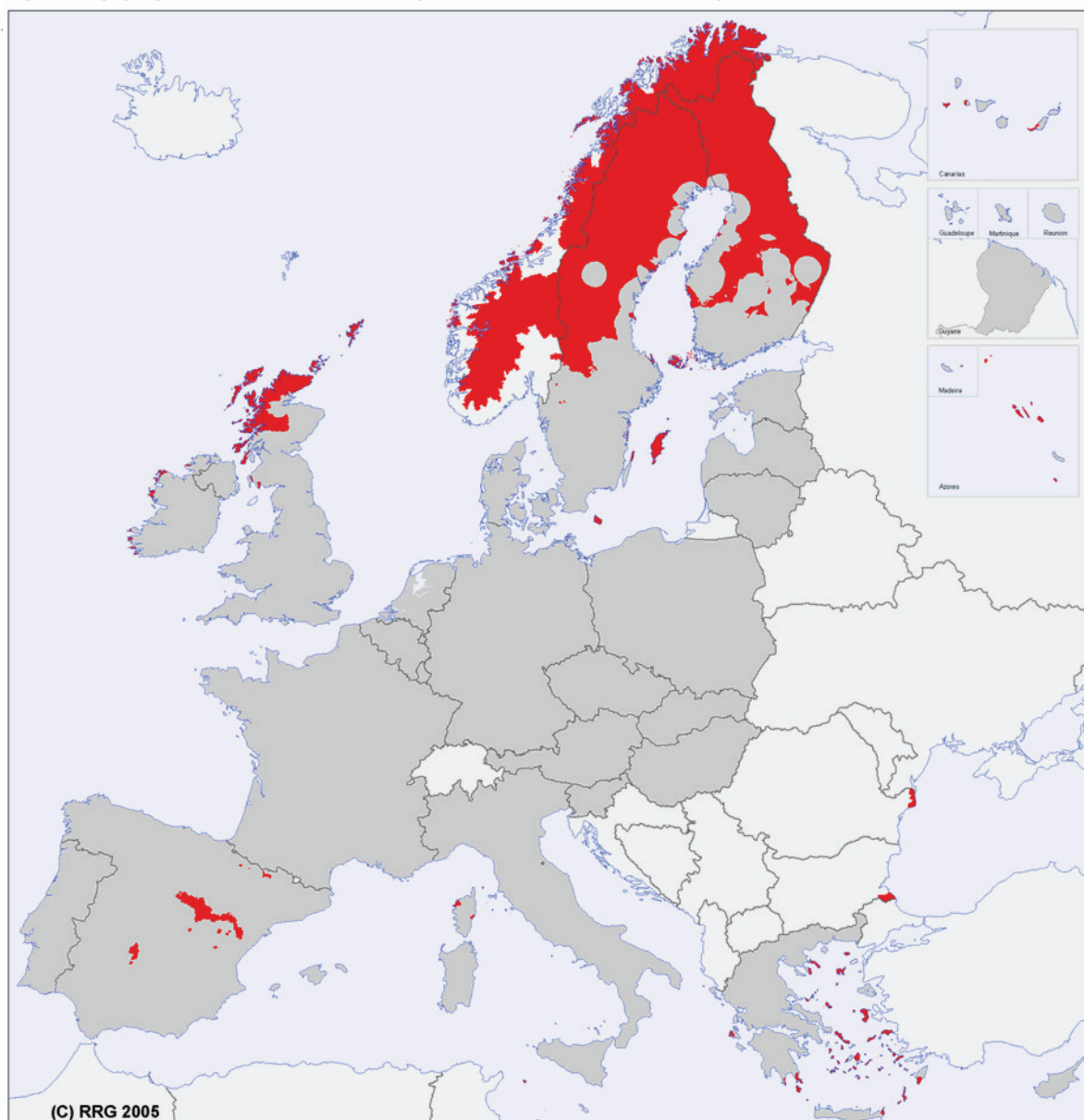
Source: RRG

FI, SE: 1x1 km grid
Rest of EU, CH, NO: NUTS-5

Figure 3.6. Sparsely populated areas in Europe - threshold of 12.5 inh/ km²

In all red areas, the number of people living within a 50 km radius is lower than 100 000.

Sparsely populated areas in Europe: Threshold of 8 inh/sqkm



Geographical Base: Eurostat GISCO

Minimum population potential assumed: 65,000

- Sparsely populated areas
- EU countries: areas not considered as sparsely populated
- Other countries

Source: RRG

FI, SE: 1x1 km grid
Rest of EU, CH, NO: NUTS-5

Figure 3.7. Sparsely populated areas in Europe - threshold 8 inh/km²

In all red areas, the number of people living within a 50 km radius is lower than 65 000.

Sparsely populated areas in Europe: Threshold 5 % of European average

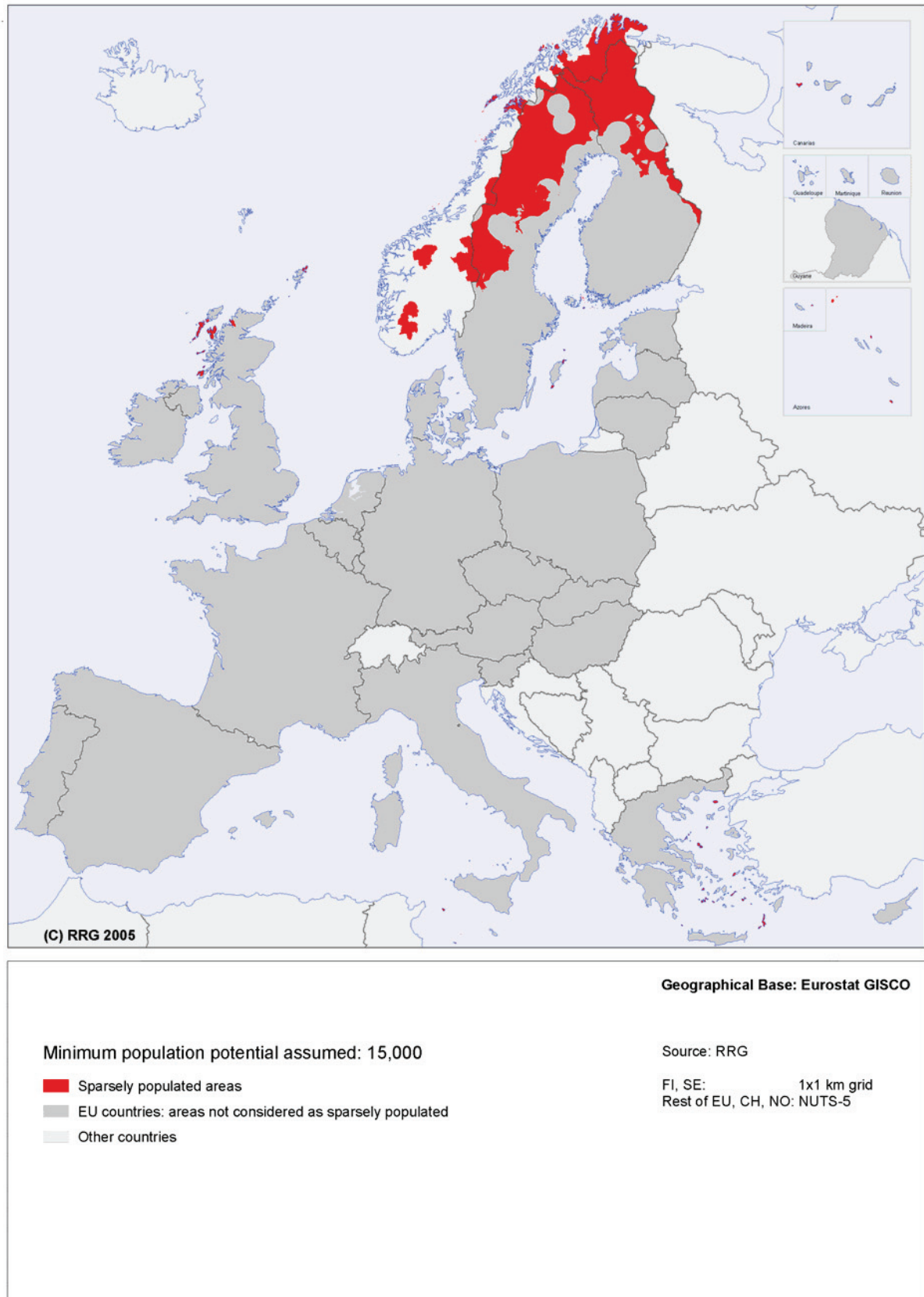


Figure 3.8. Sparsely populated areas in Europe - threshold 5% of European average

In all red areas, the number of people living within a 50 km radius is lower than 15 000.

Sparsely populated areas in Europe: Threshold 'daily services'

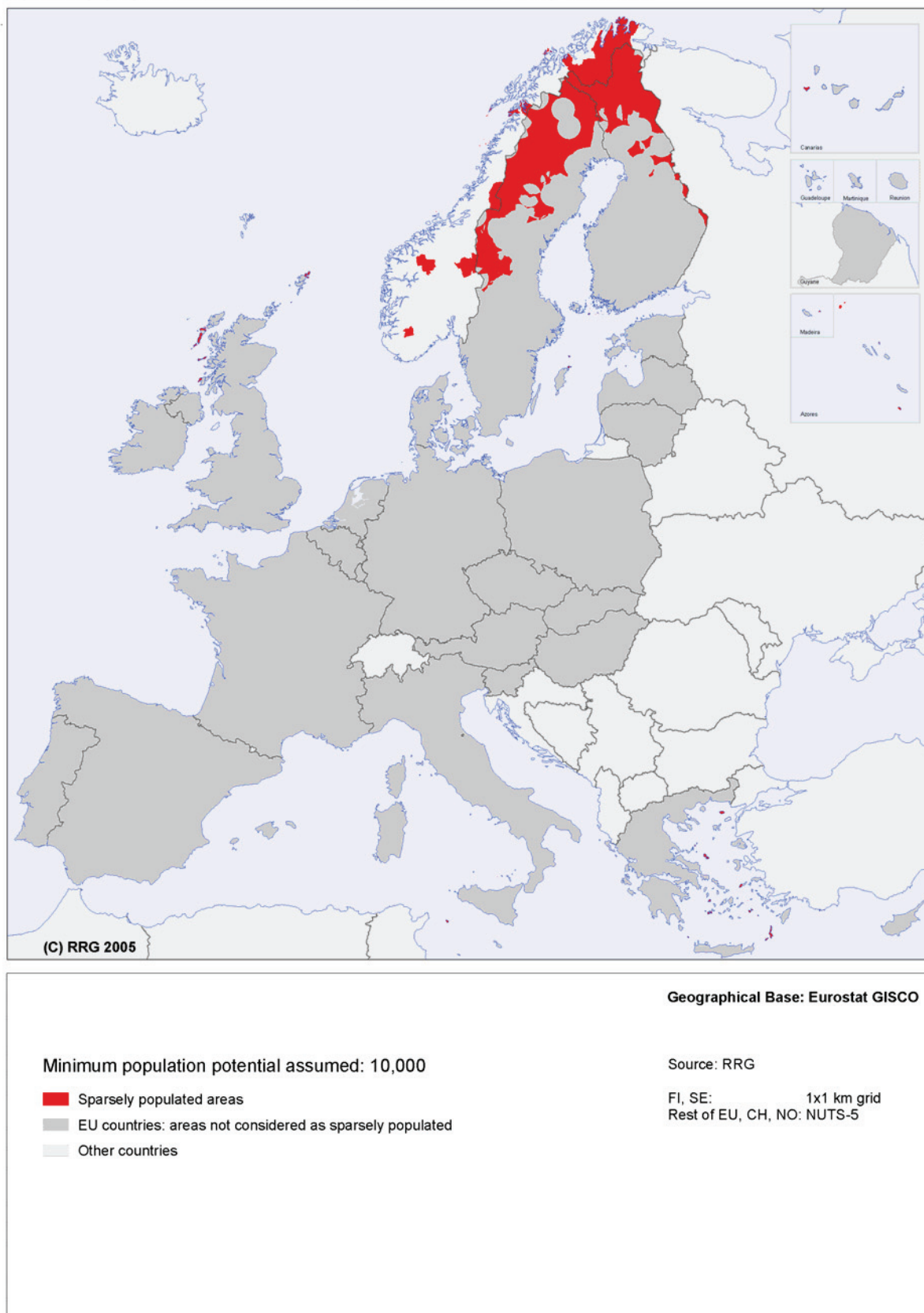


Figure 3.9. Sparsely populated areas in Europe - threshold daily services

In all red areas, the number of people living within a 50 km radius is lower than 10 000.

3.5. Delimitation of the study area

The previously identified sparsely populated areas need to be approximated to regional entities in order to gain political relevance. We have therefore overlaid them with NUTS 2 and NUTS 3 regions (Figures 3.10 and 3.11).

Tables 3.5 and 3.6 provide a ranking of NUTS 2 and NUTS 3 regions according to the proportion of the each region defined as sparsely populated according to these criteria. This ranking includes a number of island regions (Åland, Voreio Aigaio and Azores), as the calculation of population potential does not distinguish between land and sea areas. As previously noted, these island regions can however be disregarded in this context, insofar as insularity is considered as a physical handicap in its own right (European Commission, 2003).

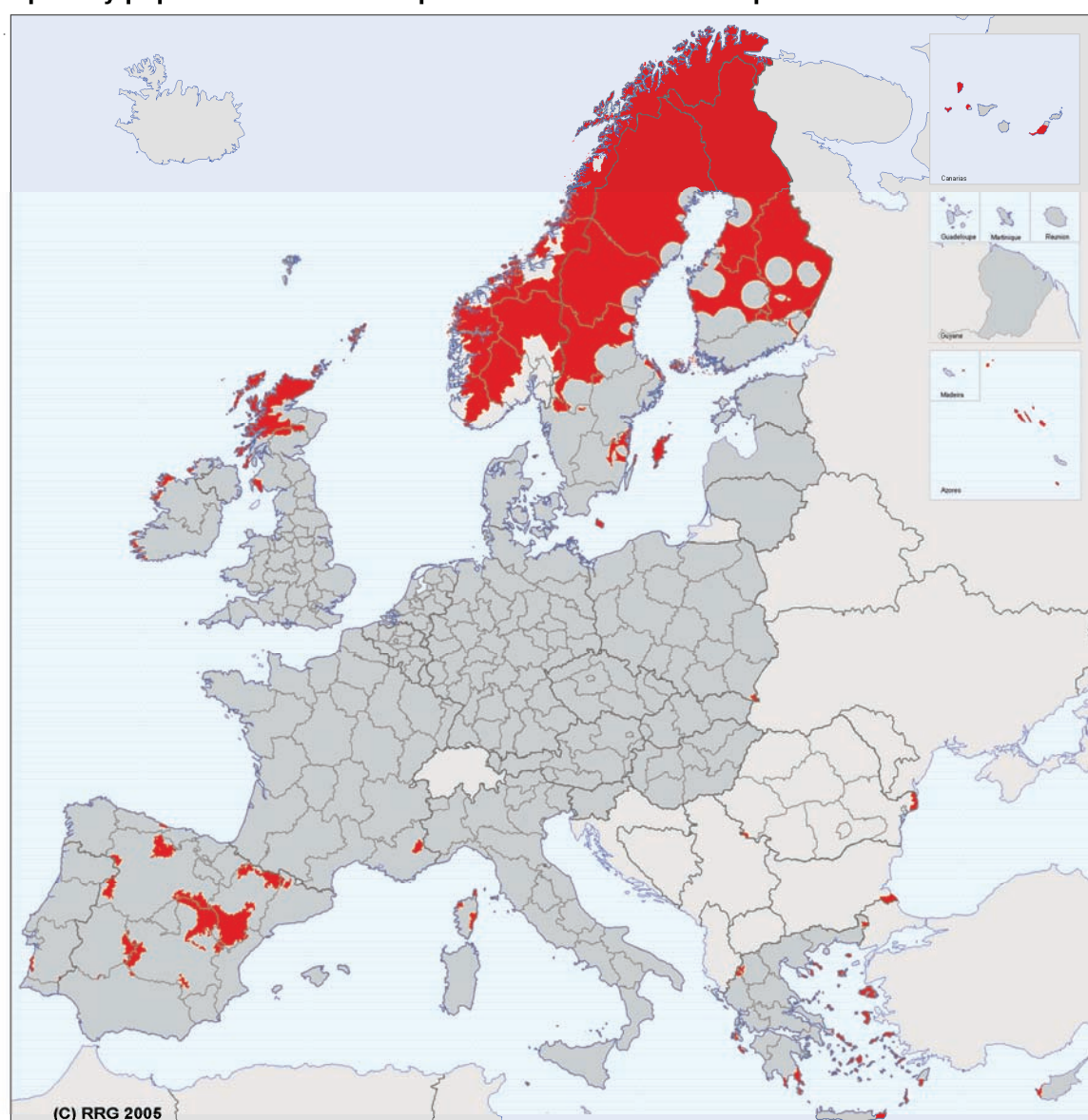
The alternative ranking is otherwise similar to that produced according to regional average values (Tables 3.1 and 3.2) concerning the most sparsely populated regions, insofar as these are Pohjois Suomi, Övre Norrland and Mellersta Norrland in both cases. However, the proportion of sparsely populated areas is significantly higher in Eastern Finland than in the Highlands and Islands (79% and 70%, respectively) even if the average population density is slightly higher in the Finnish region (9.82 inh/km², against 9.31). There is consequently some coherence to considering the NUTS 2 regions of Pohjois Suomi, Itä Suomi, Övre Norrland and Mellersta Norrland as the most sparsely populated regions in the European Union (including Bulgaria and Romania). The regions with corresponding proportions of sparsely populated areas are Nord Norge (91%) and Hedmark and Oppland (81%).

Sparse population densities are a challenge not only to the directly concerned areas, but also to neighbouring regions. These regions are indeed placed in a situation of peripherality as at least one border is facing a predominantly uninhabited land area. It therefore seems natural to include in the study area not only the previously mentioned NUTS 2 regions, but also contiguous NUTS 3 regions. The objective is to consider how these areas are dealing with their specific geographic situation, and to what extent they may be similar or unlike the sparsely populated regions *per se*.

Figure 3.13 illustrates the resulting study area delimitation. The Swedish region of Värmland is included as it is contiguous to the Norwegian sparsely populated region of Hedmark and Oppland. As shown by Figure 3.14, this study area comprises all of the Nordic Objective 1 areas for the period 2000-2006.

The study area delimitation is not to be considered as a “sparsely populated area” as such, but as a territory delimited for the analysis of population sparsity. It should not therefore be seen as a proposed intervention area. It is merely to be considered as an empirically grounded spatial context for further enquiries on the social and economic impact of sparse population, peripherality and harsh climatic conditions. Within this spatial context, further statistical analyses are developed in the following sections of this report.

Sparsely populated areas in Europe: Threshold of 12.5 inh/sqkm



Geographical Base: Eurostat GISCO

Minimum population potential assumed: 100,000
(Overlay with NUTS-2 regions as of 2003)

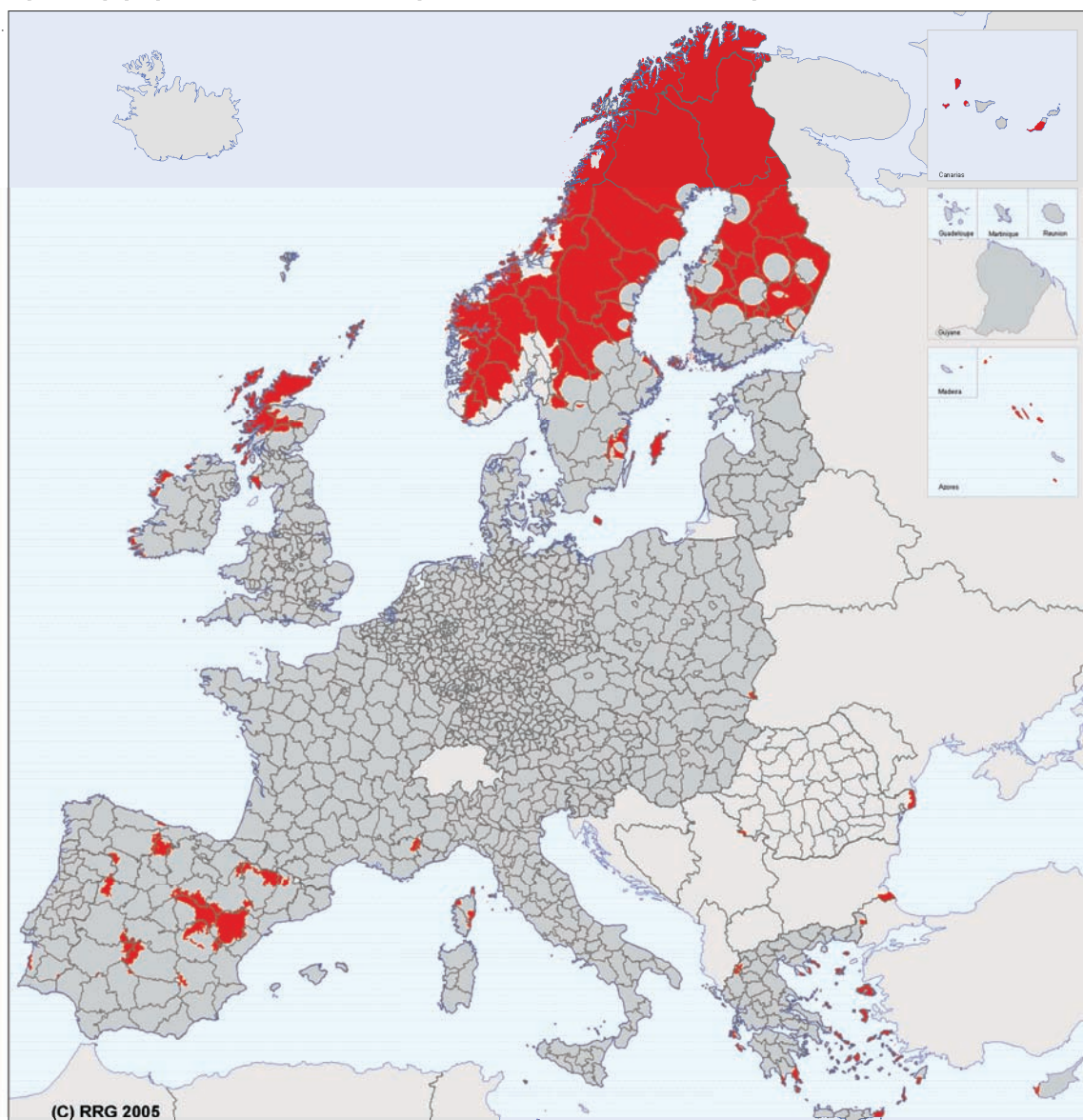
- Sparsely populated areas
- EU countries: areas not considered as sparsely populated
- Other countries

Source: RRG

FI, SE: 1x1 km grid
Rest of EU, CH, NO: NUTS-5

Figure 3.10. Overlay of sparsely populated areas in Europe (threshold 12.5 inh/km²) with NUTS 2 regions

Sparsely populated areas in Europe: Threshold of 12.5 inh/sqkm



Geographical Base: Eurostat GISCO

Minimum population potential assumed: 100,000
(Overlay with NUTS-3 regions as of 2003)

Source: RRG

- Sparsely populated areas
- EU countries: areas not considered as sparsely populated
- Other countries

FI, SE: 1x1 km grid
Rest of EU, CH, NO: NUTS-5

Figure 3.11 Overlay of sparsely populated areas in Europe (threshold 12.5 inh/km²)
with NUTS 3 regions

Sparsely populated areas in Europe: Threshold of 12.5 inh/sqkm

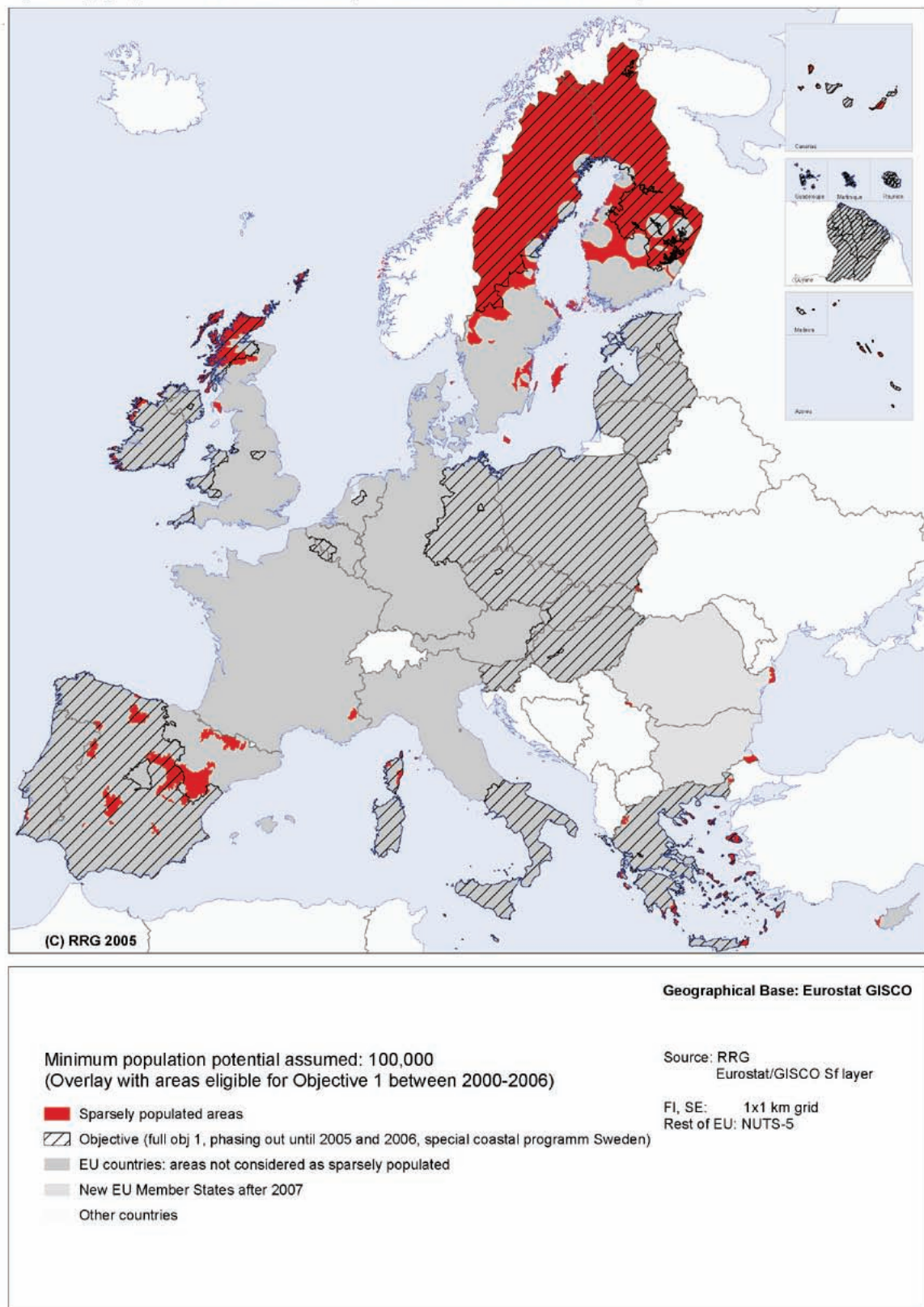


Figure 3.12 Overlay of EU sparsely populated areas in Europe (threshold 12.5 inh/km²) with Objective 1 regions (2000-2006)

Table 3.5. Percentage of sparsely populated areas within each NUTS-2 region, using a threshold value 12.5 inh/ km² and a 50 km radius

Country	Name	Percentage
FI	Pohjois-Suomi	94
SE	Övre Norrland	94
SE	Mellersta Norrland	93
NO	Nord-Norge	91
FI	Aaland	86
GR	Voreio Aigaio	86
NO	Hedmark og Oppland	81
FI	Itä-Suomi	79
UK	Highlands and Islands	70
NO	Trøndelag	69
PT	Regio Autonoma dos Acores	65
SE	Norra Mellansverige	62
GR	Notio Aigaio	58

Table 3.6. Percentage of sparsely populated areas within each NUTS-3 region, using a threshold value 12.5 inh/ km² and a 50 km radius.

Country	Name	Percentage
SE	Jämtlands län	100.00
FI	Lappi	99.90
DK	Bornholms amt	99.00
FI	Kainuu	98.90
SE	Norrbottnens län	96.20
NO	Finnmark	95.70
SE	Gotlands län	94.45
SE	Västerbottens län	91.20
NO	Sogn og Fjordane	90.40
NO	Troms	89.80
UK	Eilean Siar (Western Isles)	88.70
FI	Aaland	87.30
GR	Chios	87.30
UK	Cornwall and Isles of Scilly	86.70
GR	Lesvos	86.50
UK	Caithness and Sutherland and	85.30
NO	Nordland	85.20
FI	Pohjois-Pohjanmaa	83.20
NO	Hedmark	82.00
GR	Samos	81.90
FI	Etelä-Savo	81.60
NO	Oppland	80.40
UK	Shetland Islands	79.80
UK	Orkney Islands	79.60
SE	Västernorrlands län	77.90
FI	Keski-Pohjanmaa	76.10
FI	Pohjois-Karjala	73.60
NO	Telemark	73.30
GR	Kyklades	72.50
ES	Teruel	71.40
UK	Lochaber, Skye and Lochalsh	71.00
NO	Nord-Trøndelag	69.50
SE	Dalarnas län	69.40
NO	Sør-Trøndelag	68.30
NO	Buskerud	67.70
GR	Zakynthos	65.00
PT	Regio Autonoma dos Acores	64.50
SE	Gävleborgs län	62.90

Study area delimitation

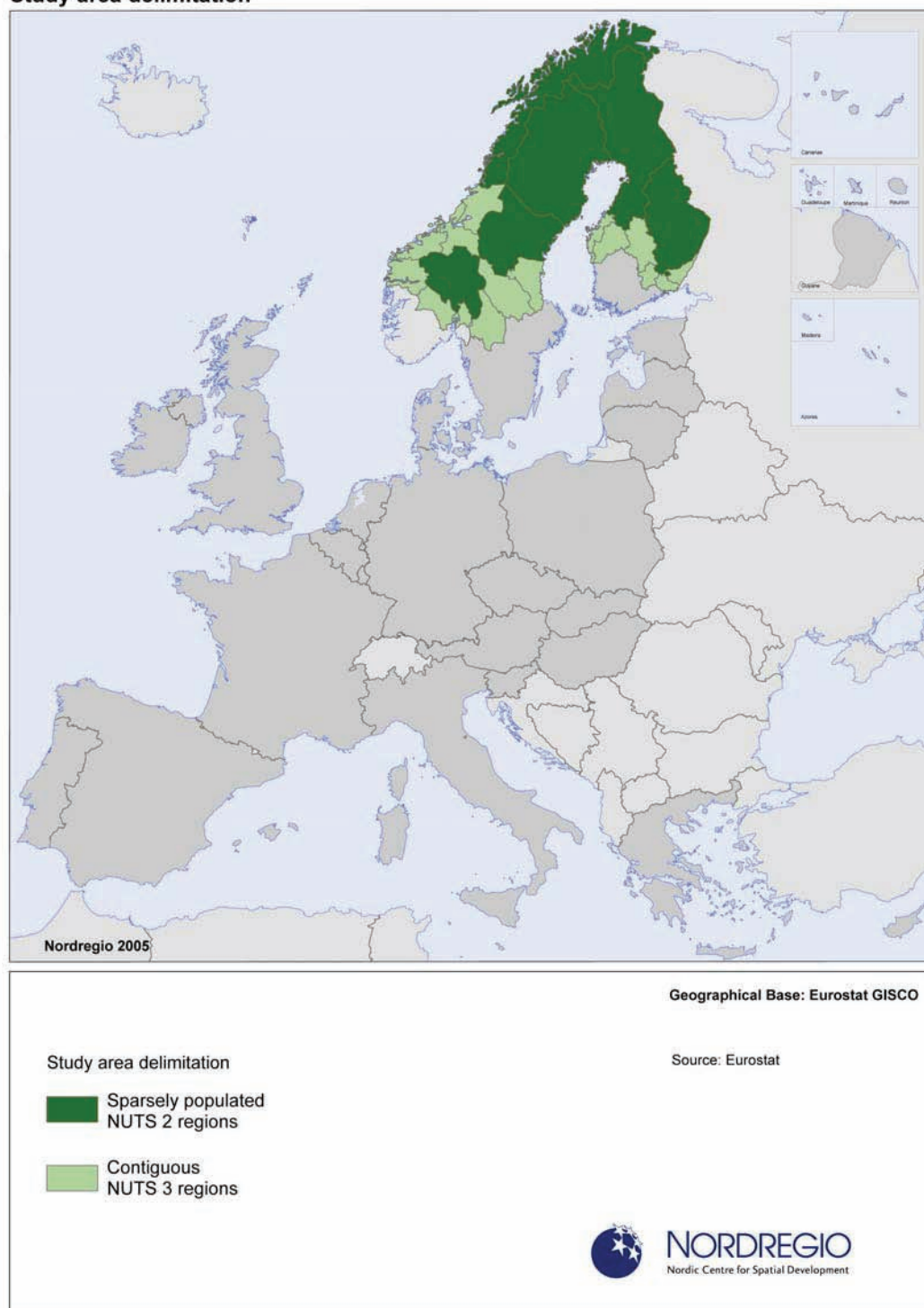


Figure 3.13. Study area delimitation

The study area is composed of NUTS 2 regions of the European Union (at 27) and Norway with the highest proportions of areas where less than 100,000 persons can be found within a maximum commuting distance of 50 km, as well as adjacent NUTS 3 regions.

Study area delimitation with Objective 1 areas

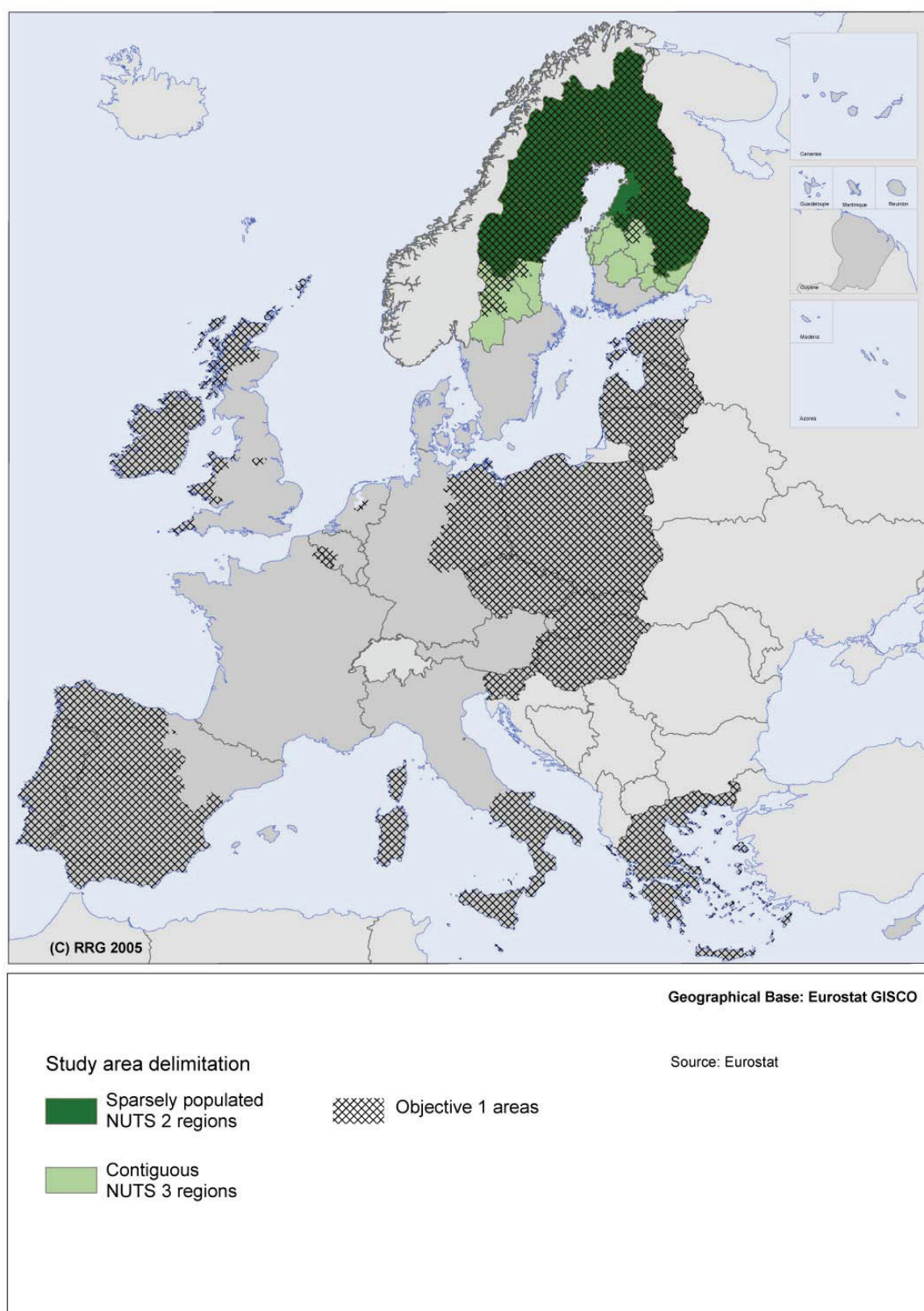


Figure 3.14. Study area delimitation with Objective 1 boundaries (2000-2006)

Conclusion

The basis for the delimitation of the study area for this study is demographic sparsity. Rather than approaching sparsity through average population densities within regions, the proportion of areas where less than 100,000 persons can be found within a maximum commuting distance of 50 km has been used. This measure better reflects the central challenge of sparsity, i.e. that services and economic activities are not established either because the market potential is below the critical population threshold, or because the potential labour market is too small. This measure can also be mapped independently of NUTS regions. This means that the effects of changes in regional boundaries will have smaller effects on the delimitation of policy intervention areas. It also implies that sparse areas within NUTS regions with major population concentrations can be identified and taken into account, even if the regional average population density gives no indication of sparsity. Finally, this measure takes into account the context of each region, as areas within 50 km from its borders are taken into account in the calculations.

The study area is composed of NUTS 2 regions of the European Union (at 27) and Norway with the highest proportions of areas where less than 100,000 persons can be found within a maximum commuting distance of 50 km. These regions are all situated in Sweden, Finland and Norway. In addition, NUTS 3 regions that are contiguous to these NUTS 2 regions have been taken into account: this buffer area allows for the analysis of spatial gradients from the less to the more sparse areas, in order to identify the possible social and economic effects of sparsity. In other words, the study area is not as such a sparsely populated area, but an area that is conducive to an analysis of the social and economic effects of sparsity.

The overlay with Objective 1 areas in Sweden and Finland in the period 2000-2006 shows that they are entirely included in the study area.

4. Demography

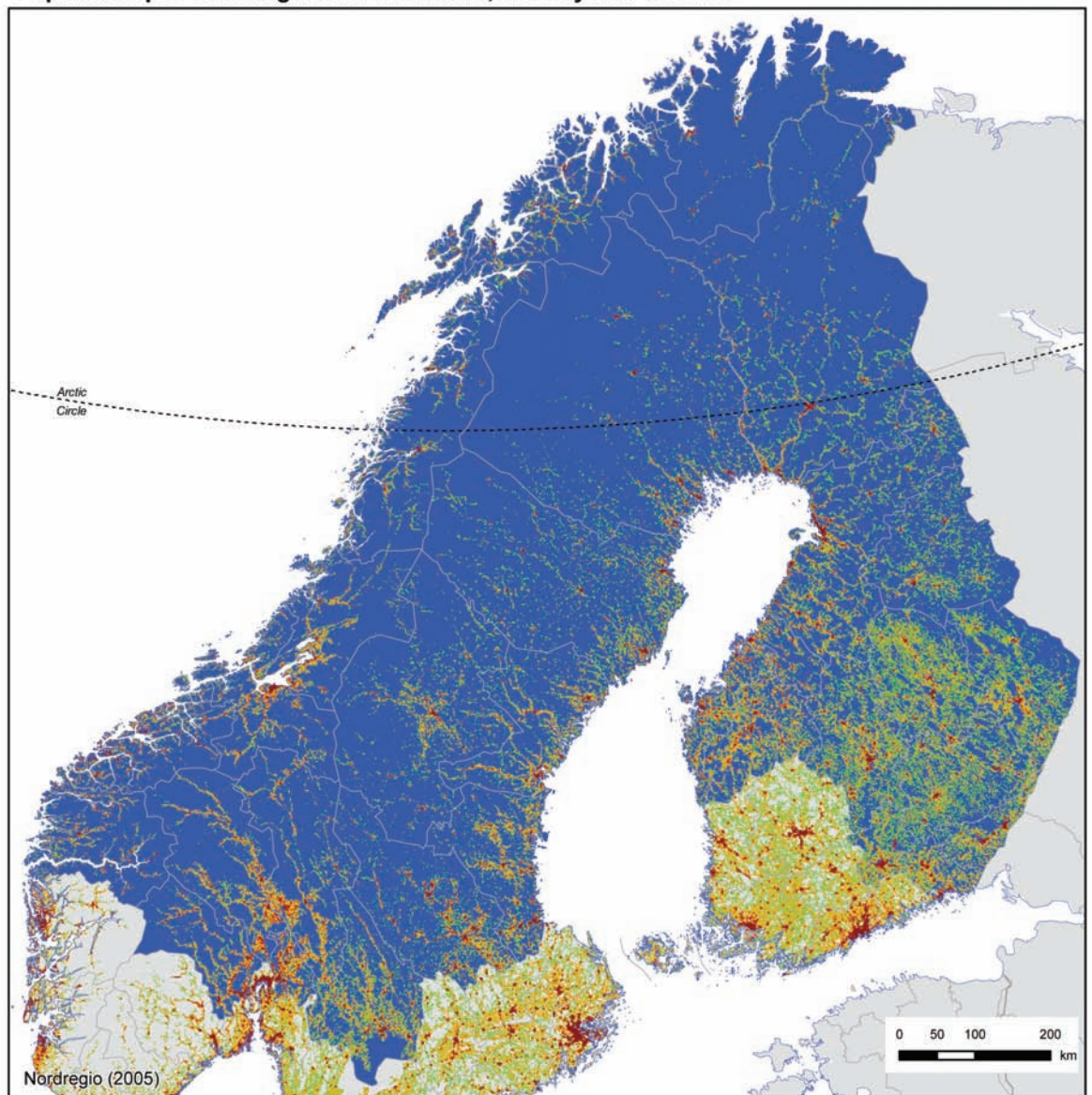
Nordic peripheral communities have been described as “thinning out societies” (Aasbrenn, 1989). According to this perspective, it is not so much the challenge of depopulation as the continued reduction in population figures that needs to be managed, for example in terms of public service provision. In the present chapter, we seek to explore the amplitude, spatial extent and driving forces of this “thinning out” process.

4.1. Settlement patterns in the Northern peripheries

Nordic sparsely populated regions are characterised by contrasted settlement patterns. Figure 4.1 represents the number of inhabitants by 1x1 km grid cell in Finland, Norway and Sweden. While Norwegian and Swedish settlements are concentrated along valleys and rivers and in a small number of towns and cities, Finnish settlements are considerably more thinly spread, especially in East Finland. This Finnish specificity is linked to a number of factors: The absence of relief and the presence of numerous lakes has historically facilitated access in these remote rural areas. In addition, urbanisation through rural out-migration is a more recent phenomenon in Finland than in most other European countries. As a result, in Figure 4.1, extensive areas with between 1 and 4 inhabitants per grid cells can be observed in Finland, particularly in its Eastern parts. By way of comparison, settlements in inland parts of the study area follow major roads and waterways in Sweden, while they are concentrated in the valleys in Norway. The East Finnish spread of population leads to additional challenges for public service provision, compared to sparsely populated areas with more concentrated settlement patterns.

Figure 4.2 synthesises these differences between regions, by showing the proportion of each region covered by grid cells classified according to their total population. Significantly, 50% of the grid cells of the East Finnish region of Etelä-Savo are inhabited (lakes excluded), in spite of a population density of only 8 inh/km². By way of comparison, the Swedish region of Dalarna has a population density of 9.1 inh/km², but less than 20% of its grid cells are inhabited. In Norway the same proportions on the country and study area are almost similar, with 82% for the country and 86% for the study area, which means Norway is by far the country with the largest proportion of uninhabited grid cells.

Population per 1x1 km grid cell in Finland, Norway and Sweden



Population (2002) within each 1x1 km grid cell

- 1 to 4 persons
- 5 to 50 persons
- 51 to 100 persons
- Over 100 persons

- Study area
- Other areas

Geographical Base: Eurostat GISCO

Source: Statistics Finland (2005),
Statistics Sweden (2005)
SSB - Statistics Norway (2005)



NORDREGIO
Nordic Centre for Spatial Development

Figure 4.1. Population per 1x1 grid cell in Norway, Sweden and Finland

The vast majority of 1x1 km grid cells in the study area are uninhabited.

Moreover, the overall proportion of uninhabited areas within the Nordic countries and within the study area is significant. Table 4.1 provides these numbers for Finland, Sweden and Norway.

Table 4.1. Proportion of uninhabited 1x1 k m grid cells

Country	Proportion of uninhabited cells	
	in the study area	in the rest of the country
Finland	76%	30%
Norway	86%	82%
Sweden	88%	25%

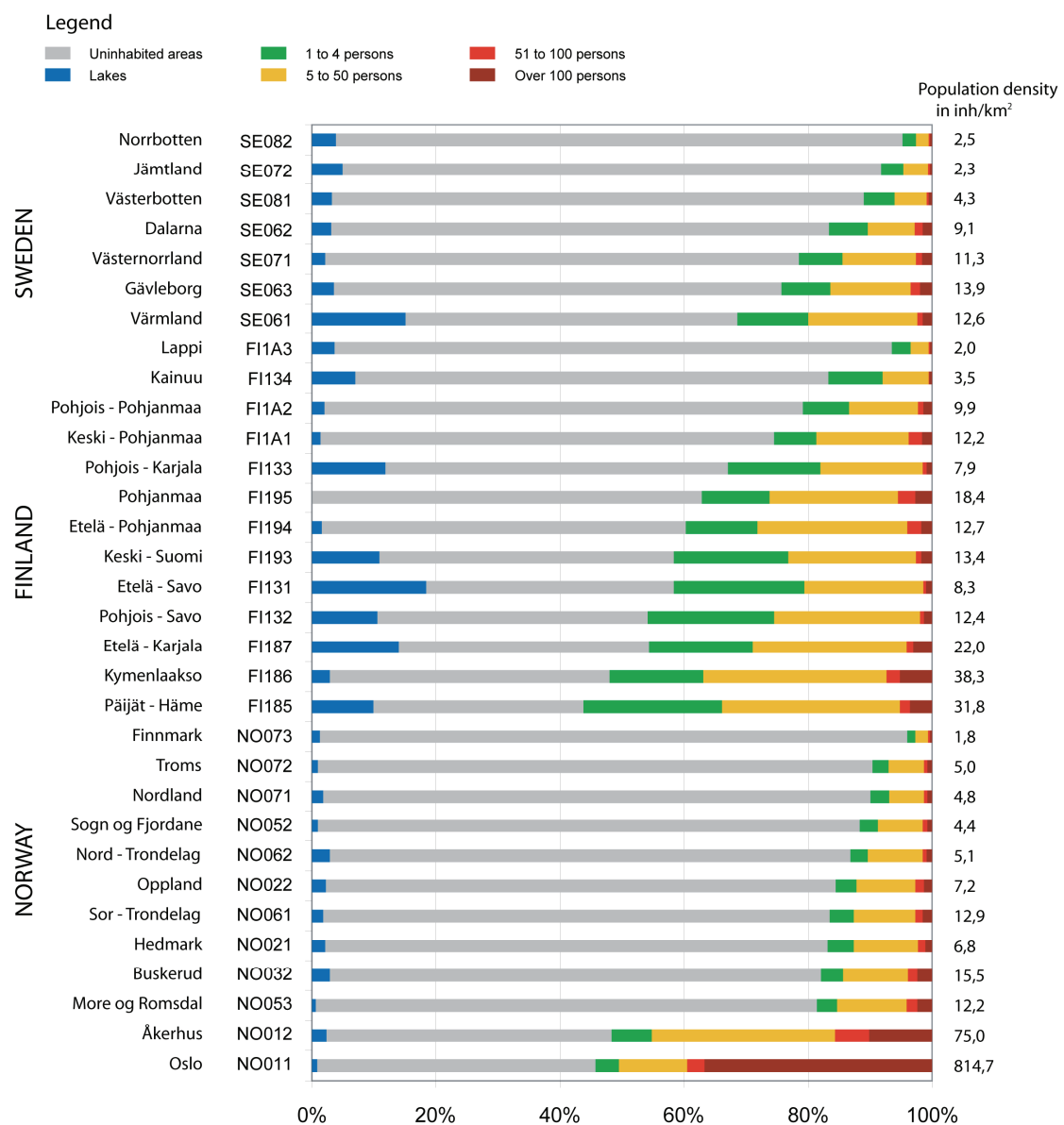


Figure 4.2. Proportions of grid cells by category, classified according to population numbers

A significantly higher proportion of grid cells are inhabited in Finnish study area regions, as compared to Swedish and Norwegian ones with equivalent population densities.

As shown by Table 4.1, uninhabited grid cells account for equivalent proportions of study area territory in Norway and in Sweden (88 and 86%), while the figure is somewhat lower for the Finnish study area (76 %). There is a strong contrast between the study area and the rest of the national territory in Finland and Sweden, as proportions of uninhabited cells fall to 30% and 25%, respectively. This is not the case in Norway, where 82% of the cells are uninhabited even outside the study area (Table 4.1).

Figure 4.3 illustrates these differences in settlement patterns in the study area, by taking three cities in the Nordic peripheries as examples. Within a 50 km radius around Tromsø in Norway, Östersund in Sweden and Mikkeli in Finland, one finds an equivalent number of persons. However, as illustrated by the figure, the proportion of inhabited cells varies considerably, as they cover most of the area in the Finnish case, but are considerably less numerous around the Swedish and especially Norwegian ones. What mainly differentiates the two types of situations is the extent of areas with only 1 to 4 inhabitants per cell, which is likely to correspond to a distance between individual houses of about 800-1000 meters. In the case of Mikkeli, a large proportion of the inhabited cells furthermore correspond to lakes.

These examples can be compared to the theoretical example presented in Figure 3.3 (p. 35). It is important to note that there is a difference in scale between the two approaches: While Figure 3.3 reflected centre structures, and considered the spatial spread of commuting areas, the present examples deal with settlement structures around single urban commuting areas (i.e. within the blue commuting area circles of Figure 3.3). In Figure 3.3, the spread of urban centre was said to contribute to a reduced degree of economic and social sparsity. This dynamic cannot however be transposed at the scale of settlements within a single commuting area. The spread out settlement structure will indeed hardly contribute to an improved access to services, insofar as the population figures outside of the core areas are so small (1 to 4 inhabitant per 1x1 km grid cell in most cases).

Specific issues and challenges are connected to the concentrated and spread out types of settlement structures in sparsely populated areas. In the case of the more concentrated settlement structure, the few households situated outside of the main nodes and axes are particularly isolated, and social interaction may be difficult to maintain. The spread out nature of the settlement structure is on the other hand a major challenge for the

provision of both public services (e.g. community nursing and home help to elderly persons) and transport infrastructure.

These three areas all have an average population density of just over 10 inh/km², but they have very different settlement patterns

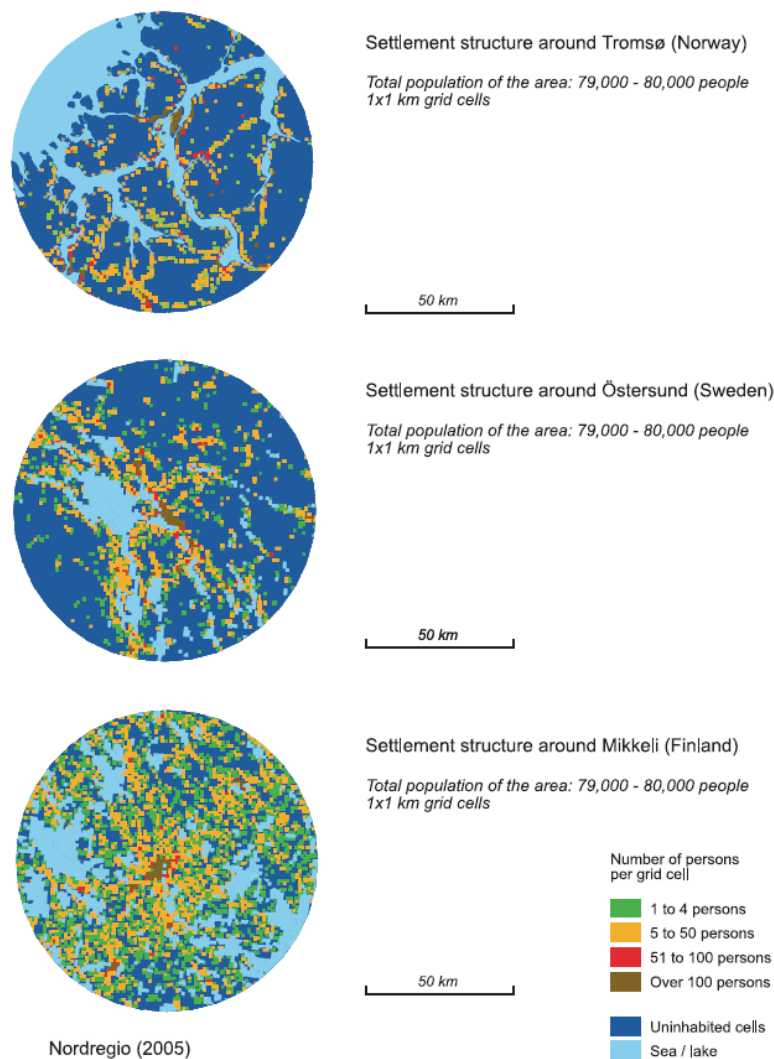


Figure 4.3. Three areas with identical area and population, but with distinct settlement patterns

Figure 4.4 highlights the areas with the lowest population potentials in Finland, Sweden and Norway, i.e. areas where less than 10 000 people can be reached within a 50 km radius. These areas account for 22% of the Finnish territory, while corresponding rates are 28% in Sweden and 19.2% in Norway. However their population is only 45 000 on the Finnish side and some 60 000 on the Swedish side. This amounts to less than 1% of the total population for both countries. In Norway the population of these extremely sparse areas reaches 62 000 people, which amounts to 1.4 % of the national population.

Areas with less than 10,000 people within 50 km distance

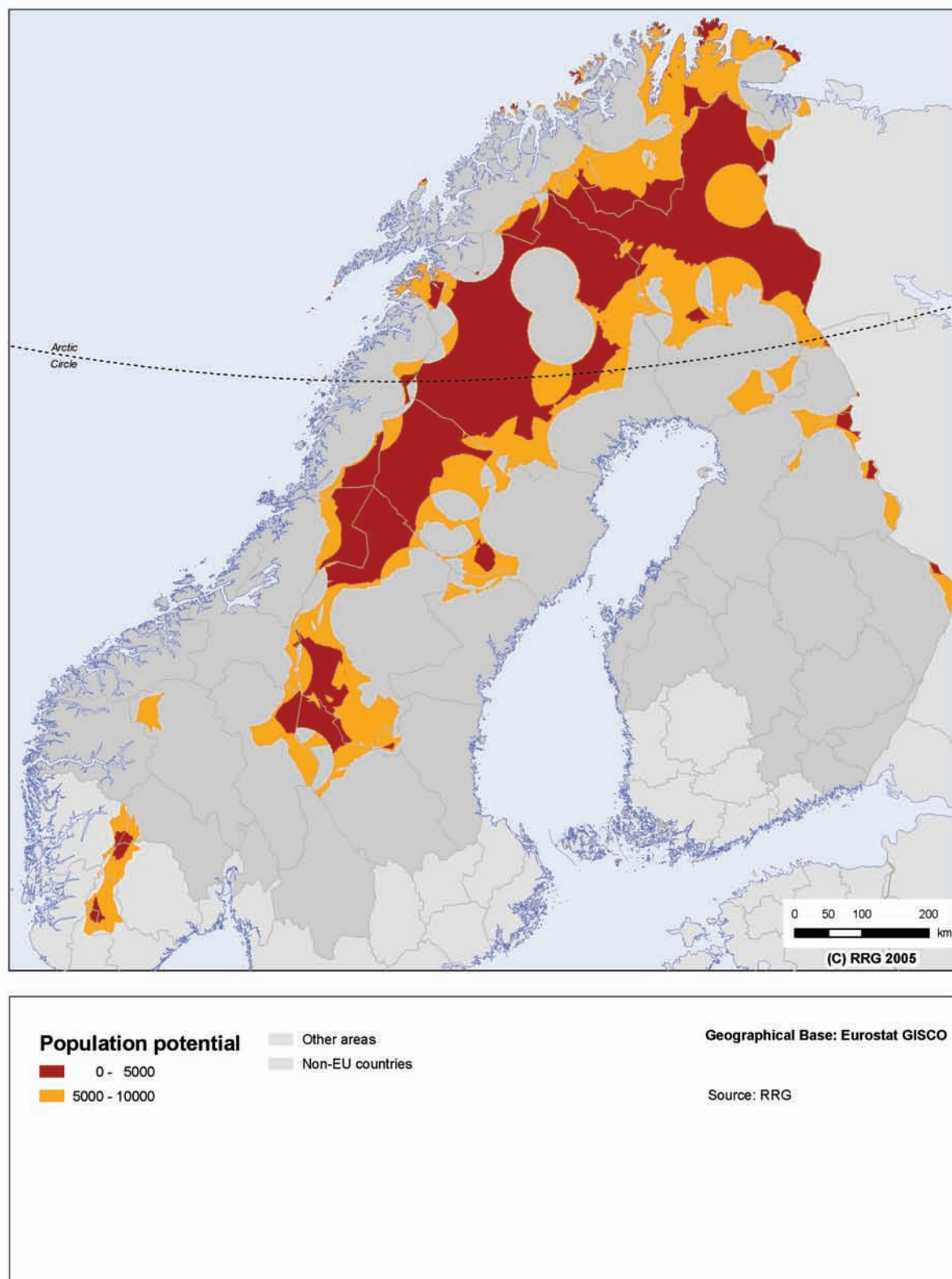


Figure 4.4 Areas with less than 10 000 people within 50 km.

These areas cover a significant part of the study area, especially in Sweden and in the northernmost parts of Norway and Finland. They extend beyond the study area only in Norway

The Samis



The area where traditional Sami living and herding areas can be found is here seen from the North Pole.

Image source: www.samer.se - Pär-Joel Utsi, NOAA®.© ESA/Eurimage 1993. © Metria 2001.

The sparsely populated areas of Norden are also the traditional living areas of the Samis, one of the indigenous peoples of Europe. The Sami population is spread out over a large territory, from the central part of Sweden and Norway to the northern parts of Finland and the Kola Peninsula in Russia. There are approximately 75 000 Samis in the four countries cited above: More than 40 000 in Norway, Between 15 000 and 25 000 in Sweden, between 6 000 and 7 000 in Finland and approximately 2 000 in Russia.

The Samis have their own language, which is composed of several distinct dialects, and culture. Reindeer herding is a traditional economic activity for the Samis and occupies a central place in their culture, even if only 10% of the Swedish Samis are still active in reindeer herding nowadays. While Samis in Sweden and Norway have the exclusive privilege of reindeer herding, this is no longer the case in Finland. Other traditional economic activities include fishing, hunting and handicraft production. Tourism has also become a significant source of income for the Sami people. The Samis are involved in different types of transnational co-operation. The main cooperative body for the Samis of Finland, Norway, Sweden and Russia is the Sami Council. Since the accession of Sweden and Finland to the European Union, different programmes such as the Objective 1 Sápmi North and South in Sweden, and Interreg IIIA sub-programmes have been designed specifically for issues related to the Sami population (North Calotte, Kolarctic and Sápmi).

In Sweden, Norway and Finland, the Samis have the ability to elect a parliament, which has advisory status in respect of the national authorities. In Finland and Norway, the purpose is mainly to attend to the rights and interests of the Samis in the national context. In Sweden, the purpose of the parliament is to work towards a self-sustained Sami community in co-operation with Sami and non-Sami organisations.

Sources:
www.sametinget.se
www.samer.se
virtual.finland.fi

4.2. Demographic trends over the last decade

Sparsely populated areas are sensitive to demographic trends, as even a modest decline can bring them under the previously described demographic threshold levels under which economic activity and service provision is longer economically viable (i.e. the “critical mass”). Due to these mechanisms, a self-reinforcing negative trend of demographic decline remains a potential threat for these regions.

Demographic trends are moreover the most comprehensive synthetic indicator of economic and social dynamism. The observation of evolutions in total population and in age structures gives a good indication of the relative performance of different sparsely populated areas.

In the context of this project we have looked at the main demographic trends between 1993 and 2002. Demographic trends are however the sum of two main components: net natural population change (differences between number of births and deaths) and net migration change (differences between the in-migrants and the out-migrants). It is therefore important first to consider these parameters separately.

In terms of net natural change between 1993 and 2002, the situation is rather different across the study area (Figure 4.5). While a negative trend can be observed in all municipalities outside of the main cities in Sweden (i.e. outside cities such as Uleå, Luleå, Östersund and Kiruna), significant parts of the Finnish and Norwegian study area experienced natural population growth. This is to a large extent due to local cultural and religious factors, especially in Finnmark, along the north-eastern coast of the Gulf of Bothnia and in Lappland. Finnish municipalities along the Russian border and in the south-eastern parts of the study area however face negative net natural change, with the exception of some cities such as Kuopio, Joensuu or Jyväskylä.

The situation in terms of net migration trends is more uniform, as negative trends can be observed across the entire study area, with only few exceptions (Figure 4.6). As illustrated by Figure 4.7, this concerns all municipalities with a population potential below 20% of the EU average in Sweden and Finland, apart from a single Swedish municipality (Orsa). There are however a number of municipalities with a positive net migration over the 10-year period in South-Eastern Norway. These are

typically municipalities with major winter tourism facilities (e.g. Oppdal, Trysil and Hemsedal), with newly established military facilities (e.g. Åmot and Rendalen) or with a regional centre of some importance despite its limited population (e.g. Nord-Aurdal (Fagernes) and Røros). Such dynamic sparse areas seem only to have developed in Southern Norway. Brønnøy is indeed the only municipality north of Trondheim with population potential below 20% of the EU average and a positive net-migration over the 10-year period. This municipality can be considered a special case, as the governmental body in charge of the main national computerised registers has been established there. While a number of very sparsely populated regions of southern Norway have managed to attract migrants, comparable dynamics have not occurred in the northern parts of the country.

Generally, one can conclude that there is a strong correlation between out-migration and low population potential. Hanell et al. (2002) have furthermore shown that these net-migration trends are negatively correlated with national growth figures. In other words, when growth increases, peripheral municipalities tend to lose population through migration. This is not primarily linked to unemployed persons moving to find a job, which is a relatively marginal phenomenon. Instead, high growth leads to decreasing in-migration to the periphery, especially among students from peripheral areas who tend not to return to their birthplace if they can find a job in the area where they are studying (Hanell et al., 2002). Growth policies that are not accompanied by measures in favour of sparse areas will therefore lead to increased depopulation.

The total demographic trend over this 10-year period shows a relatively complex pattern in which both distance to the nearest city and to the major national population concentrations play a role (Figure 4.8). Municipalities experiencing the most dramatic demographic trends, having lost over 10% of their population within a decade, are in an unfavourable position in both these respects. The concentration of these municipalities in Northern Sweden, as opposed to their spread across the Finnish study area, is however mainly due to the smaller size of Finnish municipalities: The same figures could probably have been observed in Sweden, if data at a more detailed geographical scale had been available. In Norway, municipalities experiencing such dramatic decline are few and spread out. There are also more municipalities where the birth rates have allowed the population to rise despite negative net migration figures than in Finland and Sweden. A large majority

of municipalities with population potential potentials below 20% of EU-average however experienced demographic decline in all three countries (Figure 4.9).

Population projections for the period 2002-2020, envisaged by Statistics Finland and NUTEK point to the continuation of these depopulating trends outside of the main cities in Sweden and Finland (Figure 4.10). In Sweden, the main gainers are the coastal municipalities of Umeå and Luleå. More moderate increases are however also foreseen around Östersund, Gävle and Karlstad. The only peripheral rural areas expected to gain population are those that have managed to position themselves within a specific industrial activity, such as for example the car testing centres in Arjeplog.

In Finland, the clear winners are the areas polarized around the largest urban areas: Oulu, Vaasa, Jyväskylä, Kuopio and Joensuu. The other areas, especially in the northern and central parts of Finland, as well as along the Russian border, are forecast to lose population, most by a rate of at least 15%. Complementarily to the maps displayed previously, this means that in the time period of 30 years (roughly from the 1990s to 2020), a major part of the Finnish sparsely populated areas will lose around 40% of its population.

In Norway, the medium alternative calculated by Statistics Norway foresees few areas with dramatic population decline. Population growth is envisaged in a number of municipalities without any major urban centre, in northern as well as in southern parts of the country.

Net natural change from 1993 to 2002

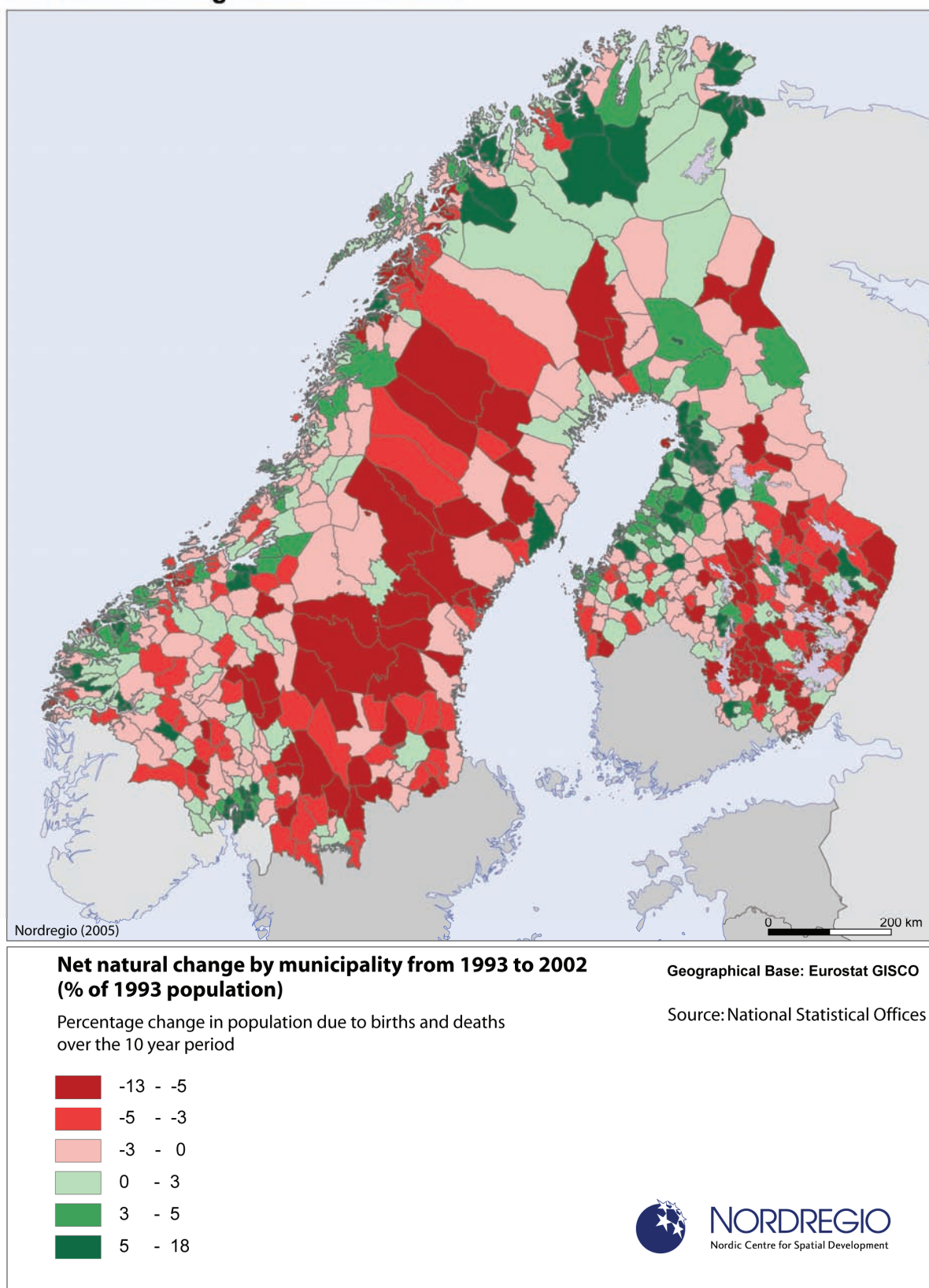


Figure 4.5. Percentage change in population due to births and deaths by municipality from 1993 to 2002

The percentage change in population due to births and deaths by municipality from 1993 to 2002 reveals relatively contrasted situations across the study area.

Net migration from 1993 to 2002

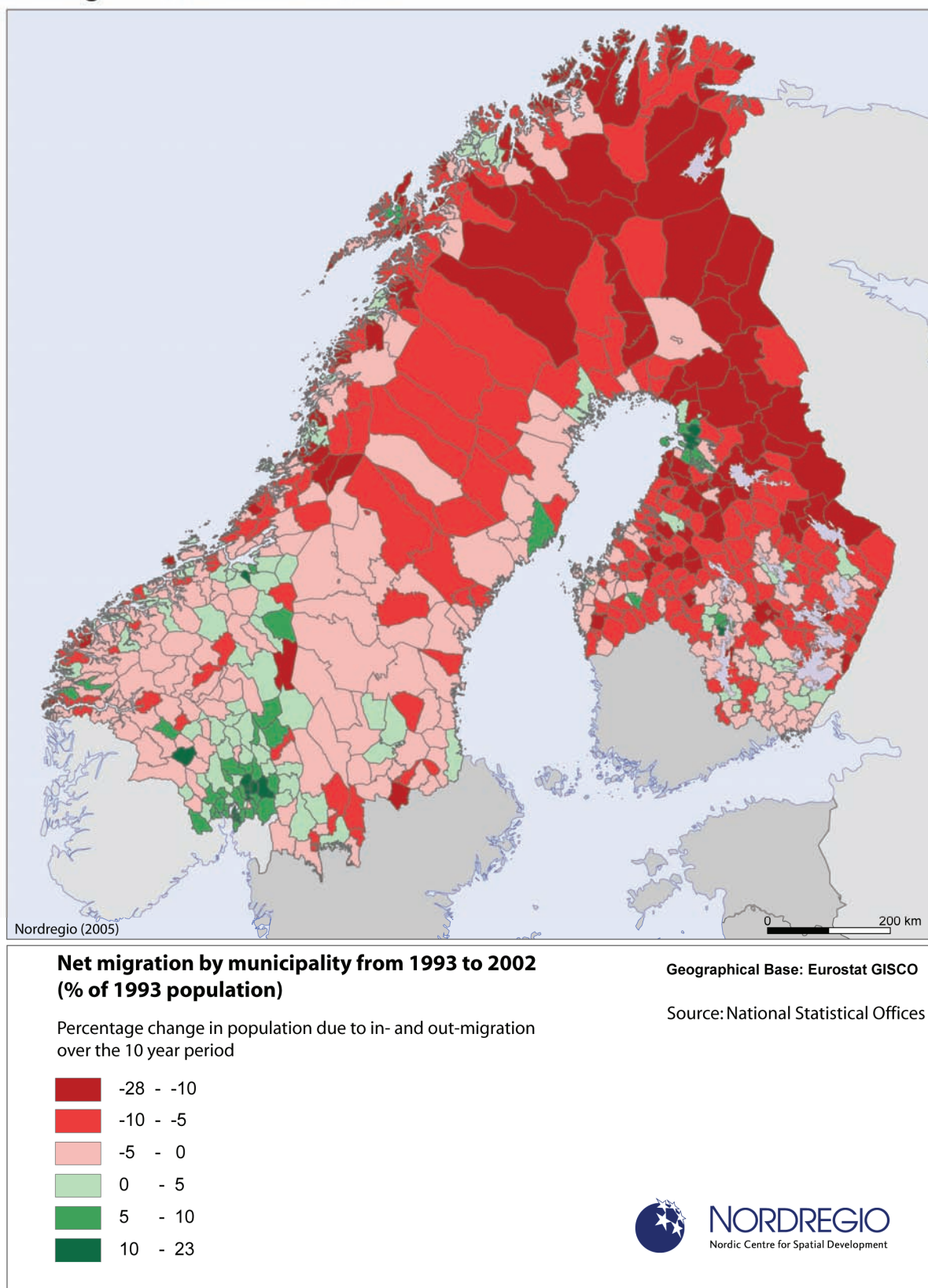


Figure 4.6. Percentage change in population due to in- and out-migration by municipality from 1993 to 2002

Only municipalities close to a city experienced positive net migration, except in central and south-eastern Norway.

Net migration change and population potential

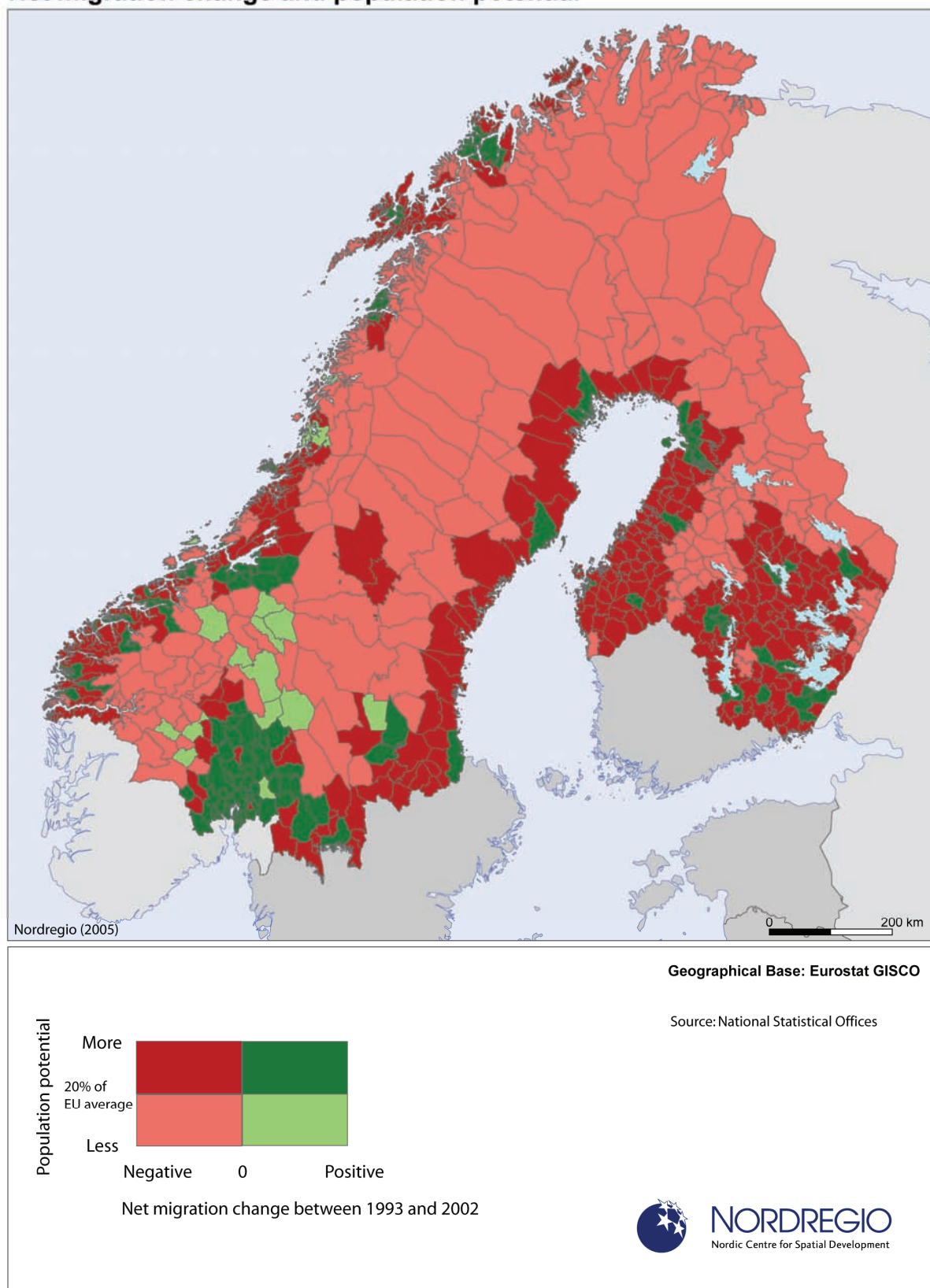


Figure 4.7. Cross-tabulation of population potentials and net migration by municipality from 1993 to 2002

Net migration figures by municipality from 1993 to 2002 are generally highly correlated with population potentials. This is however less the case in central and south-eastern Norway.

Population change from 1993 to 2002

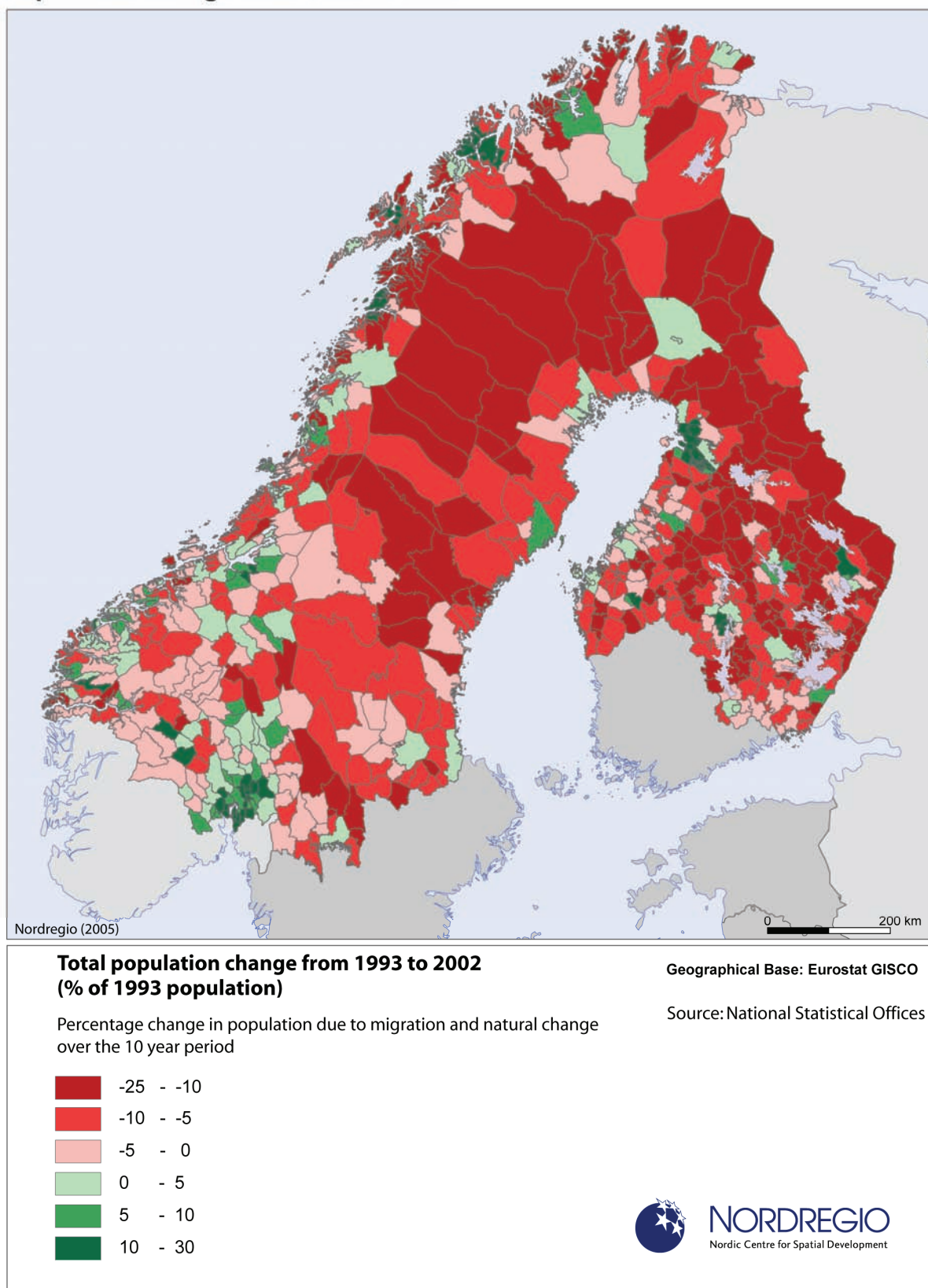


Figure 4.8. Total population change by municipality from 1993 to 2002

Growth is concentrated in and around main cities.

Total population change and population potential

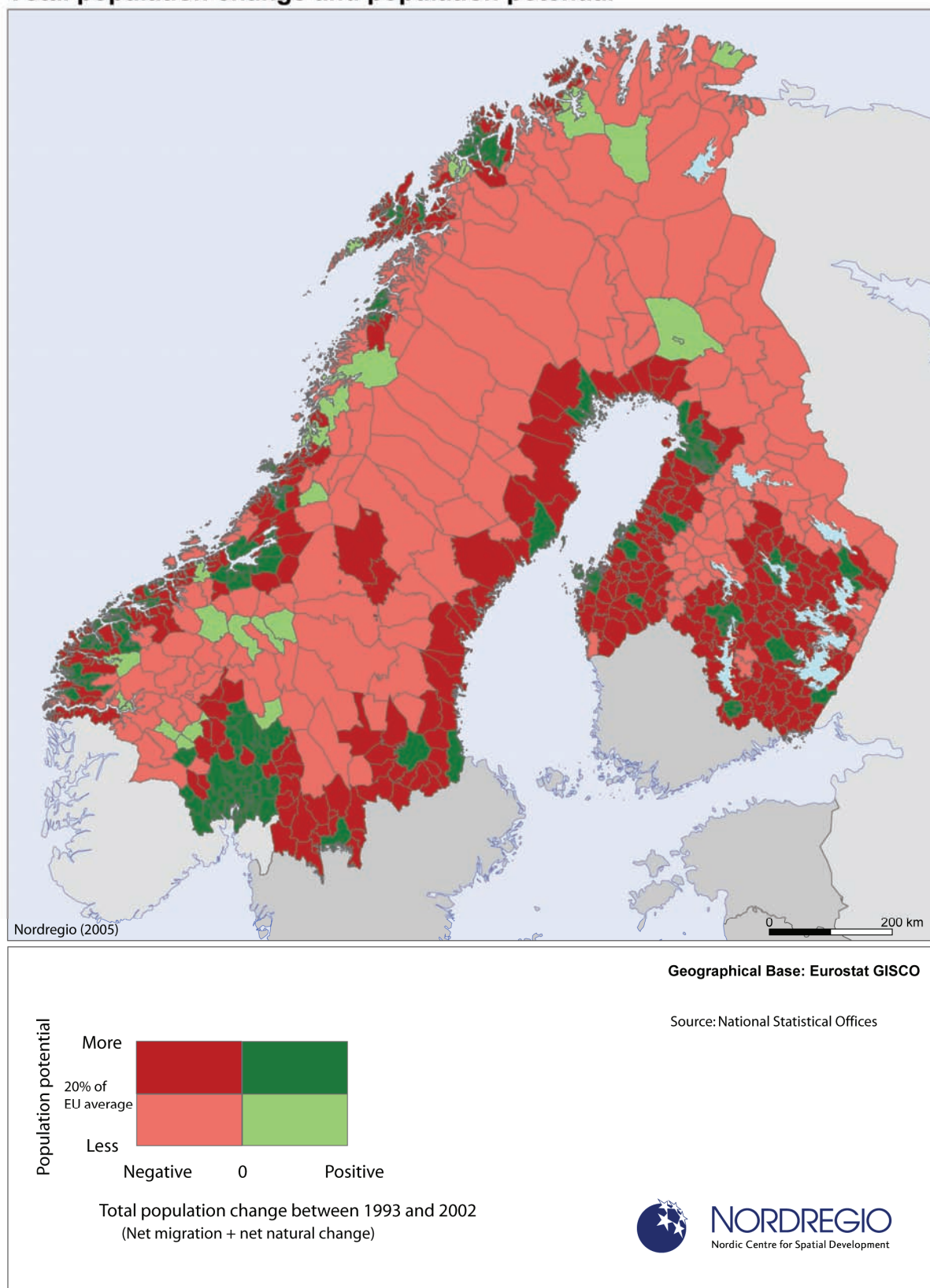
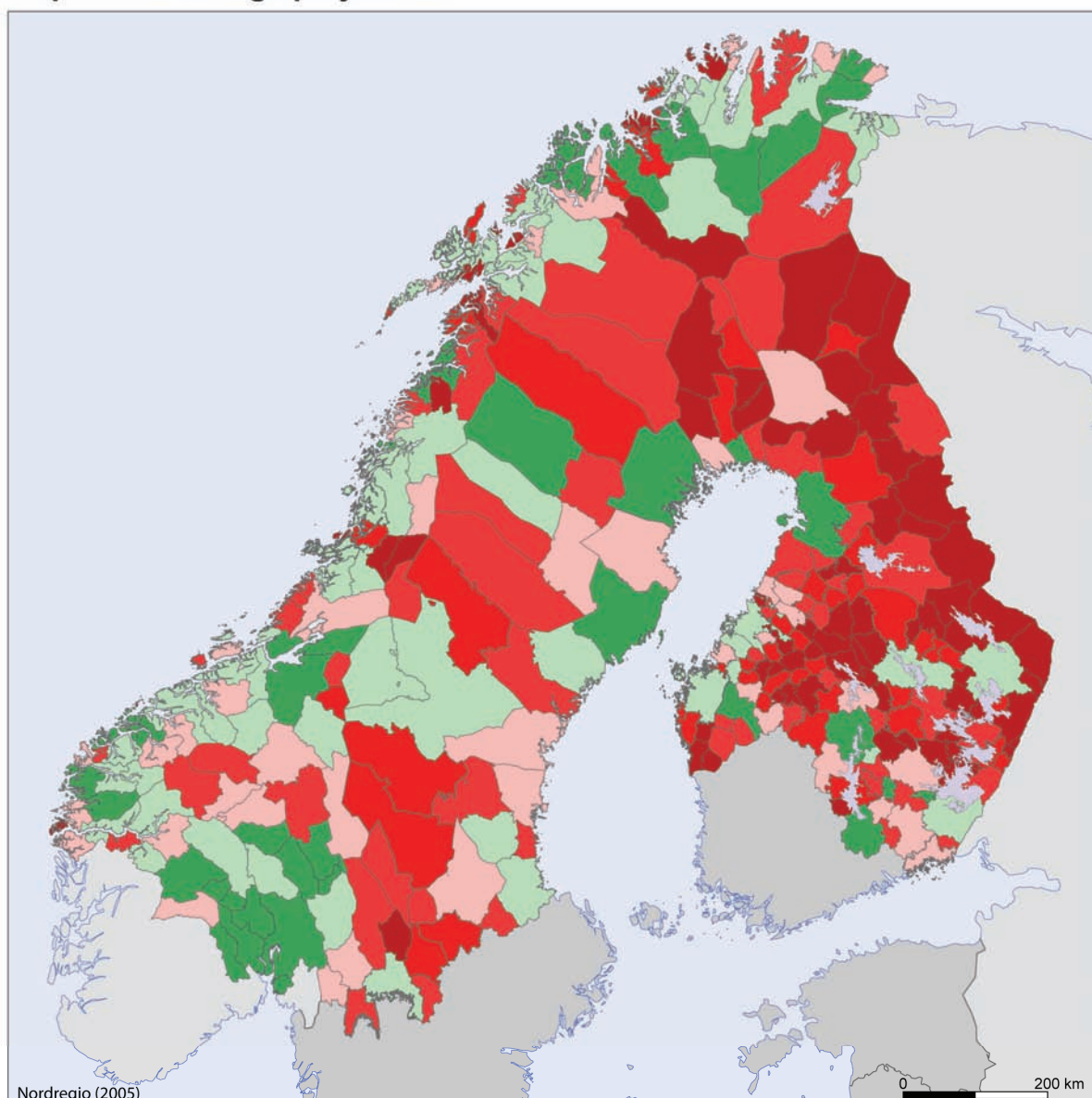


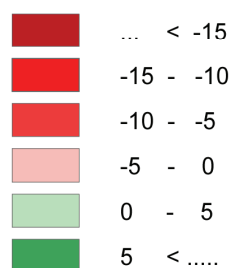
Figure 4.9. Cross-tabulation of population potentials and total population change by municipality from 1993 and 2002

Total population change by municipality from 1993 to 2002 is highly correlated with population potentials. Most exceptions are situated in Norway.

Population change projections



Forecast population change from 2002 to 2020
by labour market area
(% of 2002 population)



Geographical Base: Eurostat GISCO

Source: NUTEK (Sweden)
Statistics Finland
NIBR, Statistics Norway



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Figure 4.10. Population projections from SSB (Norway), NUTEK (Sweden) and Statistics Finland for the period 2002-2020

Continued population decline is foreseen in major parts of the study area in Sweden and Finland. The medium alternative calculated by Statistics Norway foresees more contrasted trends.

4.3. Age structures

Age structures can complement the previously described projections, as depopulation will tend to increase in the context of an ageing population. Their analysis is also important from a public service provision perspective, as an ageing population significantly increases the needs in this respect.

Old age dependency ratios

The old age dependency ratio corresponds to the ratio between the number of elderly people (over 65) and the total working-age population. The observation of these ratios shows distinct contrasts between areas around the main urban centres and other areas in Finland, and generally higher and more homogenous values in Sweden (Figure 4.11). It is interesting to note that the dependency ratios are low in the northernmost parts of Finland and Norway, which may be a combined effect of forced out-migration during the Second World War, after which a number of young persons did not return, and the demographic behaviour of the Sámi population. The relatively higher dependency ratios observed in Eastern Finland, as compared to the rest of the country, can be due to a higher out migration of students and young professionals and a higher proclivity for return migration in direction of these regions at the age of retirement.

Figure 4.12 represents the change in old age dependency ratios between 1993 and 2002. Ageing populations can be found throughout the Finnish study area, but only in sparsely populated areas situated north of Trondheim, Östersund and Sundsvall in Sweden and Norway. The areas with relatively low values observed in Figure 4.12 have experienced increases in the old age dependency ratios between 1993 and 2002. These trend figures are however extremely difficult to interpret, as they are highly dependent on the cyclical differences in the size of cohorts. The specific figures for southern Norway and Sweden may therefore be due to a difference in the structure of these cycles.

Irrespective of these trends, available statistics show a high concentration of the aged population in the sparsely populated areas. While the European average (UK

excluded¹⁾ is less than one aged person for every 4 persons aged 15 to 64, ratios of over one to three are commonly encountered in the study area. This implies that the provision of public services for this population will be higher in these regions. In all three countries of the study area, each municipality supports these costs, which implies that national transfer policies need to take into account variations in the age structure.

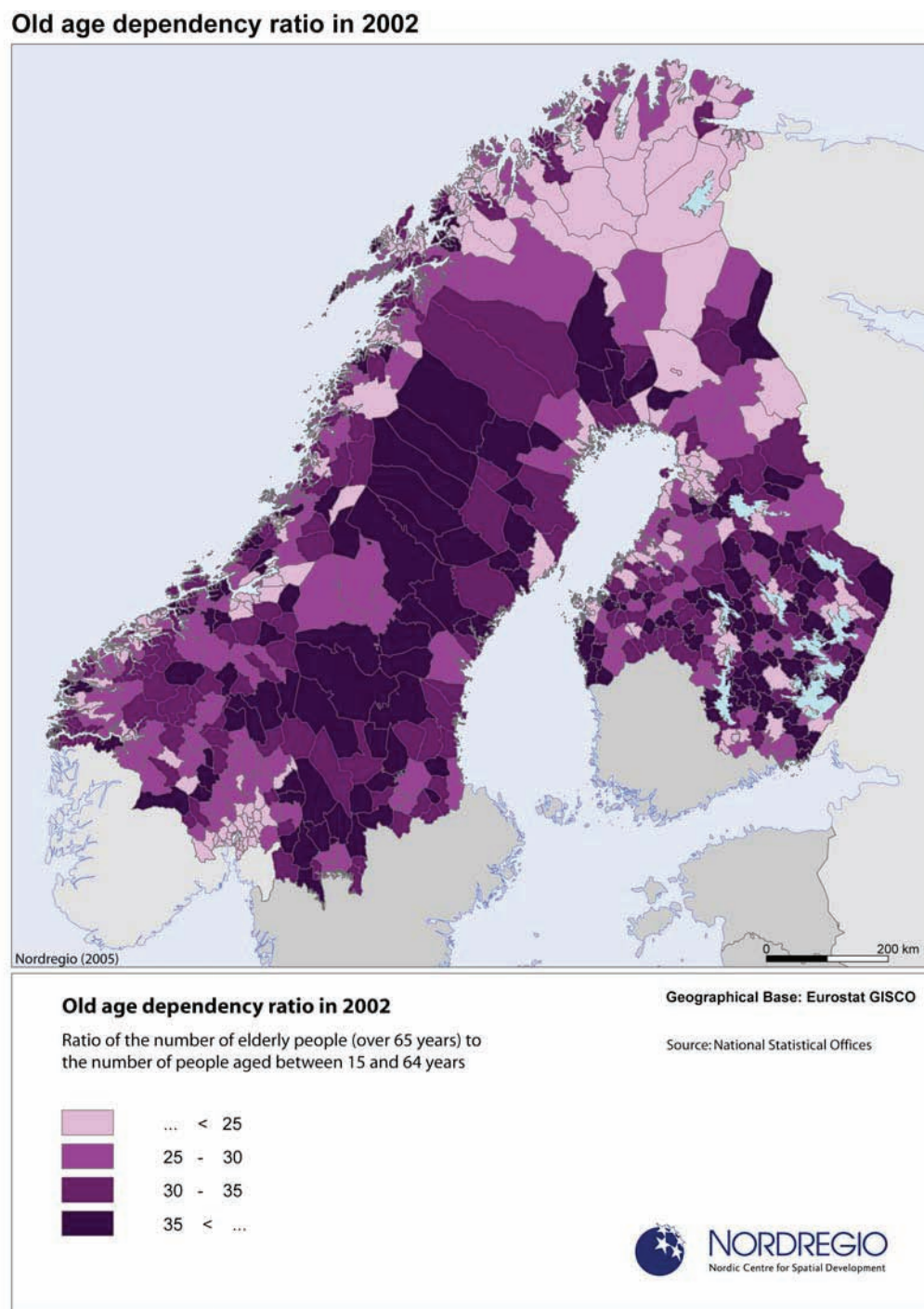


Figure 4.11. Old age dependency ratios by municipality (2002)

¹ Eurostat does not provide UK population figures per age group for the year 2002.

Change in the old age dependency ratio and population potential

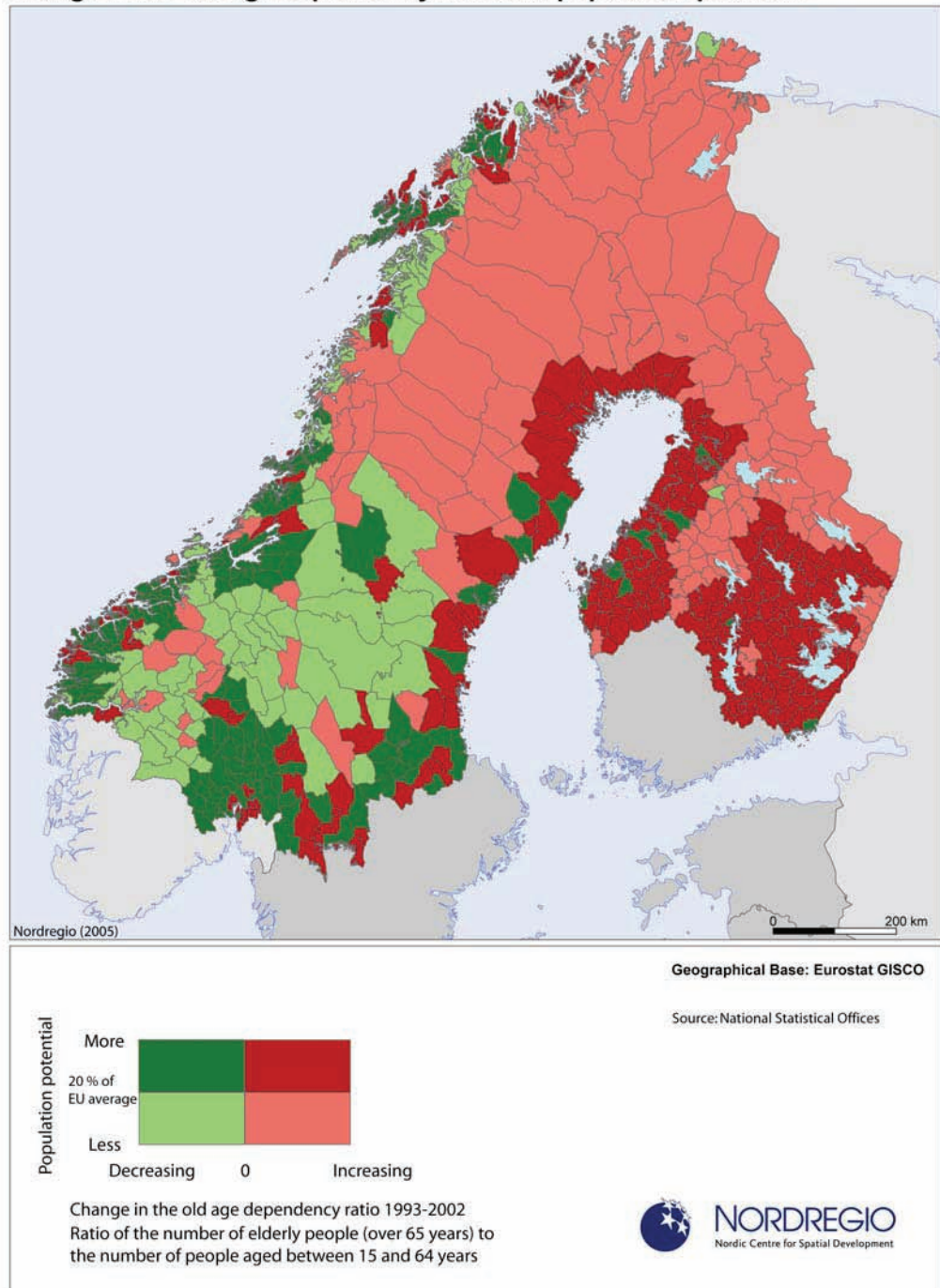


Figure 4.12. Cross-tabulation of the change in old age dependency ratios and population potentials

The ratio of the number of elderly people to the number of persons aged between 15 and 64 years tends to increase in most parts of the study area, except in central Sweden and central and southern Norway. Because of cyclical variations in cohorts sizes, these results are however highly dependent on the choice of start and end dates.

Classification of municipalities according to age structures

Analysing the age structure of an area gives a good perspective on the challenges faced by this area. In the following map, we have produced a classification of the municipalities of our study based on their age structure. The population was divided into 16 age categories, the first one consisting of children aged between 0 and 4 years, and the last one focussing on elderly people aged over 75 years.

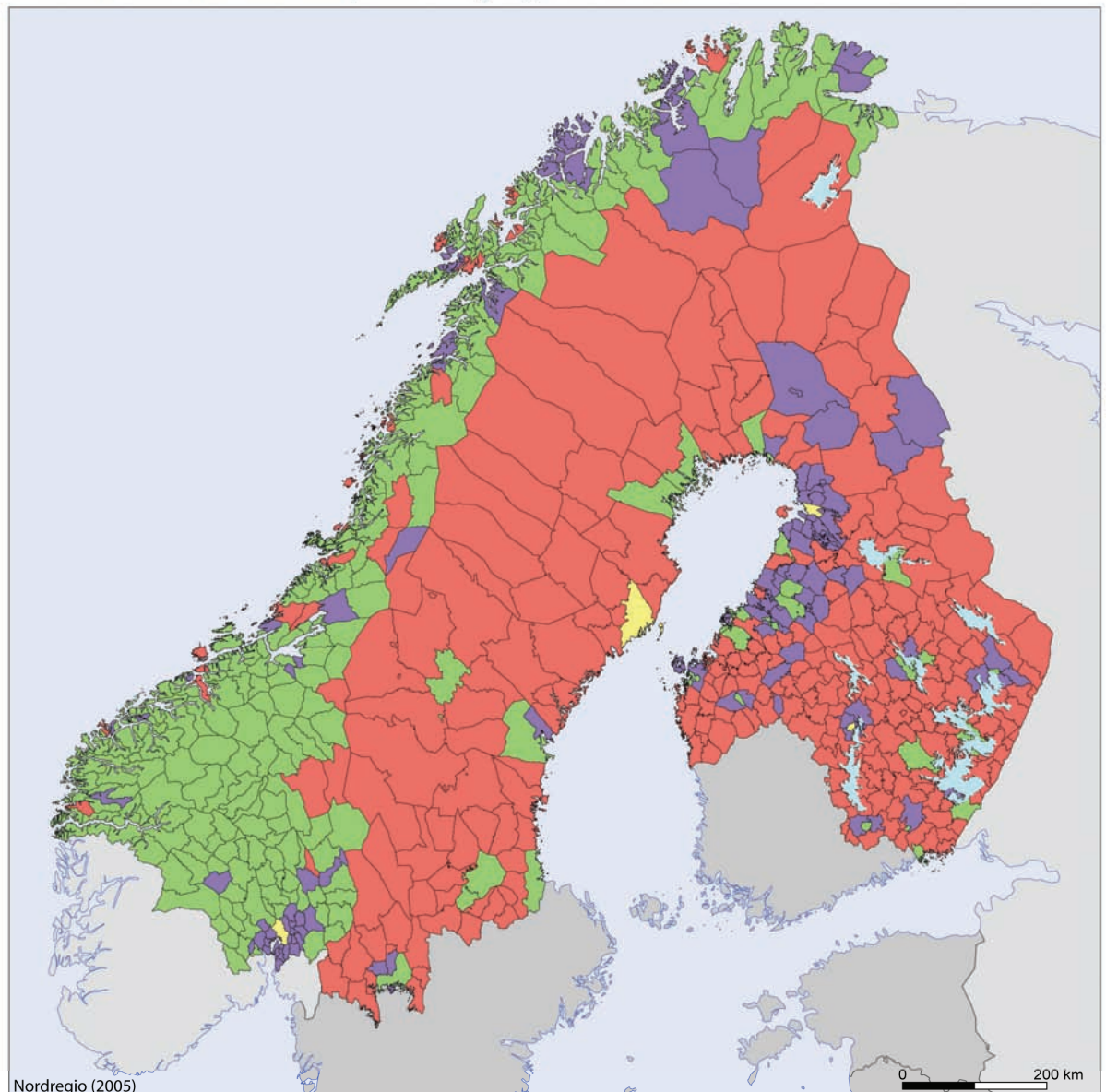
Based on this analysis, a classification of municipalities into 4 different classes was produced (Figure 4.13). Class 1 is characterized by an over-representation of elderly people compared to the average for Finland, Norway and Sweden. Class 2 displays an over-representation of families with young children. Class 3 can be characterized by an over-representation of young active persons, whereas class 4 is in line with national averages. The exact profile of these classes is presented in Figure 4.14, both in absolute and relative terms.

Most municipalities in the Finnish and Swedish parts of the Study area belong to the first category, that is to say that their population exhibits a higher share of elderly people than the Nordic average. The contrast with Norway is striking, as a vast majority of Norwegian municipalities outside of the main cities belong to the “average profile” category (class 4).

However, the other 3 classes are also represented. A number of municipalities with a greater proportion of families with children (class 2) can be found in the coastal areas of Finland, especially around Oulu, and also around some important Finnish cities in the study area, such as Kuopio or Joensuu. Municipalities belonging to the third category, with an over-representation of young active persons are few and are situated in the city centres of Oulu and Jyväskylä, as well as in Umeå and Oslo. The fourth category, in line with average age structure for Norway, Finland and Sweden, is mainly to be found in Norway, as well as in the proximity of some cities in Swedish and Finnish parts of the study area.

The over-representation of elderly people leads to higher demands in terms of public service provision, which implies higher costs for the concerned municipalities. In some cases, recruiting qualified personnel can also be a problem. As part of its population projections, the Swedish national public agency for economic policy issues (NUTEK) therefore includes the evolution of the ratio of people with medical and healthcare qualifications to the number of elderly persons.

Classification of municipalities by age structure



Classification of the municipalities by predominant age category in the age structure

Average age structure calculated for Sweden + Finland + Norway

- Class 1: Over-representation of elderly people
- Class 2: Over-representation of families with children
- Class 3: Over-representation of young active persons
- Class 4: In line with the average age structure

Geographical Base: Eurostat GISCO

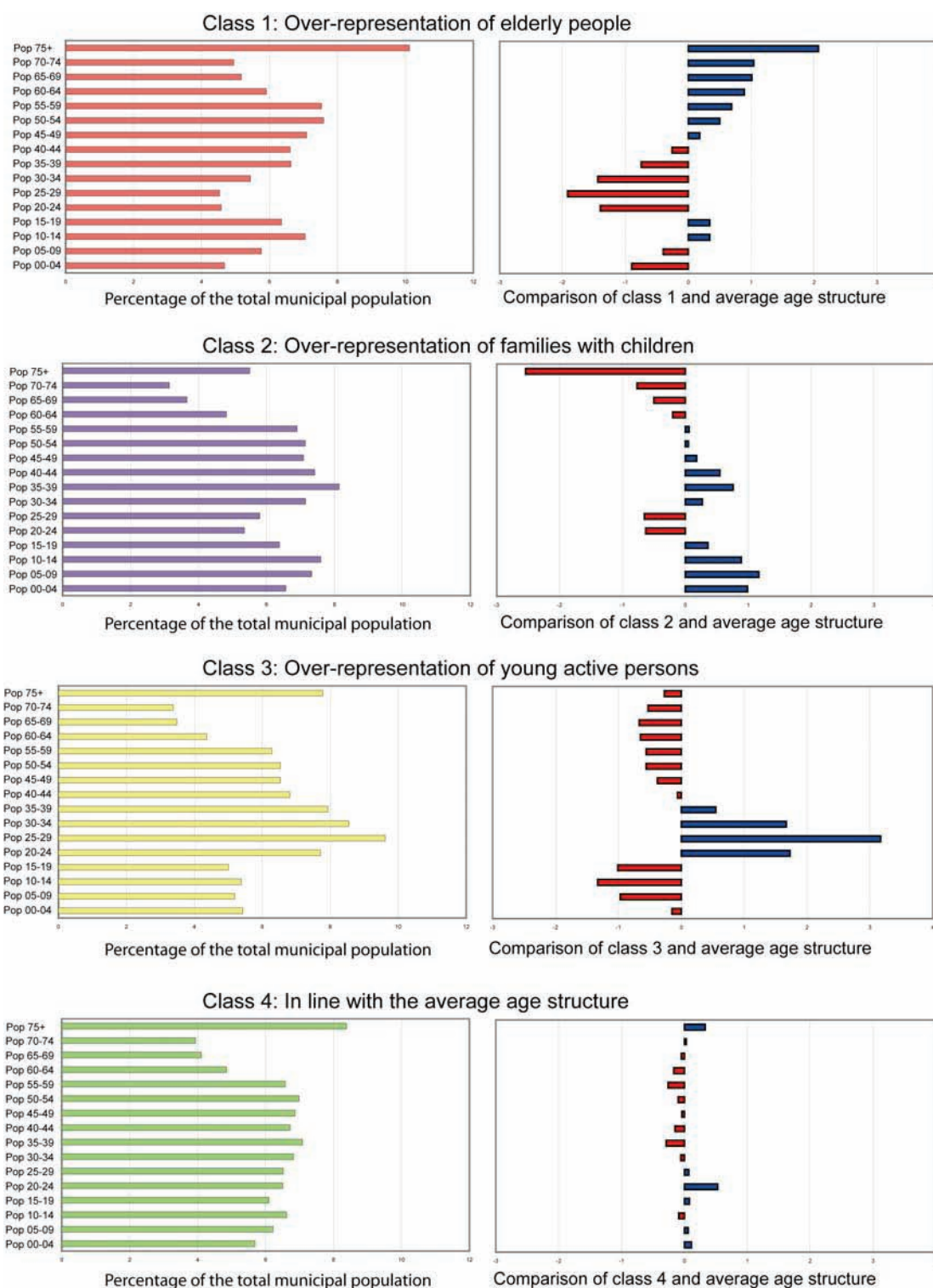
Source: National Statistical Offices

Made with PhilCarto
<http://perso.club-internet.fr/philgeo>



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Figure 4.13. Classification of municipalities according to age structures



Classification of the municipalities by predominant age category in the age structure

Detailed age structure by class

Average age structure calculated for Sweden + Finland + Norway

Figure 4.14. Characterisation of the different age structure classes

Conclusion

Sparsely populated areas face the double challenge of progressive population ‘thinning’ and of ageing. An increasingly fragile demographic structure is therefore emerging beyond the main cities, which implies major challenges ahead for public service provision both in terms of costs and labour availability.

Major cities along the coast of all three countries and in south-eastern parts of the Finnish study area are preserved from demographic decline, as recipients of out-migration from their respective hinterlands. The contrast between the extensive and continuous sparsely populated areas experiencing demographic decline in Finland and Sweden, and the considerably more fragmented patterns observed in Norway is striking. A number of secondary urban nodes in Norway are still sufficiently attractive to experience significant population growth, even in inland areas. Concentration trends in Sweden and Finland on the other hand only favour major cities.

Nonetheless, the lack of demographic dynamism of the areas that do experience demographic decline in all three countries can in general not be compensated through extended commuting trips and service provision areas around the nearest city. This makes these Nordic areas specific in comparison with other European areas experiencing population decline. The over-representation of elderly people furthermore leads to higher demands in terms of public service provision, which implies higher costs for the concerned municipalities. In some cases, recruiting qualified personnel can also be a problem. There is therefore a constant need to look for innovative solutions that allow for such areas’ continued access to the most important public and private services.

Finally, one can see that depopulation trends accelerate in periods of high growth, especially as a result of reduced return migration among young people having moved in order to obtain a higher education degree. One can conclude from this that growth policies that are not accompanied by measures in favour of sparse areas will lead to increased depopulation.

5. Measuring peripherality and accessibility in the Nordic peripheries

“Remote regions” may appear to be a relatively intuitive, easy to grasp concept. Moreover as we have already noted, they are connected to the notion of the “distance to the core areas of Europe”. But because remote regions are often also characterised by less favourable living conditions, less highly developed infrastructures and reduced population densities, “remoteness” is often also used as a generic term encompassing a wide range of handicaps which may often not be causally linked to the “distance to the core areas of Europe”. A scientific approach of “remoteness” and “peripherality” must therefore first isolate the notion of “distance to the core areas of Europe” from these other dimensions.

The notion of “remoteness” moreover implies that the core areas of Europe possess some valuable assets, to which it may be a problem to be separated from geographically. This entails a twofold challenge when trying to quantify remoteness: First, what types of “core area specific assets” should one take into account? Should one take into account population mass, the intensity of industrial activity or specialised services? Second, how does distance make it more difficult to make use of these assets? Is distance a problem at 20, 50 or 500 km? How much greater is the constraint of distance at 300 km, as compared to 150 km?

These difficulties make it close to impossible to assess the economic effects of remoteness. The issue is further complicated by the fact that industries established in peripheral regions will naturally be less sensitive to distance to markets, or be place-bound through the presence of a natural resource. Empirical evidence furthermore shows that there is no deterministic causal link between peripherality and reduced growth: the high growth levels achieved in e.g. southern Ireland and the Oulu region in northern Finland have shown that the constraints of peripherality can be overcome.

5.1. What is accessibility?

Measuring accessibility

Accessibility is the main 'product' of a transport system. It determines the locational advantage of a region relative to all regions. Indicators of accessibility measure the benefits households and firms in a region enjoy from the existence and use of the transport infrastructure relevant for their region. In general terms, accessibility then is a construct of two functions, one representing the activities or opportunities to be reached and one representing the effort, time, distance or cost needed to reach them.

The result can be compared to Newton's law of gravitation (see Stewart, 1947). According to the law of gravitation the attraction of a distant body is equal to its mass weighted by a decreasing function of its distance. Instead of mass, the attractors here are the activities or opportunities in all destination regions. The measure of distance can take many forms, e.g. airline distance, distance along the road or rail network, travel-time, transport cost. One can also consider that crossing a boundary or changing from one mode of transport to another increases the distance: different taxation systems, different legislations or simply different languages can be taken into account as additional 'transaction costs'. In social and economic terms, the notion of distance is therefore complex.

Finally, in terms of the quantification of accessibility, three approaches are possible:

- The first option is to sum up the number of opportunities within a given travel time. This would typically correspond to a *daily accessibility rate*, where the aim is to identify resources available within commuting distance.
- The second option is to calculate the distance one has to cover to reach a certain type of activity. For example, when seeking to optimise an economic activity's location, one would look at the travel cost to and from other locations where inputs to this activity are produced.
- The third and more complex solution considers that the shorter the distance to a given type of opportunity is, the more relevant it is. This measure, which is generally used when characterising the general regional accessibility, is called potential accessibility. Its calculation presupposes a hypothesis on how the relevance of opportunities decreases with distance, e.g. in a linear or exponential way. This is referred to as the "impedance function" of distance. Table 5.1 provides

a further account of important concepts as regards the measurement of accessibility.

Table 5.1. Different parameter dimensions of common accessibility indicators (Wegener et al., 2001, 9).

Dimension	Comments
Origins	Accessibility indicators may be calculated from the point of view of different population groups such as social or age groups, different occupations such as business travellers or tourists or different economic actors such as industries or firms.
Destinations	Accessibility indicators may measure the location of an area with respect to opportunities, activities and assets such as population, economic activities, universities or tourist attractions. The activity function may be rectangular (all activities beyond a certain size), linear (of size) or non-linear (to express agglomeration effects).
Impedance	The spatial impedance term may be a function of one or more attributes of the links between areas such as distance (Euclidean or network distance), travel time, travel cost, convenience, reliability or safety. The impedance function applied may be linear (mean impedance), rectangular (all destinations within a given impedance) or non-linear (e.g. negative exponential).
Constraints	The use of the links between areas may be constrained by regulations (speed limits, road gradients, maximum driving hours) or by capacity constraints (vehicle size, congestion). Barriers In addition to spatial impedance also non-spatial, e.g. political, economic, legal, cultural or linguistic barriers between areas may be considered. In addition, non-spatial linkages between areas such as complementary industrial composition may be considered.
Types of transport	Only personal travel or only goods transport, or both, may be considered.
Modes	Accessibility indicators may be calculated for road, rail, inland waterways or air. Multimodal accessibility indicators combine several modal accessibility indicators. Intermodal accessibility indicators include trips by more than one mode.
Spatial scale	Accessibility indicators at the continental, transnational or regional scale may require data of different spatial resolution both with respect to area size and network representation, intra-area access and intra-node terminal and transfer time.
Equity	Accessibility indicators may be calculated for specific groups of areas in order to identify inequalities in accessibility between rich and poor, central and peripheral, urban and rural, nodal and interstitial areas.
Dynamics	Accessibility indicators may be calculated for different points in time in order to show changes in accessibility induced by TEN projects or other transport policies, including their impacts on convergence or divergence in accessibility between areas.

Figure 5.1 is an attempt to summarise the complexity of the different accessibility indicators that are widely used in the literature. Simple endowment indicators (infrastructure measures, e.g. length of motorways in each region) can be best applied at higher NUTS levels (NUTS-0 to NUTS-3), and show the least complexity (provided that the respective data is available). Travel time or travel cost indicators such as the travel time to the nearest airport, university or agglomeration, or the accumulated travel costs to a set of certain activities are more complex in terms of data requirements and the way

they are calculated, however, they are still relatively easy to communicate. They can best be applied at NUTS levels 2 to 5; applications at NUTS-0 or NUTS-1 level is of course possible from a technical point of view, however, the explanatory power is then very limited.

Daily accessibility and potential accessibility indicators are the most complex ones, both in terms of data needs and calculation requirements, but they are also those indicators with the greatest explanatory power, as they really take into account a full set of origin-destination-pairs, and consider both the activities at any destination and the impedances to reaching them.

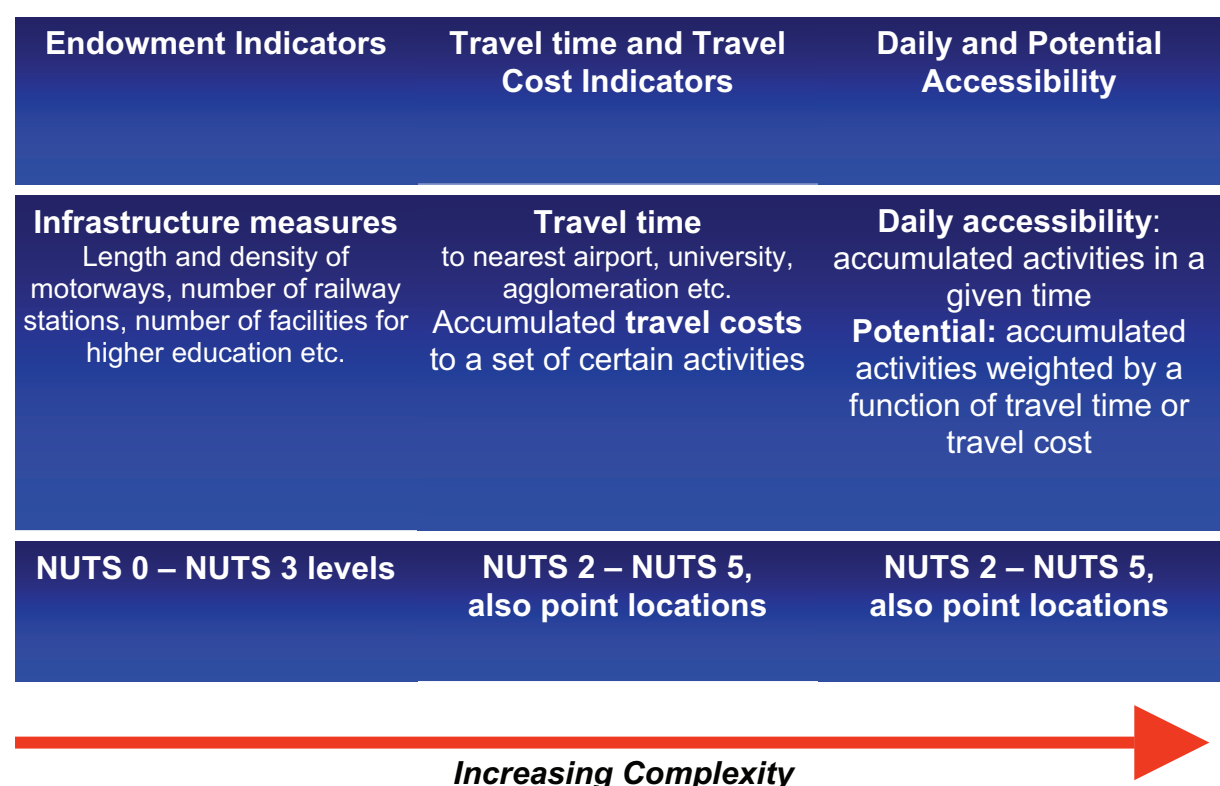


Figure 5.1. Complexity of accessibility indicators.

Accessibility, Regional Development and Cohesion

The important role played by the transport infrastructure in regional development is one of the fundamental principles of regional economics. In its most simplified form it implies that regions with better access to the locations of input materials and markets will, *ceteris paribus*,

be more productive, more competitive and hence more successful than more remote and isolated regions (see Linneker, 1997).

The two-way interaction between regional economic development and interregional transport is illustrated in Figure 5.2. The relationship between regional development and transport can be seen as a self-reinforcing positive feedback loop in which regional economic growth creates more traffic and, vice versa, transport opportunities generate regional economic growth, with congestion and factor prices acting as equilibrating negative feedbacks:

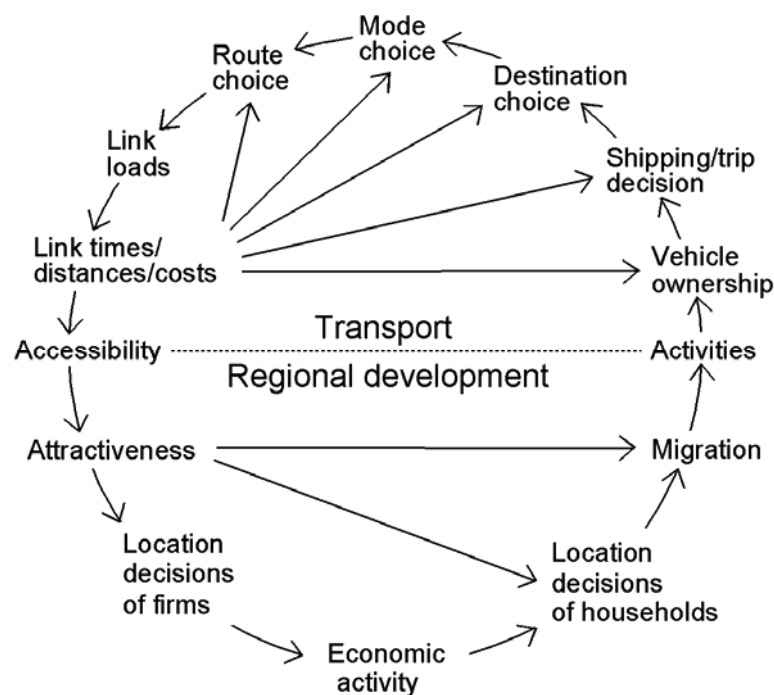


Figure 5.2. Transport and regional development (Wegener et al., 2000).

- (1) The spatial distribution of economic activity and population gives rise to shipments of goods and movements of travellers between the regions.
- (2) Shippers and traveller make use of the existing transport infrastructure by a sequence of decisions about vehicle ownership, trips to make (or not to make), choice of destination, choice of mode(s) and choice of route(s).
- (3) These decisions lead to congestion in parts of the networks, which result in increases in transport and travel costs and times, which in turn affect the transport decisions of shippers and travellers.
- (4) Transport and travel costs in the (congested) networks are location factors co-determining the attractiveness of regions for investors and households.

- (5) Investors decide on the location or relocation of capital and firm locations, this leads to changes in employment opportunities in the regions.
- (6) Households make migration decisions as a function of employment opportunities, this leads to changes in regional population which then will lead to changes in the spatial configuration of the activities.

According to SACTRA (1998) a list of the important regional effects of the effects of transport investment must include the following aspects: Transport investment may broaden the access of employers to qualified labour, expand market areas, attract inward investment, improve the image of a region, unlock suitable development sites and induce further economic activity and further employment. However, there may be also negative impacts: The net effect on employment and regional activities depends on the balance between export promotion and import substitution for local production. Transport improvement may have displacement effects in other regions. Marginal changes in the quality of an already good infrastructure system are less likely to have significant effects. Transport investments may reduce the demand for transport resources (e.g. drivers and vehicles) by improving the productivity of the transport sector. And finally, labour market characteristics have to be considered.

Whether the positive effects of transport investments outweigh the negative effects, cannot be judged theoretically but instead depends on the type of investments and type of transport infrastructure project in question, and of course also upon the existing transport network within a region.

From the point of view of regional development policies, Figure 5.3 illustrates the dilemma between the positive effects and the counteracting negative effects of transport investments. In this theoretical example, region A is disadvantaged by its peripheral location, its poor transport connections to the central regions B and C and by its low population mass (i.e. small internal markets). An improvement of the transport link between that peripheral region A and the central region B enables region A to market its products in B and C more easily and efficiently (and so expands its potential markets), but it also opens it up to the products of B and C . Very often, producers in B and C are more productive compared to those in region A , as they have higher skilled labour forces available, lower *per-capita* costs, economies of scale, and more advanced technologies at

hand, and so there is severe danger that the formerly closed monopolist local markets in region *A* will be destroyed by the new competitors of central regions *B* and *C*. Of course, in monopolist closed markets consumers usually have to pay higher prices for goods. However, in this case the destruction of the formerly closed markets may end up in the closure of the small scale local companies and firms, and so may increase unemployment rates.

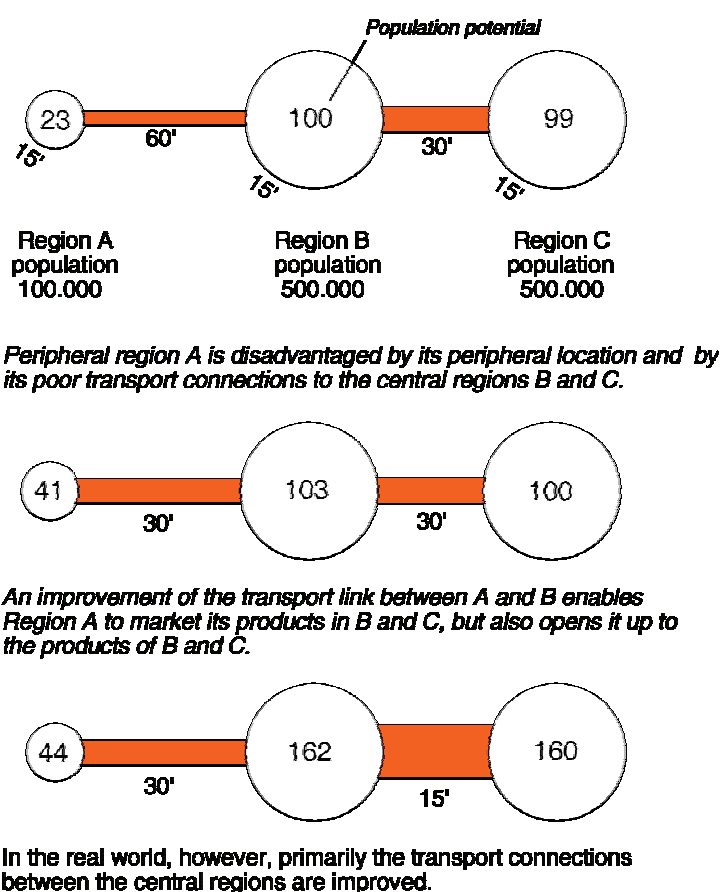


Figure 5.3. Transport investments and regional development.

Moreover, it is not realistic to hypothesise an improvement of transport links between peripheral region *A* and central region *B* only, without a concomitant upgrading of connections between central regions *B* and *C*. The comparative assessments of infrastructure projects based on cost-benefit analyses indeed favours connections with high traffic demand. For this reason, the central regions will tend to be the main beneficiaries of infrastructure improvements. Even if there are improvements in accessibility for all regions, the gap between the central regions and the peripheral will tend to widen. While the macro-economic effect transport investments is positive, the

outcomes are not satisfying from a cohesion perspective. The positive macro-economic effects in the short run should be weighed against the possible negative effects within the peripheral community, e.g. in terms of employment.

This of course is only one possible scenario of the spatial impacts of transport investments. Similar processes have however been observed in a number of regions where the general economic growth triggered by transport investments was at the expense of losing jobs and raising local or regional unemployment.

The impact of transport infrastructure on regional development has been difficult to verify empirically. There seems however to be a clear positive correlation between both the transport infrastructure endowment and the location in interregional networks, and the *level* of economic indicators such as GDP *per capita* (e.g. Biehl, 1986; 1991; Keeble et al., 1982, 1988). However, this correlation may merely reflect historical agglomeration processes rather than a current causal relationship between accessibility and economic performance (cf. Bröcker and Peschel, 1988). Attempts to explain *changes* in economic indicators, i.e. economic growth and decline, by transport investment have been much less successful. The reason for this failure may be that in countries with an already highly developed transport infrastructure further transport network improvements bring only marginal benefits. The conclusion is that transport improvements have strong impacts on regional development only where they result in removing a *bottleneck* (Blum, 1982; Biehl, 1986; 1991; Fürst et al., 2000a, 2000b).

While there is uncertainty about the magnitude of the impact of transport infrastructure on regional development, there is even less agreement on its direction. It is hotly debated whether the transport infrastructure contributes to regional polarisation or decentralisation. Some analysts argue that regional development policies based on the creation of infrastructure in lagging regions have not succeeded in reducing regional disparities in Europe (Vickerman, 1991a), whereas others point out that it has yet to be ascertained whether the reduction of barriers between regions has disadvantaged peripheral regions (Bröcker and Peschel, 1988). From a theoretical point of view, both effects can occur. A new motorway or high-speed rail connection between a peripheral and a central region, for instance, makes it easier for producers in the peripheral region to market their products in the large cities, however, it may also expose the region to the competition of more advanced

products from the centre and so endanger formerly secure regional monopolies (see Figure 5.3) (Vickerman, 1991b; Bundesminister für Verkehr, 1996).

While these two effects may partly cancel each other out, one factor unambiguously increases existing differences in transport infrastructure. New transport infrastructure tends to be built not between core and periphery but within and between core regions, because this is where transport demand is highest (Vickerman, 1991a). It can therefore be assumed that the trans-European networks will largely benefit the core regions of Europe.

As shown in many studies, accessibility indicators can be used to analyse and quantify the impacts of transport investments on regional development (Schürmann et al., 1997; Fürst et al., 2000a; Geurs and van Eck, 2001; Bröcker et al., 2004). However, apart from calculating the accessibility indicators this implies the application of a more general model of regional economic development.

If the negative effects outweigh the positive effects in the long run, as discussed above, this would likely shed a negative light on the fulfilment of major policy goals of the European Union:

Article 2 of the Maastricht Treaty states as the goals of the European Union the promotion of harmonious and balanced economic development, stable, non-inflationary and sustainable growth, convergence of economic performance, high levels of employment and social security, improvement of the quality of life and economic and social coherence and solidarity between the member states.

The trans-European networks in the fields of transport, communications and energy (TEN) play a prominent role in the achievement of these goals. Indeed, Article 129b of the Maastricht Treaty linked the TEN to the objectives of Article 7a (free traffic of goods, persons, services and capital) and Article 130a (promotion of economic and social cohesion). In particular the trans-European transport networks were to link landlocked and peripheral areas with the central areas of the Union. These objectives were confirmed in the European Spatial Development Perspective (ESDP 1999, 14).

In the ESDP document, improvements in accessibility are given a high priority as a policy target: *"Good accessibility of European regions improves not only their competitive position but also the competitiveness of Europe as a whole."* (ESDP 1999, p. 69). *"The creation of several dynamic zones of global economic integration, well distributed throughout the EU territory and comprising a network of internationally accessible metropolitan regions and their linked hinterland (towns, cities and rural areas of varying sizes), will play a key role in improving spatial balance in Europe"* (ESDP, 1999, 20). However, it is admitted that, *"it is not possible to achieve the same degree of accessibility between all regions of the EU"* (ESDP, 1999, p. 36).

This goal setting reflects the assertion that improvements in accessibility have positive implications for regional (economic) development. Unfortunately, there is no uni-causal or straightforward link between these two phenomena, and thus the question remains *a priori* open: upgrading a region's accessibility provides actors in that particular region with improved possibilities to reach destinations outside, but at the same time, they meet increasing competition from outside. The net effect on regional development remains an empirical issue.

Accessibility indicators can be used to analyse peripherality in several ways: regions can be classified into central and peripheral regions, impacts of different policy measures such as transport investments can be evaluated, or impacts of accessibility on regional development can be analysed.

Large-scale accessibility measures and small-scale accessibility measures

From the perspective of regional development, and thus also from the perspective of the Nordic sparsely populated areas, it is important to analyse the degree of peripherality (as being the negative notion of accessibility) at different spatial levels.

First, large-scale European-wide accessibility measures are positioning the regions relative to all other regions in the European Union, revealing differences in accessibility and in the development of accessibilities over time. These types of indicators mainly represent business activities and the transportation of goods; for business trips and also for the movements of goods it is important to know how quickly any destination is reachable,

and of course at what cost. The daily accessibility and also the potential accessibility indicator can, moreover, also be interpreted as the market potential that any origin may offer to businesses (how many people can be reached in a reasonable time?) and to producers (how many customers are living in close proximity?). However, private trips are not so well covered by these kinds of measures as long-distance international travel is not the main concern of daily life and has little influence on the quality of life in the regions apart from holiday travel.

Second, small scale accessibility measures are more concerned with intra-national or intra-regional types of accessibilities, and so try to contribute to measuring the quality of life and infrastructure provision in a region in a broad sense. Here, the focus lies on the endowment and travel time indicators: How long does it take to go to the nearest hospital, or university, or to the nearest airport? What is the travel time to the three nearest large cities? As these activities are more concerned with daily life, these types of indicators can be considered as more individual-driven rather than economically driven. The very practical implication of these measures is, for instance, that if a region is performing badly in terms of the above-mentioned indicators, people may be forced to leave because the region is lacking in basic infrastructure (for example, hospitals); or in other words: if a region is performing above-average (for example, as regards facilities for higher education), the region may attract people from outside the region, and so may generate additional income and additional economic activities.

It is therefore important to analyse both large-scale European-wide accessibility indicators, as well as small-scale accessibility indicators to obtain a full picture of a region's external and internal accessibility.

Accessibility indicators in the SPA study

In this study on the Nordic sparsely populated peripheral areas, accessibility indicators play a crucial role at several stages:

First of all, a derivate of the accessibility potential measure has been used to delimitate the sparsely populated areas (how many people can be reached within 50 km), and so to delimitate the study area (see Chapter 3).

Second, travel time indicators have been used to analyse the infrastructure provision and infrastructure supply in the regions with respect to airports, hospitals and universities and functional urban areas. These indicators represent the small-scale accessibility measures.

5.2. European accessibility measures

A possible measure of accessibility introduced by the ESPON project 2.1.1¹ uses GDP as an indicator of economic activity in destination regions, and considers that its relevance for the origin region decreases by 50% for every 1000 minutes (16,6 hours) of travel time (Figure 5.4). Based on these hypotheses, the northernmost Finnish region of Lappi appears to be among the most remote areas in Europe, while most other regions of the study area appear in the same group as the Eastern parts of Romania, Bulgaria and Greece. Generally, as for all accessibility maps based on ground transport, the dominant feature is the centre-periphery patterns from a European core area stretching from the Benelux countries to Paris and Frankfurt to the outer parts of Europe. This illustrates the monocentric structure of Europe, organised around only one major core area.

This pattern can indeed also be observed in Figure 5.5, which corresponds to the potential accessibility to population in EU 27 (including Romania and Bulgaria), Norway and Switzerland, by road. In this calculation, the exceptionally low accessibility levels in the Study area appear, compared to the rest of Europe, even more clearly, as only Cyprus and some Greek islands have equivalent values. Some measures of potential accessibility

¹ ESPON stands for European Spatial Planning Observatory Network. This INTERREG III programme has financed a number of research projects in view of providing a diagnosis of the principal territorial trends at EU scale and a cartographic picture of territorial disparities. More information about ESPON is available at www.espon.lu.

to population show a relatively favourable position for East-Finland, due to the proximity to the 10 million inhabitants of the Saint-Petersburg region (e.g. ESPON Project report 1.2.1 'Transport trends'). This however needs to be nuanced as a hypothetical opportunity for the concerned Finnish regions, as the practical, administrative and economic difficulties developing cross-border interaction in these areas are considerable. For this reason, we have developed an alternative calculation taking into account destinations in EU 27, Norway and Switzerland only. From the Finnish perspective, the border with Russia is perceived as an important barrier, not only for historical reasons but also because of the contrasts in terms of revenue and welfare. Furthermore, the political and administrative situation creates a certain degree of unpredictability in terms procedures, tariffs and general trade conditions. For these reasons, it is from some perspectives reasonable to assume that the population situated beyond the Eastern border of the EU should not be taken into in the accessibility calculations.

If air transport is introduced, more complex spatial patterns appear, as accessibility to airports can often be better in remote regions than in centrally located rural regions. Figure 5.6, based on data provided by Spiekermann and Wegener, illustrates these differential effects of air transport on the relative levels of accessibility in regions across Europe. Most centrally located regions (pink regions in Figure 5.6) have a lower relative level of accessibility when air transport is introduced, because their *gain* in terms of accessibility from air transport is much weaker than in other parts of Europe. At the other end of the scale, the remote regions of the Nordic periphery are those who gain most from the introduction of air transport. Most regions of the study area have relative accessibility levels that are more than 500% higher with air transport than without. These increases however only concern the areas around the main regional airport. In all other parts of the regions, accessibility remains low even when taking into account air transport (see subchapter 5.4).

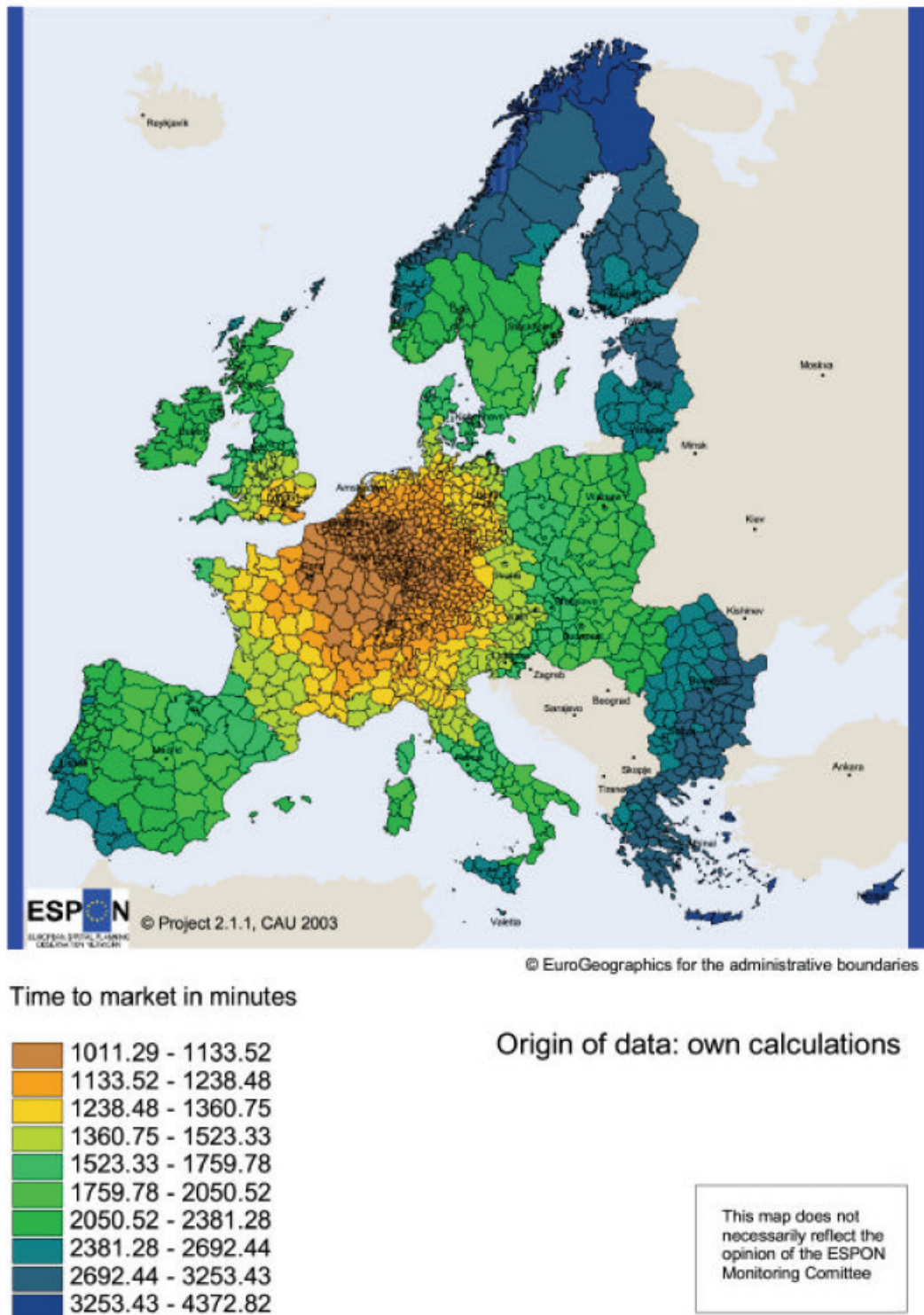


Figure 5.4. Multimodal (road + rail) accessibility to GDP at the macro scale

Source: Christian-Albrechts-Universität zu Kiel, ESPON project 2.1.1 (2003).

Potential accessibility by road to destinations in EU 27, Norway and Switzerland

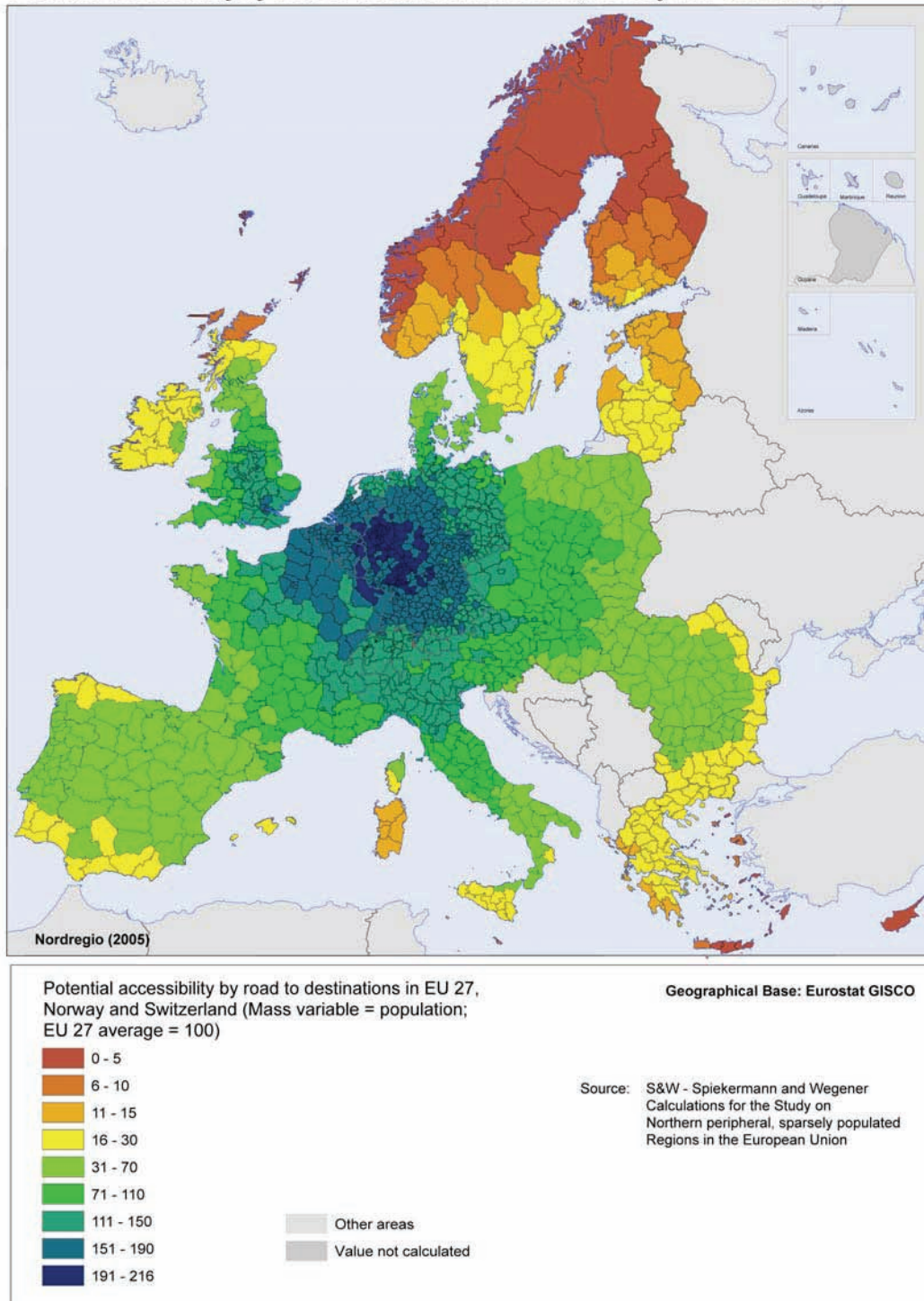


Figure 5.5. Potential accessibility by road to population in EU 27, Norway and Switzerland

According to this calculation, most of the study area regions have the lowest potential accessibility to population in EU 27, Norway and Switzerland.

By not taking into account destinations in other countries, such as Russia, Belarus, the Ukraine and Moldova, this map reflects the difficulties crossing the border to these countries and the contrasts in terms of economic, administrative and social systems that significantly reduce trade possibilities.

Comparison of multimodal and road accessibilities

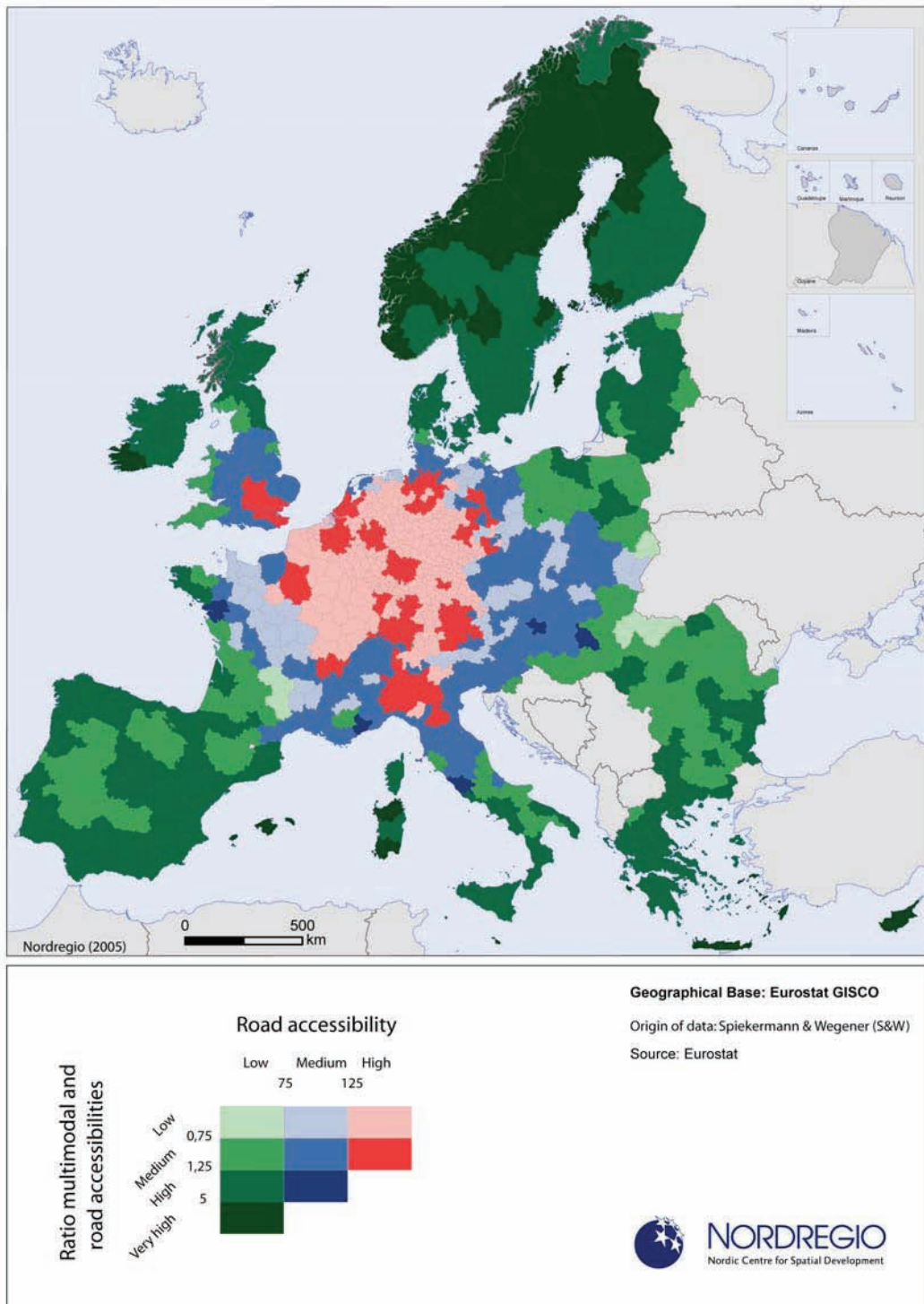


Figure 5.6. Comparison of air and road accessibilities

There is strong improvement of relative accessibility levels in Nordic peripheries through air transport. relative accessibility levels generally increase by over 500%. This illustrates the high dependency on air transport in these regions.

5.4. Access to airports

As shown in the previous section, air traffic increases the accessibility of Northern Peripheries up to a level that may, in some respects, be equivalent to that of the rural regions of continental Europe. The intra-regional contrast between areas which can access an airport with regular traffic, and those that cannot, is however all the greater.

This section introduces some quantitative analyses on the access to airports in the Nordic peripheral regions. These are based on the present situation, or on the latest available data. One should however bear in mind that, based on the current deregulation of air traffic, trends in passenger numbers, and increased demands in terms of profitability, national airport authorities in both countries expect a number of smaller airports to be closed in the years to come.

As shown by Figure 5.7, a rather balanced distribution of airports exists in the Study area. There are 29 airports in the Finnish part of the study area, 50 in the Norwegian part and 38 in the Swedish part. However, many of them are of very local importance. There are almost no international routes from any of the airports in the study area.

The dominant destinations served from airports in the remote regions of Sweden and Finland are the capital cities, i.e. Stockholm and Helsinki (Figure 5.8). There are very few routes interconnecting airports within the northernmost regions with each other in these countries. The only exceptions are the Luleå-Kiruna and Vilhelmina-Storuman connections in Sweden. The situation is quite different in the northernmost regions of Norway, many of which are closely interconnected with each other. This is, in part, due to the extreme importance of air transport for insular communities, and also to the design of Norwegian public policies in favour of air transport in remote regions. There are indeed a number of regional hubs, such as Tromsø, Bodø, Evenes, Bardufoss and Alta, around which transport from other smaller airports is organised. These lines are subsidised, through a system by which the state purchases the operation of certain connections. There is consequently no competition on these subsidised secondary regional routes. Despite the subsidies, fares to and from local airports are considerably higher than between the regional and national hubs.

Airports in the northernmost regions

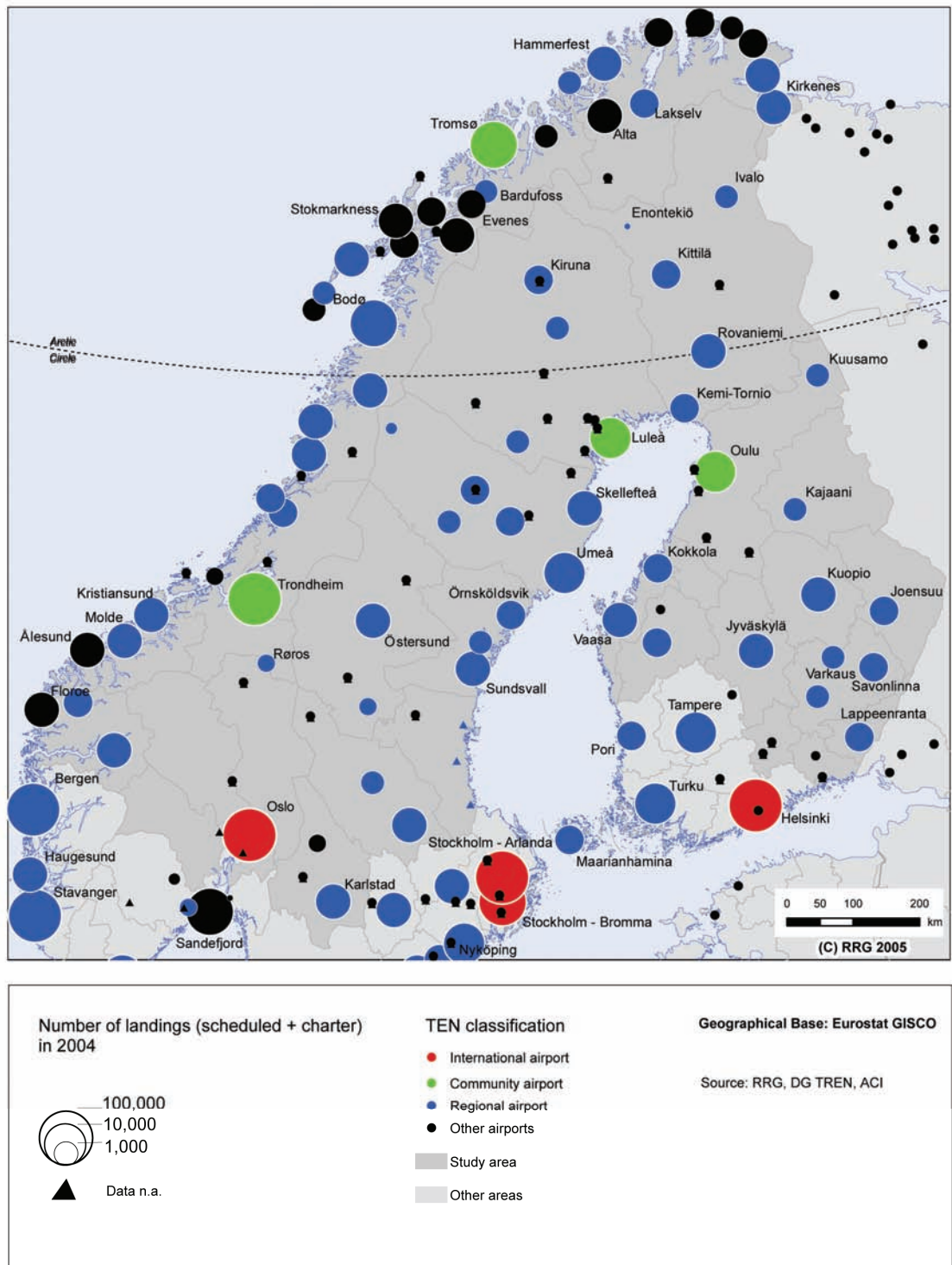


Figure 5.7. Airports in the northernmost regions
(RRG, 2005, European Commission, 2005, ACI, 2003).

Flight connections from study area airports (2005)

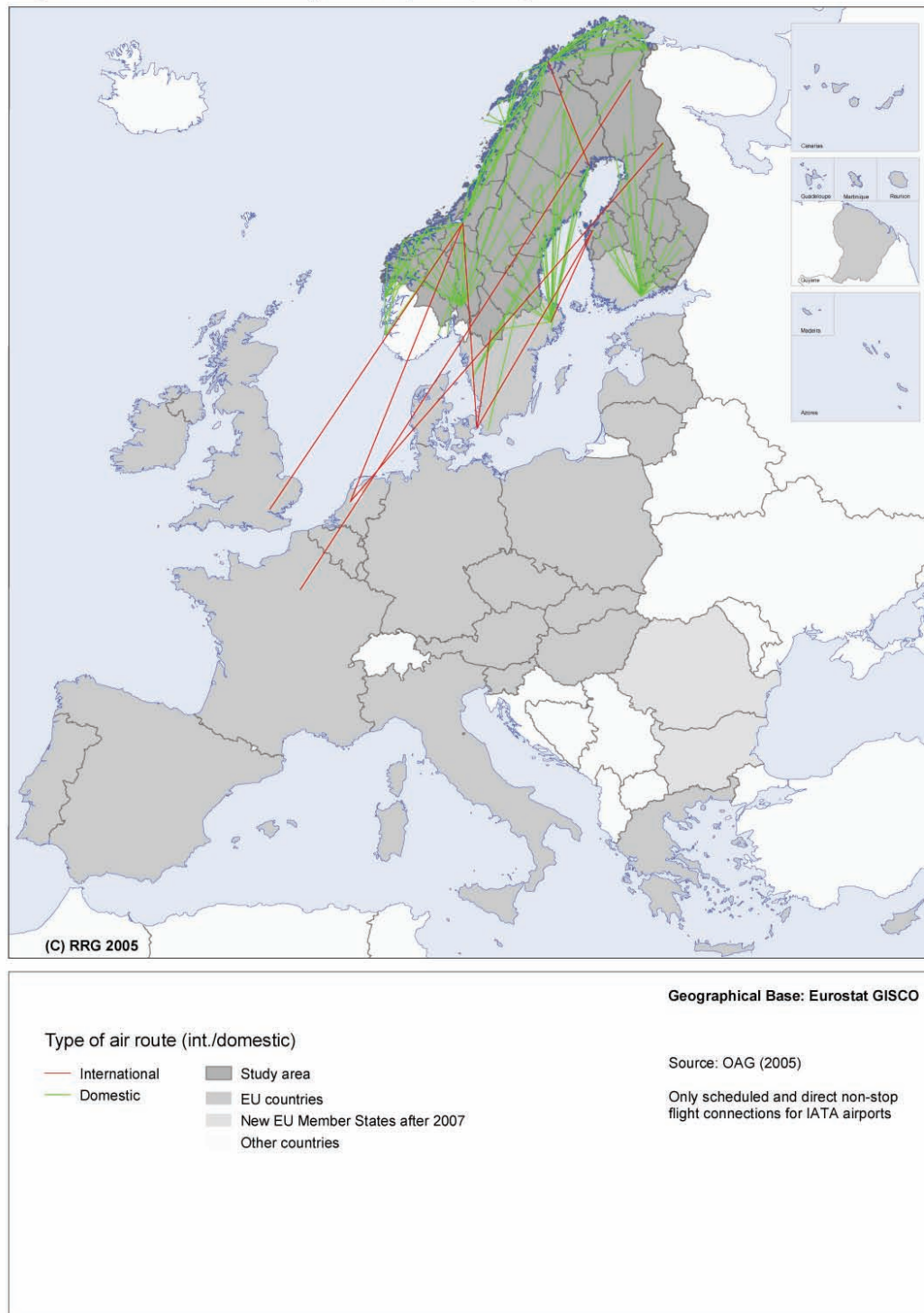


Figure 5.8. *Air connections in the northernmost regions (RRG, 2005, European Commission, 2005, ACI, 2003).'*

There are very few transversal connections in the peripheries of Finland and Sweden, which greatly reduces the potential for interaction between peripheral regions. In this respect, Norwegian peripheral regions are in a considerably more favourable position.

Air transport connections that are exclusively oriented towards the national capital region create a monocentric type of relations, which may increase the dependency of remote regions. Indeed, rather than developing certain common specialised services for a group of interconnected peripheral regions, they will tend to refer to existing facilities in the capital region. Transversal links between peripheries are therefore of fundamental importance for the constitution of viable autonomous economic development nodes outside of the capital regions.

Air connections in peripheral parts Finland and Sweden cannot, in other words, be expected to contribute to the notion of functional regional enlargement (*“regionförstoring”*), often evoked in national policies as a way of compensating for the lack of critical mass in these areas. This is however a possibility in Norway.

In addition, as noted previously, even if air transport makes some towns and cities relatively easily accessible, albeit at the cost of a transit through the main national airport, this only reinforces the relative isolation of areas that are further away from the nearest airport. It is therefore interesting to assess the relative extent and demographic weight of areas in the study area from which one cannot access any airport in less than 60 minutes. As illustrated by figures 5.9 and 5.10 this concerns only marginal inhabited parts, except possibly in Eastern Finland. This is expressed more explicitly by calculating the proportion of municipality population living within the 60 minutes isochrones as a percentage of the total municipality population (Figure 5.11).

According to the airport locations, in municipalities located on the Baltic Sea more than 80 %, often even more than 90 % of the population lives within one-hour's driving time. This holds true for Finland, Sweden and Norway, with only few exceptions. However, on moving further away from the coastlines the situation in Finland and Sweden differ to some extent: As the percentages in Sweden and Norway remain rather high often at more than 50 % even in remoter hinterland municipalities, in the Finnish hinterland municipalities these percentages often do not exceed the 50 % limit. This finding of course not only reflects the airport's location, but is also illustrative of the different population patterns in both countries (see Chapter 4). Table 5.2 sums up these results at NUTS-3 level.

Table 5.2. Population at more than 60 minutes from nearest airports per NUTS 3 region

Figures in this table are generally overestimated, due to the limited resolution of the network model used. Their value is primarily comparative.

NUTS 3 region	Proportion at more than 60 minutes from nearest airport (%)	Concerned population
Etelä-Savo	24.99	40 642
Pohjois-Savo	32.78	80 830
Pohjois-Karjala	45.26	75 244
Kainuu	43.43	37 904
Päijät-Häme	3.48	6 352
Kymenlaakso	5.21	10 424
Etelä-Karjala	12.78	16 874
Keski-Suomi	25.40	66 566
Etelä-Pohjanmaa	26.91	52 000
Pohjanmaa	23.72	34 482
Keski- Pohjanmaa	10.04	6 928
Pohjois- Pohjanmaa	37.33	140 882
Lappi	25.08	49 196
FINLAND	17.74	929 921
Värmlands Län	19.18	52 729
Dalarnas Län	24.54	67 784
Gävleborgs Län	9.29	25 655
Västernorrlands Län	16.53	40 636
Jämtlands Län	36.14	45 503
Västerbottens Län	23.97	6 013
Norrbottens Län	18.09	38 905
SWEDEN	17.63	277 225
Akershus	4.06	14 322
Hedmark	39.23	7 309
Oppland	33.70	6 114
Buskerud	17.30	39 574
Sogn og Fjordane	52.74	49 095
More og Romsdal	46.16	96 768
Sør Trøndelag	26.22	68 784
Nord Trøndelag	26.01	31 421
Nordland	18.70	39 515
Troms	13.38	19 527
Finmark	37.94	35 133
NORWAY	19.82	407 562

Airports in the study area: 60-minutes isochrones

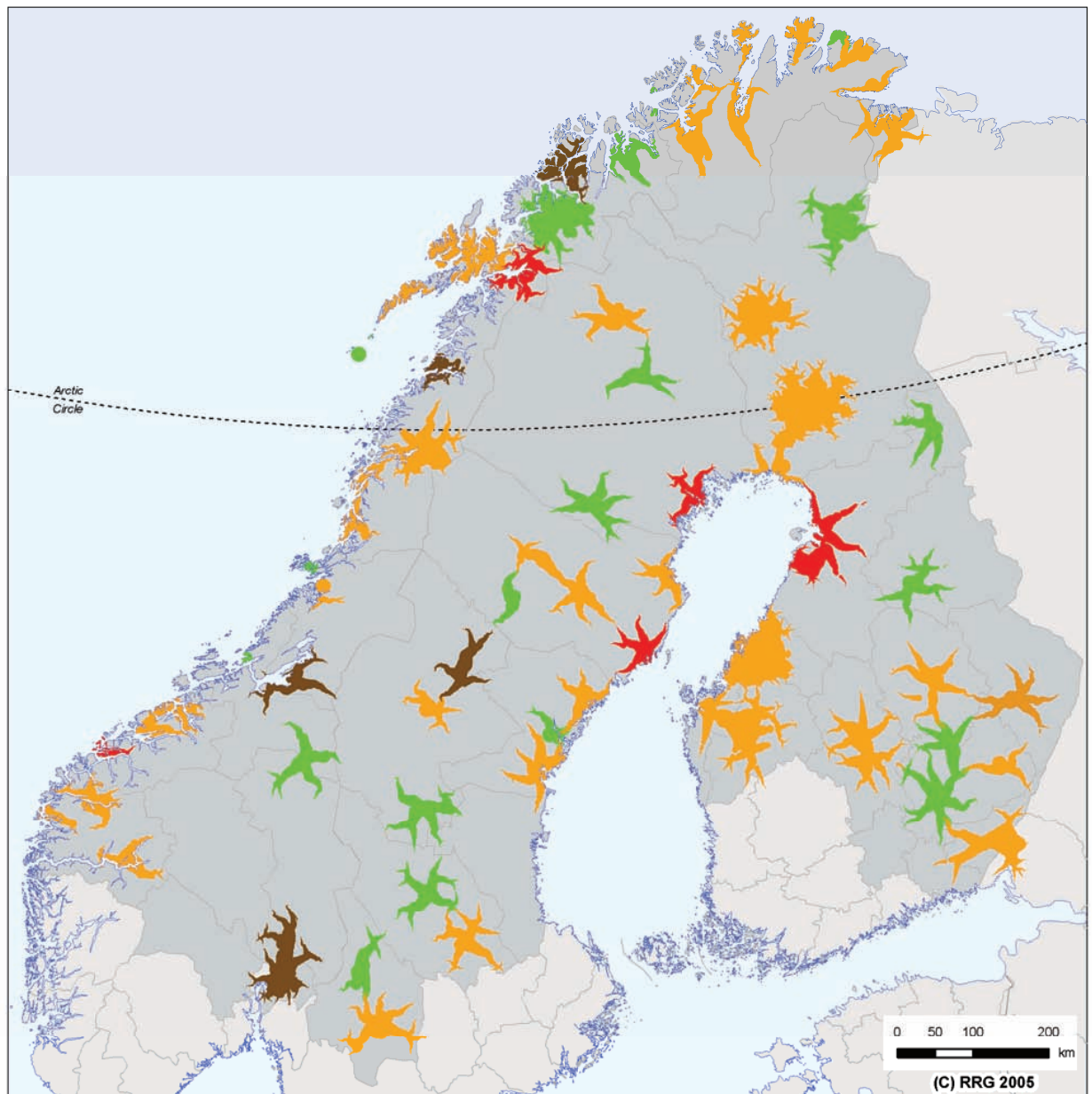
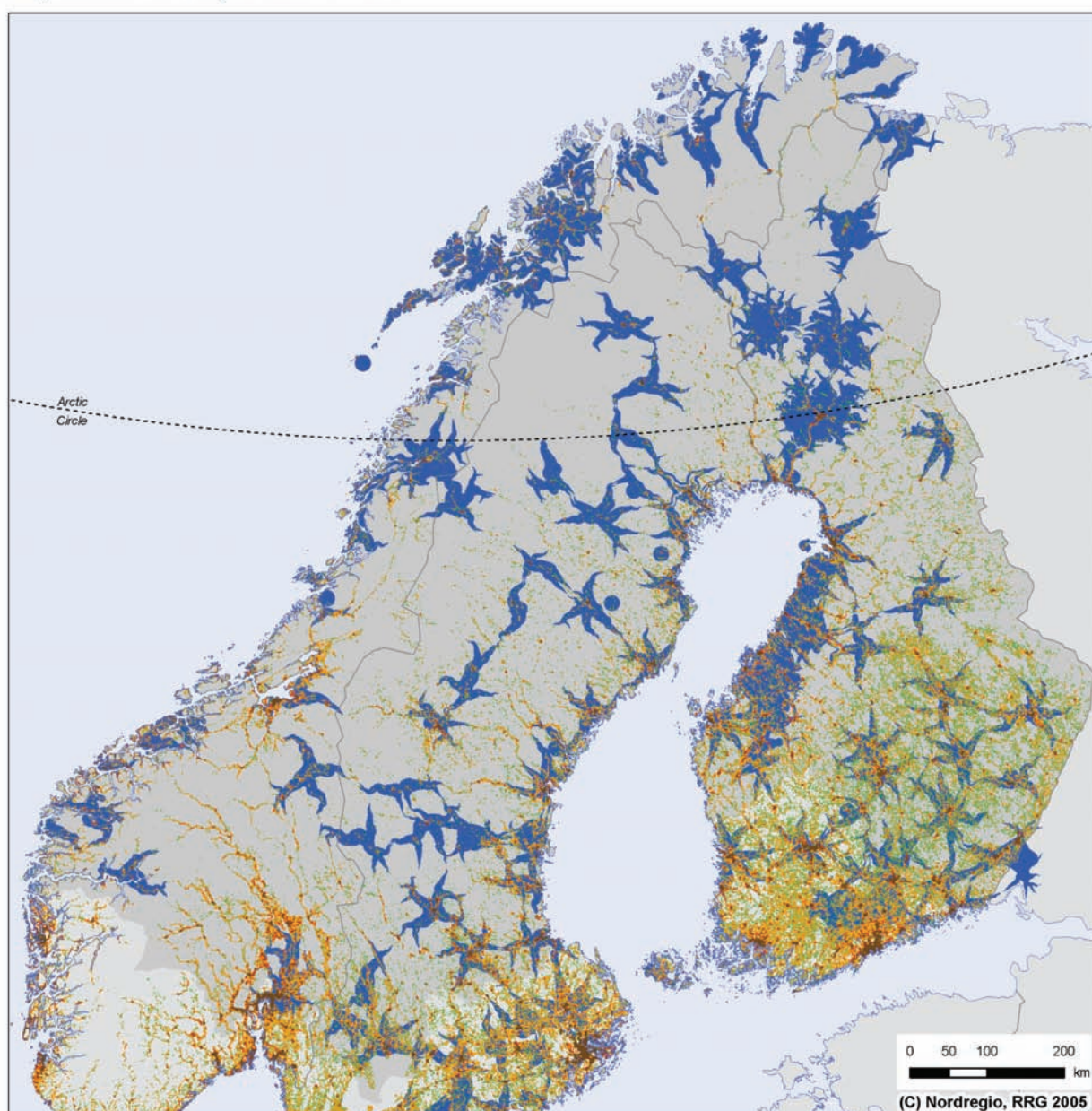


Figure 5.9. Areas within 1 hour of the nearest airport

The population only has access to an airport in a limited proportion of the area of each region.

Population and airport isochrones



Population (2002; 1x1 km grid) and airport isochrones (1 hour)

- | | |
|-------------------|--------------------|
| 1 to 4 persons | Other areas |
| 5 to 50 persons | Non-EU countries |
| 51 to 100 persons | Airport isochrones |
| Over 100 persons | |

Geographical Base: Eurostat GISCO

Source: Statistics Finland (2005),
Statistics Sweden (2005),
RRG



NORDREGIO
Nordic Centre for Spatial Development

*Figure 5.10. Overlay 1x1 grid cell populations
and areas within 1 hour of the nearest airport*

Municipality population within 1 hour airport isochrones

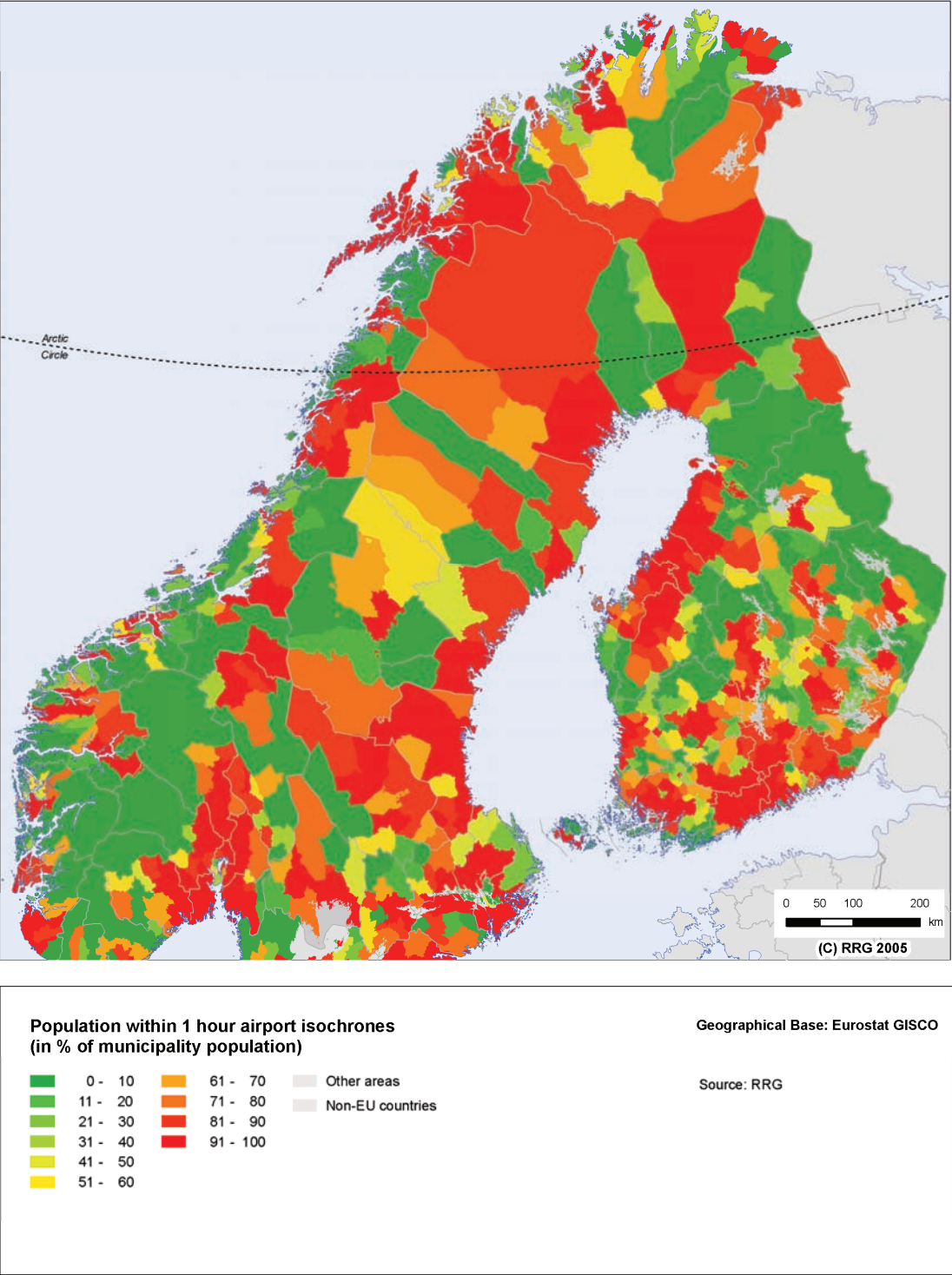


Figure 5.11. Proportion of municipal population living less than one hour (by individual car) from the nearest airport (in %)

Using this same methodology, one can thus also assess the population potential of each airport, i.e. the local population that, having a travel time of less than 60 minutes, is potentially likely to use it. This population potential is presented in Figure 5.12. It shows the exceptional character of Nordic peripheral regions in the European context: no other part of the continent has such low values over such a wide territory. As these areas cannot generally rely upon mass-tourism to improve the profitability of the airport infrastructure, in the same way as for example a number of Mediterranean islands, a proactive public policy in their favour is necessary.

If one looks at the relationship between the number of passengers and the local population potential (Figure 5.13), it is interesting to note that the ratio is similar for some very peripheral Nordic airports, and in major tourism destinations such as Majorca and the Greek islands, or European air traffic hubs such as London and Paris. This shows the intense use that is made of the airport infrastructure by the local population, and suggests that the closure of the smaller peripheral airports could have dramatic consequences for the concerned local communities.

Airports in Europe: Population potential (10 % overlay)

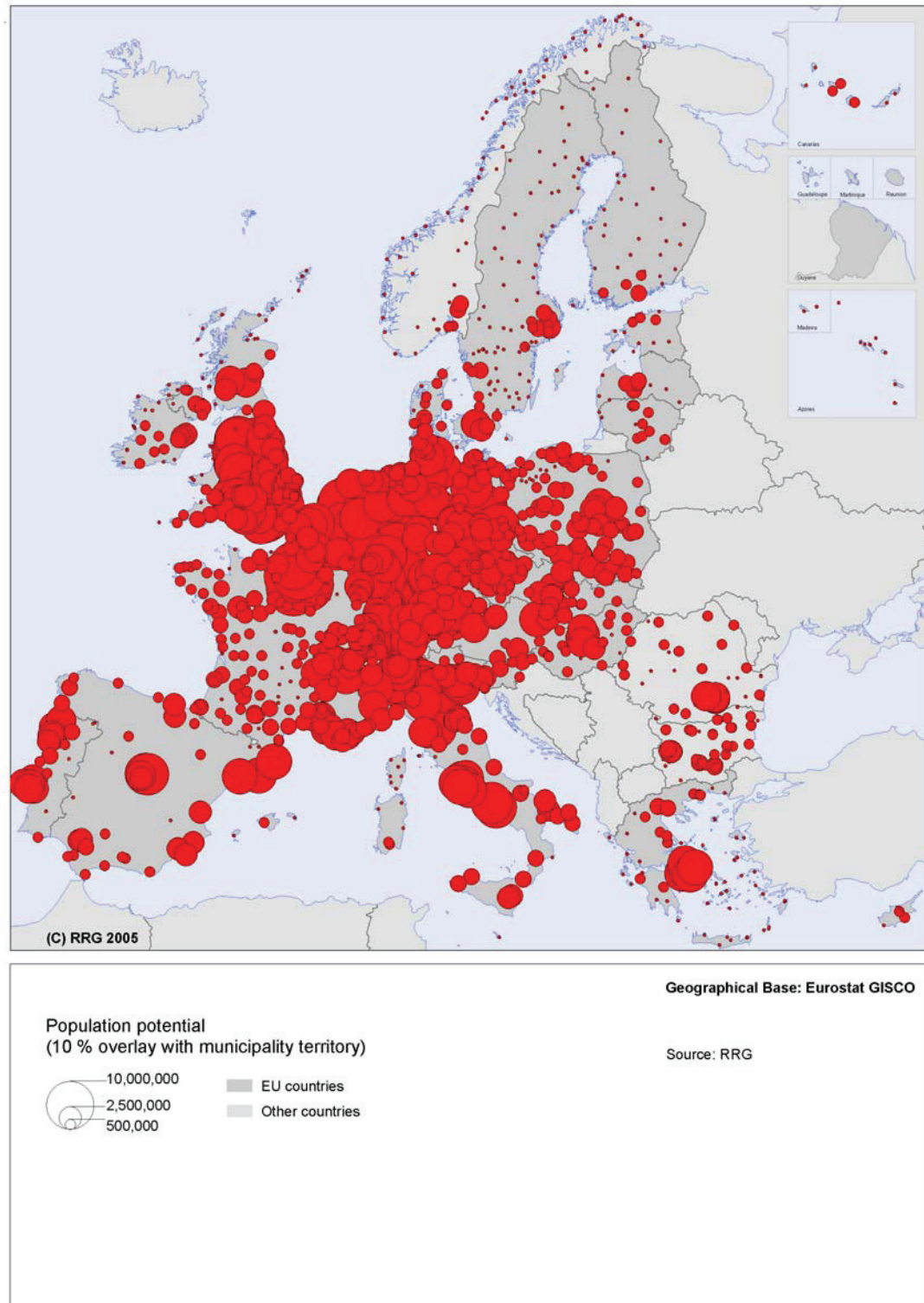


Figure 5.12. Airport population potential
(i.e. total population living within 60 minutes from airport)

Airports in Europe: Passenger surplus compared to population potential (10 % overlay)

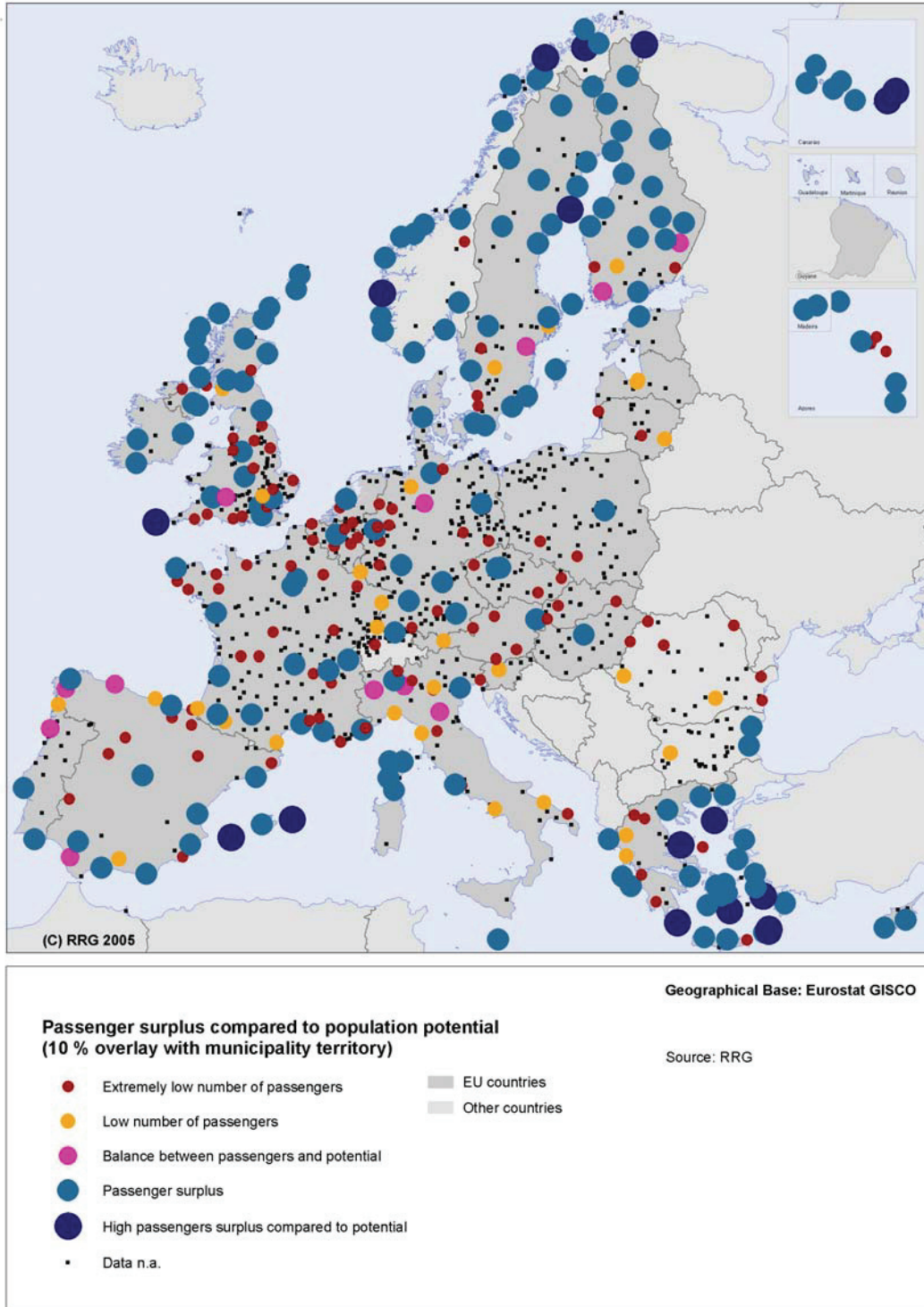


Figure 5.13. Relationship between airport population potential (i.e. total population living within 60 minutes from airport) and airport traffic.

The relationship between population potential and traffic is similar in peripheral European airports and in major European hubs. The highest ratios are found in peripheral and insular tourist destinations, as well as some regional hubs in Norway and Sweden.

5.4. Road maintenance costs

Cold climates imply a number of specific challenges for the building, maintenance and operation of a road network. For safety reasons, the use of specific winter tyres is compulsory throughout the study area. These winter tyres tend to be studded, particularly in more sparsely populated areas. This leads to a significantly higher degree of erosion of the road surface. In terms of road building, road surfaces in the Nordic peripheries are therefore designed to resist a much higher degree of erosion than in other parts. Roads built in areas of cold climate moreover need to be built in order to resist the weathering effects both of freeze-thaw and of gullies created by melting snow in the spring season.

In terms of road maintenance, keeping the road open for circulation during the winter months has major cost implications. The actual expense depends not only on the number of days with snowfall, but also on wind intensities. In exposed mountainous or coastal areas, most snow clearing operations will be carried out because of snow blown back onto the road surface, and not following a snowfall. The frequency of road clearing operations also depends on the intensity of traffic on each portion of the road network. Nonetheless, the cost per travelled kilometre is considerably higher in the most sparsely populated areas, compared to the national capital regions (Figures 5.14 and 5.15). This point is further elaborated upon in section 7.2.

The low density of trunk roads (as shown by Figure 5.16) can also be an obstacle to mobility. There will not in many cases be any alternative itinerary if one road is closed for climatic reasons.

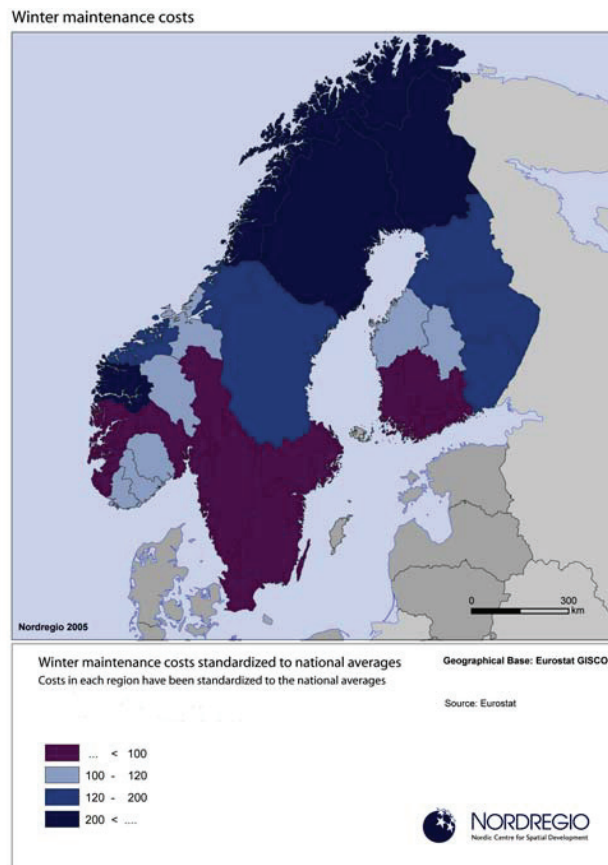


Figure 5.14. Winter maintenance costs per km and per vehicle standardised according to national average values

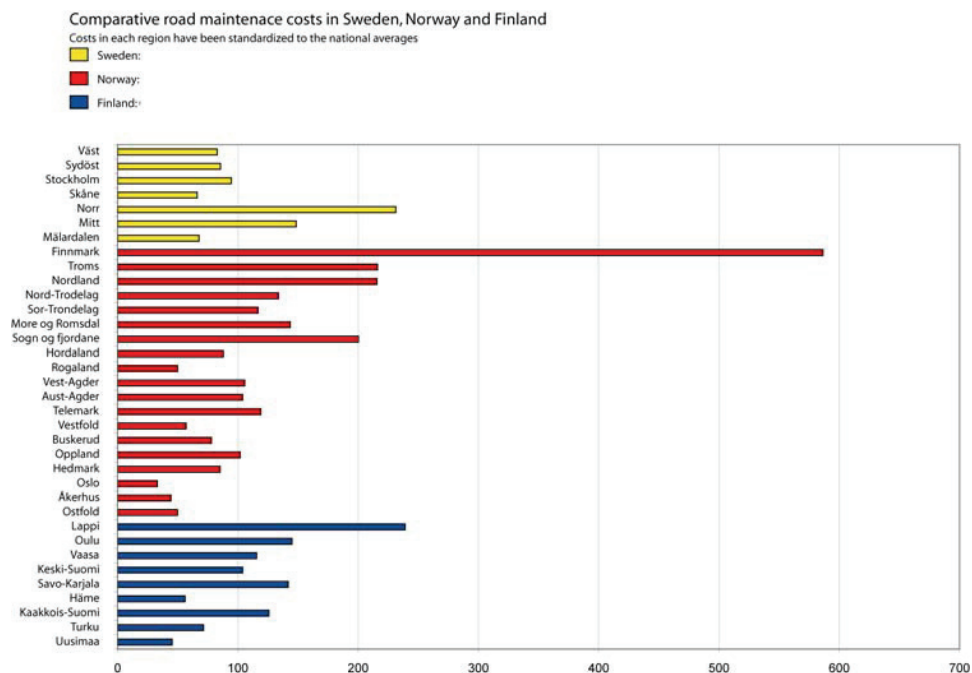


Figure 5.15. Winter maintenance costs per km and per vehicle standardised according to national average values

5.5. Rail connections in the Study area

Rail links in the study area are of essential importance for the major steel industry plants and paper mills, and continuous improvements are being made. The Iron Ore Line running from Boden in Sweden in direction of the Narvik harbour facilities in Norway for example handles 90% of the Swedish iron ore company LKAB's annual production of 22 million tons. (Johnsson, 2004).

On the other hand, data from the Swedish railway authorities indicate that the main North-South railway connection between cities of Northern Sweden does not offer a sufficient capacity and can therefore be a bottleneck for industrial development in the sparsely populated regions of the North. The cost of transporting goods per weight and distance unit on this part of the Swedish rail network is furthermore significantly higher than in the rest of the country. The fact that the coastal cities of the North are connected by a railway that is situated about 50 km from the shoreline further complicates their interconnection. This for example makes it impossible to operate passenger traffic to and from cities such as Skellefteå and Piteå (Swedish rail authority, 2003).

A number of railways in Northern and Eastern Finland are in such a condition that commercial traffic may have to cease. This is for example the case of the Salla railway in Eastern Lapland, which is currently only used to transport timber. Such a closure would imply increases transport costs for the forestry industry, and a reduction of the value of standing timber. In East Finland, the future of the Savonlinna-Huutokoski railway is also uncertain, despite its importance for the development of flows between Central Finland and Russia via Karelia, using the border crossing point of Parikkala. More generally, the Northern and Eastern sparsely populated regions could benefit from an upgrading of the railway network in north-western Russia.

The national Norwegian railway network does not extend further north than Bodø, except for the short connection between the Narvik harbour and the Swedish railway network (*Ofoibanen*). Most freight transport to and from Northern Norway is rail-based between Bodø or Narvik and Oslo, and road-based from there to the final destination. This handicap is only partly compensated by the good maritime accessibility. In sparsely populated parts of Southern Norway, the National Transport Plan for the period from 2006 to 2015 recommends that the existing railway network should be maintained. However, only minor infrastructure investments are envisaged. In Central and Northern

Norway, some improvements are planned along the line from Trondheim to Bodø, but none on *Ofofbanen* between Narvik and the Swedish border (St.meld. nr. 24, 2003–2004).

The development of railways in the study area should also be envisaged at the wider scales of the Bothnian and Barents Corridors, as well as the Transcontinental Northern East-West Freight Corridor from Eastern Asia to Northern America, via the harbour of Narvik (International Union of Railways, 2004). These programs can potentially generate a substantial added value for the area, but presuppose that all regional and national actors contribute to this long-term development perspective. The closure of railway sections due to insufficient traffic and the incapacity to finance improvements on sections that are currently functioning at maximum capacity could jeopardize these transnational programs and limit the industrial development of the regions.

Road and railway networks in the Nordic regions



Figure 5.16. Railways and trunk roads in the study area

5.6. Seaports and ferry connections

Seaports play an important role in the economy of the northernmost regions. Due to the low densities of other high-level infrastructures such as motorways or railways, most of the freight either exported from, or imported to these regions is transported through seaports. On the other hand, due to the harsh climatic conditions, ice can reduce the free movement of cargo vessels in the Baltic Sea over the winter period.

Out of the eleven main Finnish seaports, three are located in the northernmost regions (Rautaruuki / Raahe, Kokkola, Kemi), while only 2 out of the 14 main Swedish ports are located in the study area (these being Luleå and Gävle) and 2 of the main 9 Norwegian ports (Narvik and Mo i Rana). Although the number of vessels approaching them is lower compared to seaports in other parts of the two countries, they account for a significant proportion of cargo transhipped (see Table 5.3), as most of them are concerned with the transshipment of natural resources such as ore, wood, etc.

Figure 5.17 shows over a quarterly period the number of vessel arrivals and the annual seaborne cargo tonnage handled in each port. In terms of the number of vessels approaching the seaports, those located further south clearly dominate (e.g. Helsinki, Turku and Mariehamn in Finland, and Stockholm in Sweden), each with more than 750 vessel arrivals within each quarter. However, in terms of the cargo handled the picture is more complex (Figure 5.17, right). Of course, seaports such as Helsinki, Stockholm or Turku still play a dominant role, but other seaports located in the Gulf of Bothnia claim significant shares: the ports of Narvik (Norway), Luleå and Husum (Sweden) and Tornio, Kemi, Oulu, Raahe, and Kokkola (Finland) all handled more than 2 million tonnes of cargo in 2003, demonstrating their important role as gateways for goods transported from and to the Nordic regions.

In the case of Eastern Finland, freight volumes on inland waterways on the Lake Saimaa are in many cases comparable to those of main seaports. These massive freight flows are mainly generated by forestry related industries. In 2004, 3,55 million tons were transported on Lake Saimaa by boat, while timber floating reached 1,2 million cubic metres. The Saimaa Channel is in use 9-10 months of the year, depending on the ice conditions. The possible growth in the use of wood as a source of energy could significantly increase transport volumes on the Lake Saimaa in the coming years.

Table 5.3. Main ports¹ handling at least 80 % of the country's total port cargo traffic (2001) (European Communities, 2003; Eurostat, 2005a; 2005b).

Finland (11 main ports out of 21)				Sweden (14 main ports out of 27)				Norway (9 main ports out of 21)			
Name	Study area	Arrival of vessels ²	Sea borne goods transport (1,000 tonnes) ³	Name	Study area	Arrival of vessels ²	Sea borne goods transport (1,000 tonnes) ³	Name	Study area	Arrival of vessels ²	Sea borne goods transport (1,000 tonnes) ³
Sköldvik		344	17,453	Gothenburg	no	1,668	32,356	Bergen	no	922	76,406
Helsinki	no	3,269	11,688	Brofjorden		25	19,440	Narvik	yes	82	14,145
				Scanraff							
Kotka	no	549	8,384	Trelleborg	no	1,537	10,655	Karmsund /	no	673	13,505
								Haugesund /			
Naantali	no	495	7,159	Helsingborg	no	11,308	6,913	Karmøy			
Rautaruuki /	yes	188	5,943	Luleå	yes	49	7,605	Tønsberg	no	401	10,520
Raahе								Grenland/Skien	no	n.a.	9,774
Rauma	no	322	5,934	Malmö	no	378	7,215	Oslo	no	816	6,022
Pori	no	235	6,087	Stockholm	no	1,220	5,025	Stavanger	no	491	4,023
Hamina	no	370	5,940	Oxelösund	no	98	5,126	Fredrikstad	no	212	3,539
Turku	no	814	3,688	Karlshamn	no	219	4,596	Mo i Rana	yes	253	2,984
Kokkola	yes	150	3,020	Norrköping	no	223	4,113				
Kemi	yes	176	2,833	Gavle	yes	191	3,442				
				Stenungsund	no	88	3,273				
				Slite /	no	38	2,380				
				Industrihamn							
				Storugns		n.a.	2,409				
Sum		6,912	72,195			17,042	114,548			3,597	140,918

Notes: ¹ Main ports are ports that handle a cargo volume of at least 1 million tonnes.

² Arrival of vessels represents the quarterly number of vessels arriving in a seaport in the 4th quarter of 2003.

³ Total annual seaborne transport by ports in 1,000 tonnes in 2003

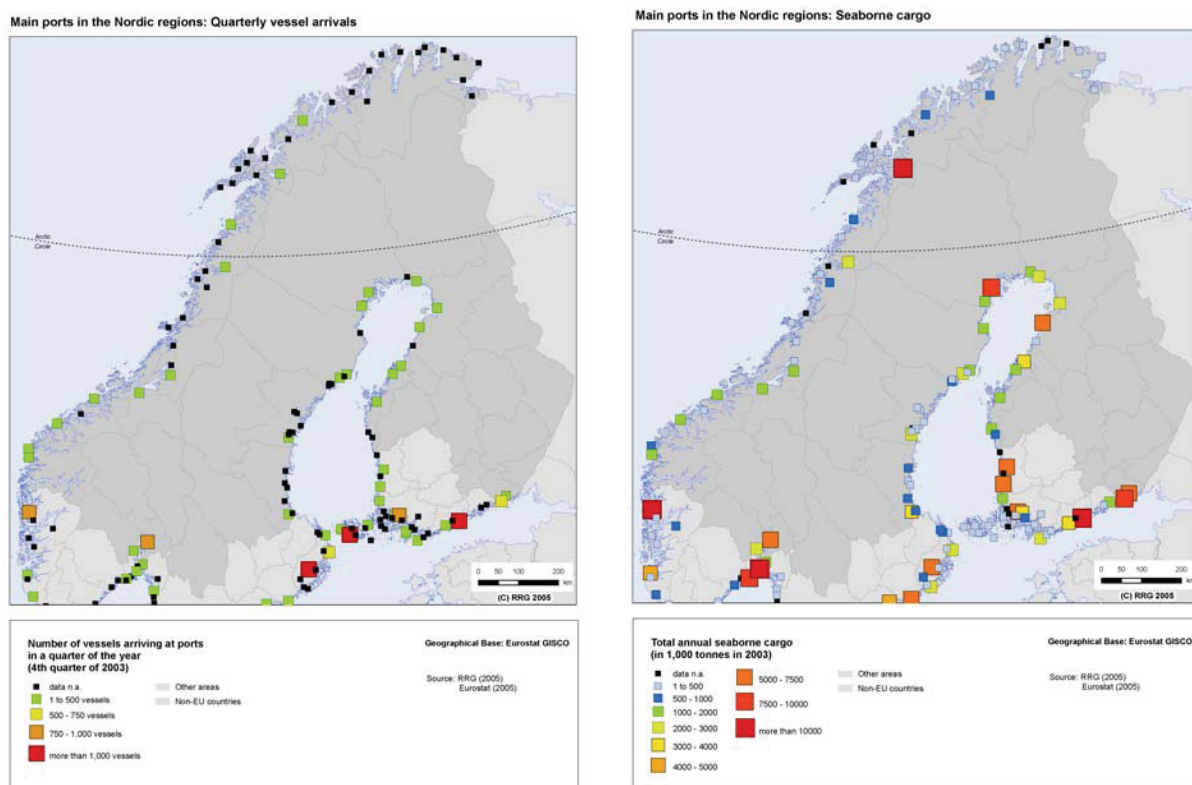


Figure 5.17. Seaports in the Nordic regions: Vessel arrivals (left), annual cargo handled (right)

Ice coverage

Given its specific geographical position, some 80-90% of Finnish exports and imports are carried via merchant vessels. The ice season in the most northern part of the Baltic Sea lasts for six months and in the central parts 2-3 weeks, thus making all Finnish harbours, as well as many Swedish ones ice bound during normal winters. Finland is, consequently, the only country in the world in which all ports are ice bound during winter. Figure 5.18 illustrates this by showing the ice coverage in the Northern parts of the Baltic Sea, the Gulf of Bothnia and the Gulf of Finland for the last three years 2003-2005. Although the maximum extent of the ice coverage varies significantly over the three years, it can be seen that throughout the years in question all Finnish ports, all ports in northern Sweden, as well as all seaports in Estonia and along the Russian coast were frozen.

On average the Baltic Sea starts to freeze in October / beginning of November each year, while the ice remains until April or even May (depending on the actual climatic conditions and on the lat./long. Position). During this period any shipping service can only be maintained through the use of icebreakers, which keep certain channels to dedicated ports open. However, although icebreakers are widely used, the free movement of cargo vessels is nonetheless limited during winter.

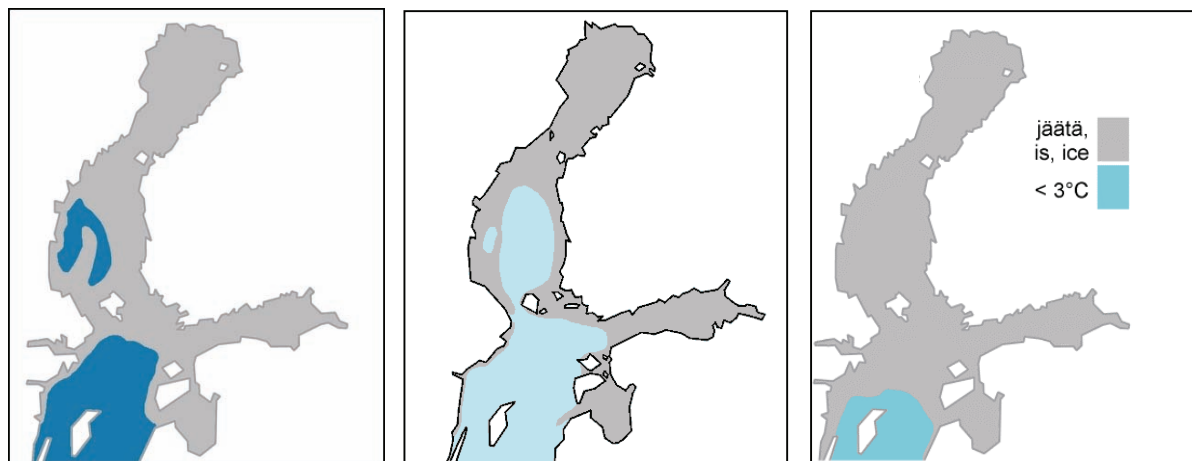


Figure 5.18. Largest ice cover in the northern parts of the Baltic Sea, Gulf of Bothnia and in the Gulf of Finland: (left) in 2005 at 16 March with 177,000 km²; (middle) in 2004 at 11 March with 152,000 km²; (right) in 2003 at 5 March with 232,000 km² (Finnish Institute of Marine Research, 2005).

Ferry services from Finnish, Swedish and Norwegian ports (2004)

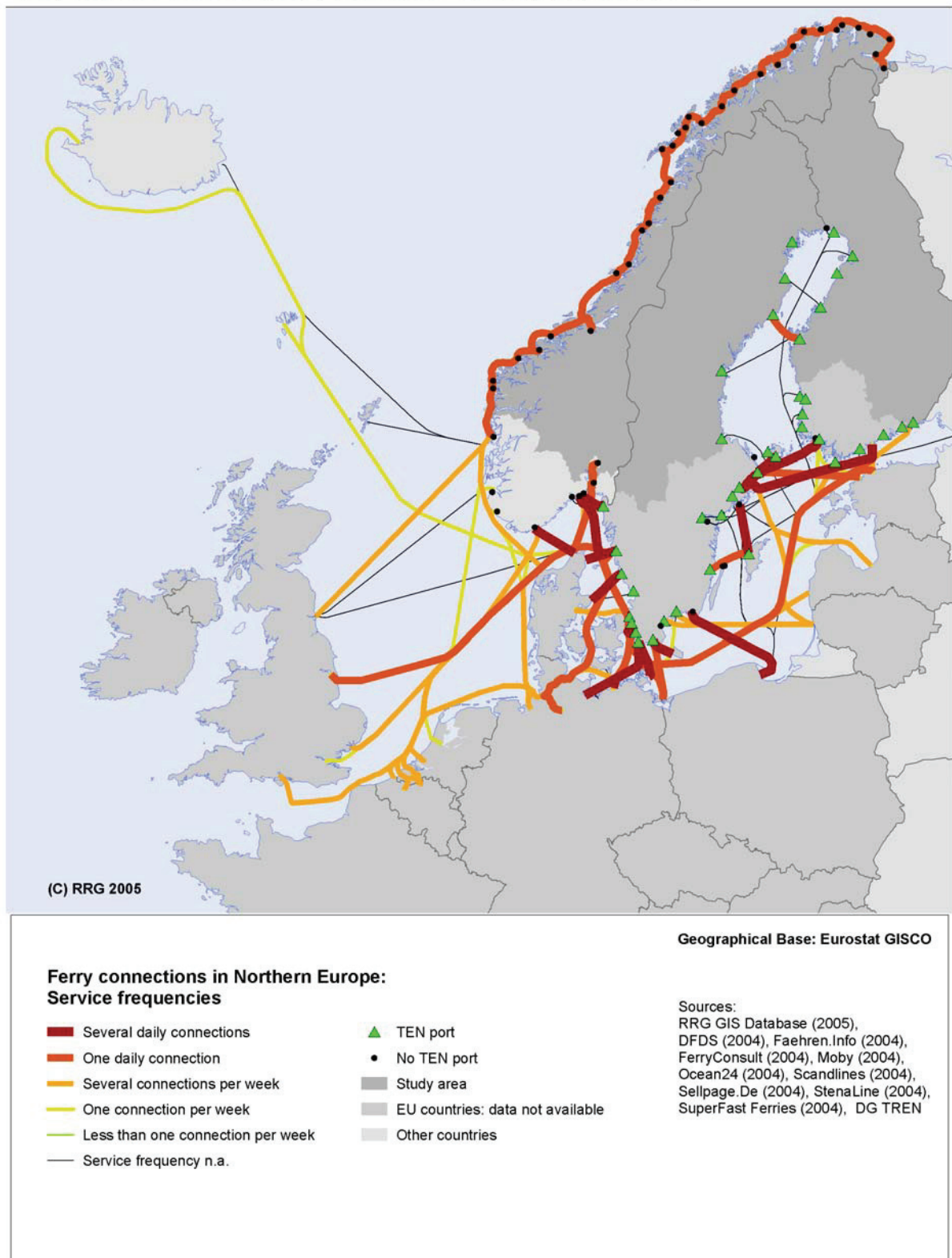


Figure 5.19. Ferry connections in the Northern peripheries. While the Coastal express remains an important element for coastal communities in Norway, the unique regular link between Finland and Sweden connects Umeå and Vaasa. Regional authorities have been struggling to maintain this link since membership in the European Union put an end to tax-free sale on board the ships.

5.7. Access to universities in the northernmost regions

Education and educational attainment is a policy field that has gained increasing recognition in recent years (see, for instance the OECD PISA study – *Programme for International Student Assessment, OECD 2005*). In the context of the transition of the economy towards a service-oriented society, education, knowledge, and research and development are widely expected to become the key locational factors for businesses. Regions with higher proportions of a skilled labour force are assumed to be more competitive and hence more successful than regions with lower numbers of skilled labour force members. It is undisputed that universities and polytechnics play a crucial role in this process. Moreover, the presence of higher-education facilities also helps (rural) regions not only to keep young people, but also to potentially enable them to attract young people from other parts of the country (or even from the rest of the world) and so eventually helping them to avoid ‘brain drain’ and to maintain a balanced age structure. Inversely, the lack of access to higher education has long been identified as a critical constraint on the development of rural and peripheral areas. In the past, in many rural areas the brightest young people nearly always had to leave their home regions in order to gain the university-level education that enabled them to qualify for higher-income jobs in the technology or service sectors. Moreover, after their education, many of these people did not return, as equivalent jobs in the rural peripheral areas were not available.

Despite the low population numbers, a number of higher education facilities are located in the northernmost regions of Finland, Sweden and Norway (Figures 5.20 and 5.21). Most of these facilities are universities of applied science (polytechnics), and only in eight cities can universities also be found, of which four are located in Finland (Oulu, Kuopio, Joensuu, Rovaniemi), two in Norway (Oslo and Trondheim) and two in Sweden (Umeå and Luleå).

Most of these facilities are rather small, compared to similar functional facilities in other parts of Europe and also compared to other universities in the respective countries themselves. Only five of them have around 10,000 students or more. These are Oulu, Kuopio and Joensuu in Finland, Trondheim in Norway and Umeå in Sweden (Table 5.4). Nevertheless, in terms of the number of students *per inhabitant*, even the smaller ones account for a high ratio, sometimes accounting for even higher ratios than in the

respective capital cities. Oslo, Helsinki and Stockholm yield ranges between 3.4% and 5.6% of students within the labour market area. These ratios are easily reached and often excelled by many of the smaller university towns, such as Volda (13.9)%, Steinkjer (11.7%) and Bodø (9.2%) in Norway, Oulo (9.4%), Joensuu (8.5%) or Rovaniemi (11.1%) in Finland, and Umeå (15%) in Sweden. As such then, these ratios give an indication of the importance of these facilities in demographic terms (attracting younger people) but also in economic terms. In Finland, almost 25 % of all students are studying in the northernmost regions, as compared to only 11% of students in Sweden.

The figures consequently reflect the active policies promoting higher education outside of the capital regions, as illustrated by the high proportions of students in a number of labour markets around peripheral cities. It is important to ensure that these facilities are integrated in the local economic environment, and contribute to the development of entrepreneurship and innovation in their area.

Table 5.4. List of universities and polytechnics in the northernmost regions of Finland, Sweden and Norway and in the capital cities.

Country	City	Fac.	Number of students			Inhabitants in labour market area - 2001	Students / inhabitant
			Polytech.	University	Total		
Finland	<i>Helsinki</i>	UP	25 273	44 863	70 136	1 355 008	5.2%
	Oulo	UP	5 905	13 380	19 285	204 971	9.4%
	Kuopio	UP	5 711	4 651	10 362	121 662	8.5%
	Joensuu	UP	3 540	6 251	9 791	97 575	10.0%
	Rovaniemi	UP	2 944	3 382	6 326	56 991	11.1%
	Mikkeli	P	4 200	0	4 200	54 407	7.7%
	Tornio	P	2 616	0	2 616	22 456	11.6%
	Iisalmi	P	1 983	0	1 983	40 111	4.9%
	Varkaus	P	1 983	0	1 983	41 626	4.8%
	Kajaani	P	1 699	0	1 699	55 729	3.0%
Sweden	<i>Stockholm</i>	UP	17 314	56 666	73 980	2 190 164	3.4%
	Umeå	U	0	20 495	20 495	137 067	15.0%
	Luleå / Boden	P	0	9 097	9 097	140 783	6.5%
	Östersund	P	4 655	0	4 655	94 009	5.0%
	Sundsvall	P	4 073	0	4 073	110 915	3.7%
Norway	<i>Oslo</i>	UP	9 300	47 668	57 693	1 036 900	5.6%
	Trondheim		7 098	19 404	26 502	223 889	11.8%
	Bodø	P	4 120	0	4 120	44 892	9.2%
	Steinkjer	P	4 010	0	4 010	34 177	11.7%
	Lillehammer	P	2 623	0	2 623	35 916	7.3%
	Volda	P	2 581	0	2 581	18 581	13.9%
	Hamar/Elverum/Stor-Elvdal	P	2 522	0	5 044	58 759	8.6%
	Tromsø	U	0	2 265	2 265	62 551	3.6%
	Drammen	P	2 258	0	2 258	142 646	1.6%
	Sogndal	P	1 468	0	1 468	13 789	10.6%
	Forde	P	1 467	0	1 467	19 200	7.6%
	Molde	P	1 460	0	1 460	53 382	2.7%
	Nesna**	P	1 412	0	1 412	n.r.	n.r.
	Gjøvik	P	1 409	0	1 409	67 471	2.1%
	Ålesund	P	1 331	0	1 331	75 534	1.8%
	Harstad	P	1 314	0	1 314	30 820	4.3%
	Narvik	P	1 154	0	1 154	24 119	4.8%
	Hammerfest	P	1 133	0	1 133	10 276	11.0%
	Alta	P	1 132	0	1 132	17 079	6.6%

Facilities: UP University and polytechnic available in town

U University available in town

P Polytechnic available in town

Labour market area population

** Nesna school of higher education has campuses in Mo i Rana, Sandnessjøen, Brønnøysund and Mosjøen. The school also organises courses in Narvik.

Universities and selected polytechnics in Europe

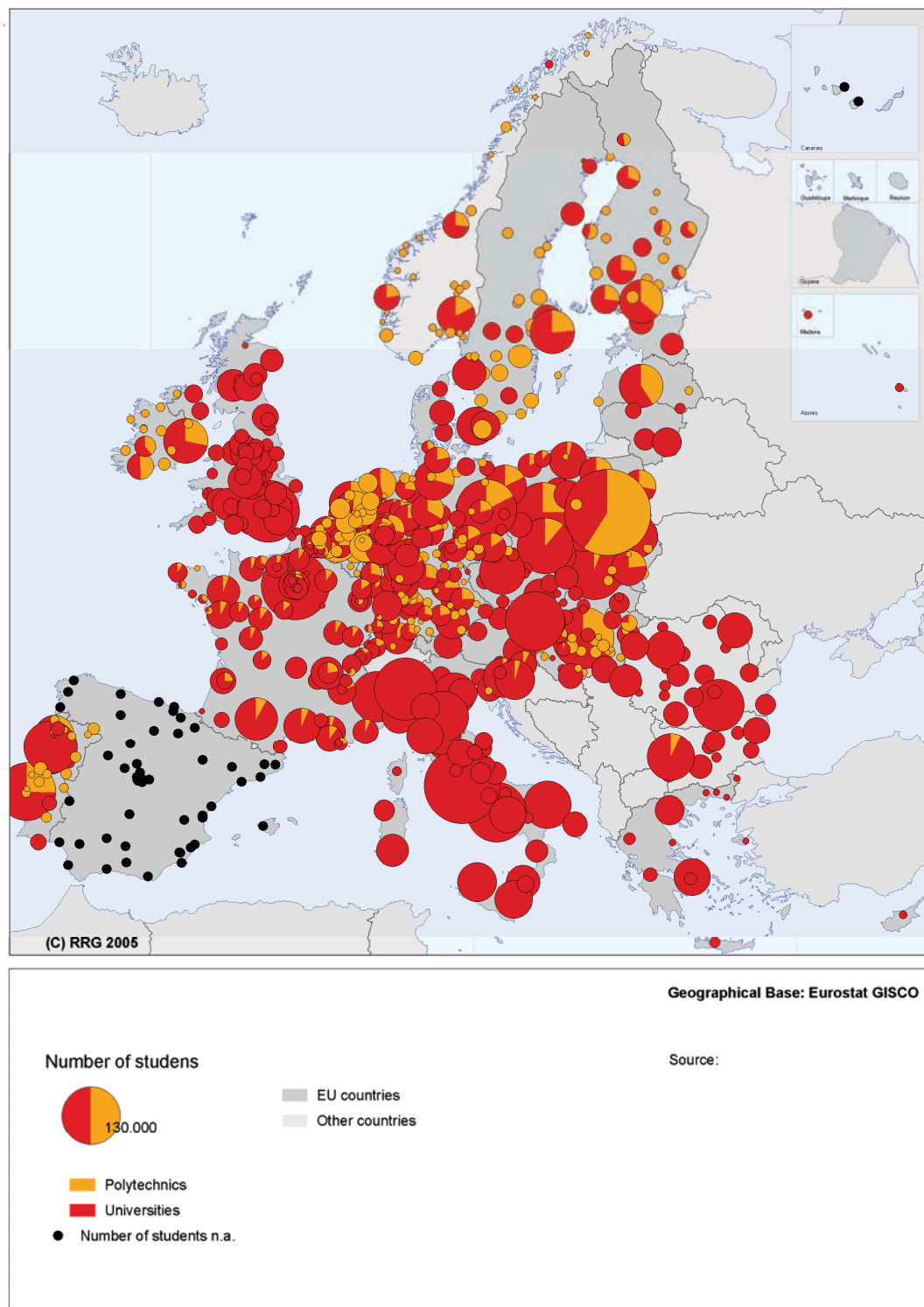


Figure 5.20. Universities and polytechnics in Europe.

Universities and selected polytechnics in the Nordic regions

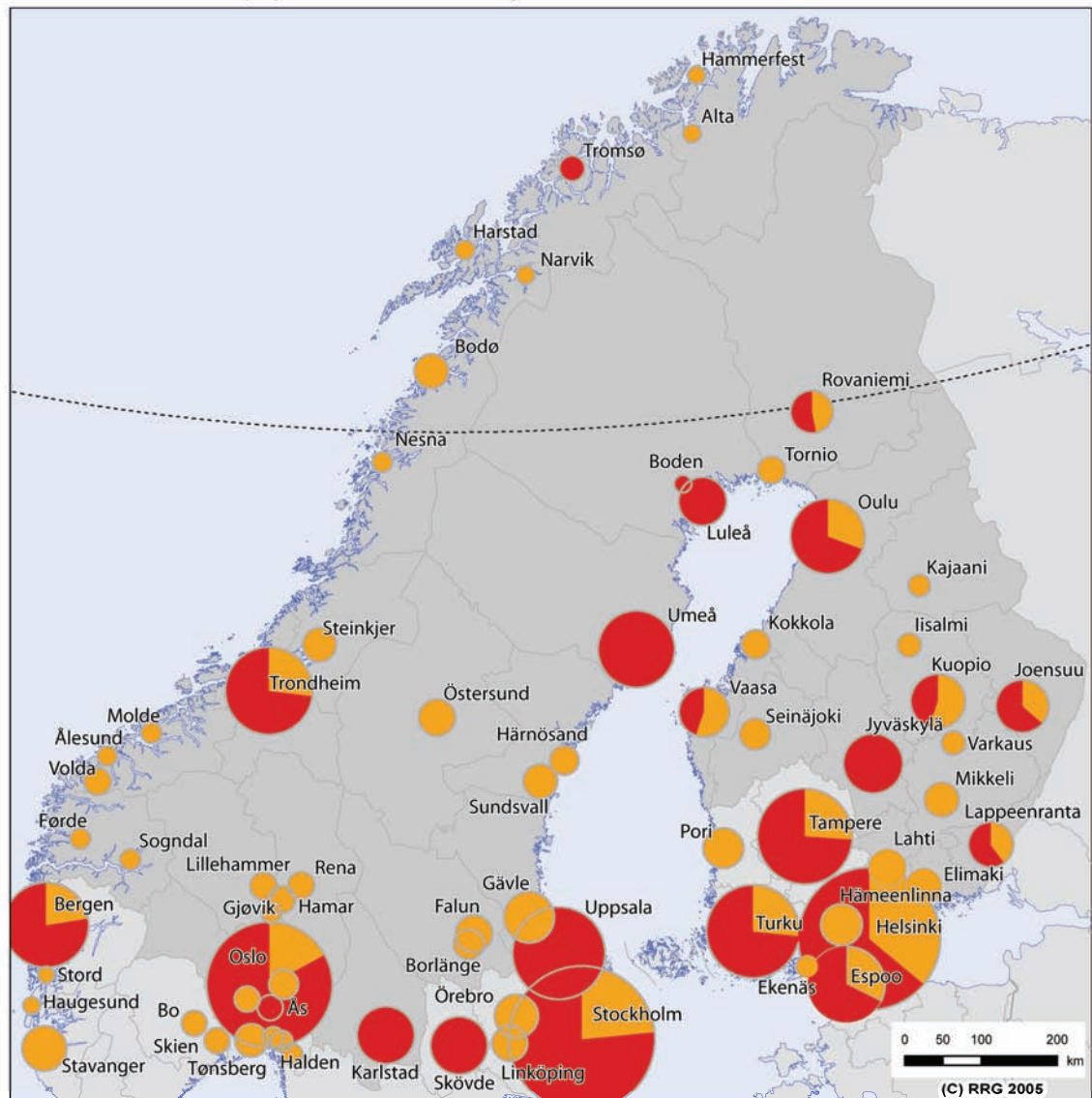


Figure 5.21. Universities and selected polytechnics in the northernmost regions.

Access to hospitals

Hospitals are an important and indeed integral part of the public infrastructure. Therefore, the availability of hospitals and the question of access to hospitals should be analysed as being crucial for public health care. Given the decentralisation trends in public health care services in the Nordic countries, and the complexity of hospital typologies, it has unfortunately not been possible to gather complete data for the study area within the scope of this project.

Two main general aspects should however be highlighted. The first is access to emergency medical treatment. In this respect, hospital location is only one parameter, as one also needs to be able to alert the hospital in case of emergency, and to be transported to the hospital within a sufficiently short period of time. The ongoing development of a new type of mobile telephony network, specifically adapted to sparsely populated areas (i.e. combining long range and low capacity, by using a lower frequency than for traditional mobile telephony systems) is therefore important from a public health perspective. Likewise, the continued availability of an operational hospital helicopter service is essential. Both these elements however entail costs for the community. These three dimensions would have to be combined in order to assess the quality of the offer in terms of medical emergency treatment, which proved to be beyond the scope of the present study.

The second aspect here is access to specialised health care. The population mass required to develop such services with a good cost ratio is generally very high. However, it can be perceived as a major social handicap to require transport to another part of the country for medical services, where social and family networks are not available. Finally, access to maternity hospitals remains a major issue of debate in all Nordic peripheral regions.

While it is obvious that operating specialised hospital services with a low demographic basis entails additional costs, these costs cannot be quantified in a European comparative perspective. The additional expenses depend upon on the general level of public healthcare in each country, and on the politically defined level of “universal health service” which should be made available to all inhabitants, irrespective of their place of abode. Any quantification of additional expenses is therefore only valid within the country where it is carried out.

Conclusion

Northern peripheral regions face major challenges in terms of accessibility, both at the continental scale (distance to European markets) and at the regional scale (lack of critical population mass). In order to compensate for these handicaps, major efforts have been made, for example in developing dynamic higher education facilities, and maintaining a relatively dense network of airports. Sustaining these efforts in the years to come is of critical importance for such sparsely populated regions, but may be difficult in a context of public service rationalisation and deregulation.

An infrastructure strategy for the sparsely populated peripheral region must therefore be designed to help build and maintain wider regions with complementary functions in the different nodes, with the objective of reinforcing internal regional coherence. One objective of such regional infrastructure policies is to facilitate the establishment of higher value-added processing industries, capable of drawing benefits from primary resources in the northern peripheries.

Maintained efforts to ensure high quality external freight connections are equally essential, so as to ensure that industrial outputs can be exported efficiently to major European and global markets. Over the last decades, multiple projects have highlighted the potential for a further development of East-West connections, from Russia to the North Sea, or even at the scale of the Eurasian continent (International Union of Railways, 2004). All project capable of asserting crossroads of major freight corridors in northern and central Finland, Norway and Sweden are of essential importance, as they can compensate for current centralising trends.

6. Socioeconomic characterisation of Sparsely Populated Areas

The possible causal relationships between population sparsity, peripherality and cold climate on the one hand, and social and economic characteristics on the other lie beyond the scope of the present study. What we do seek to identify are the correlations between certain types of social and economic characteristics, and population sparsity. The observation of such correlations is sufficient to consider whether sparsity is an appropriate criterion to delimit regional policy intervention areas. However, the formulation of strategies to solve identified problems would require an analysis of the processes at stake.

6.1. Employment

Unemployment

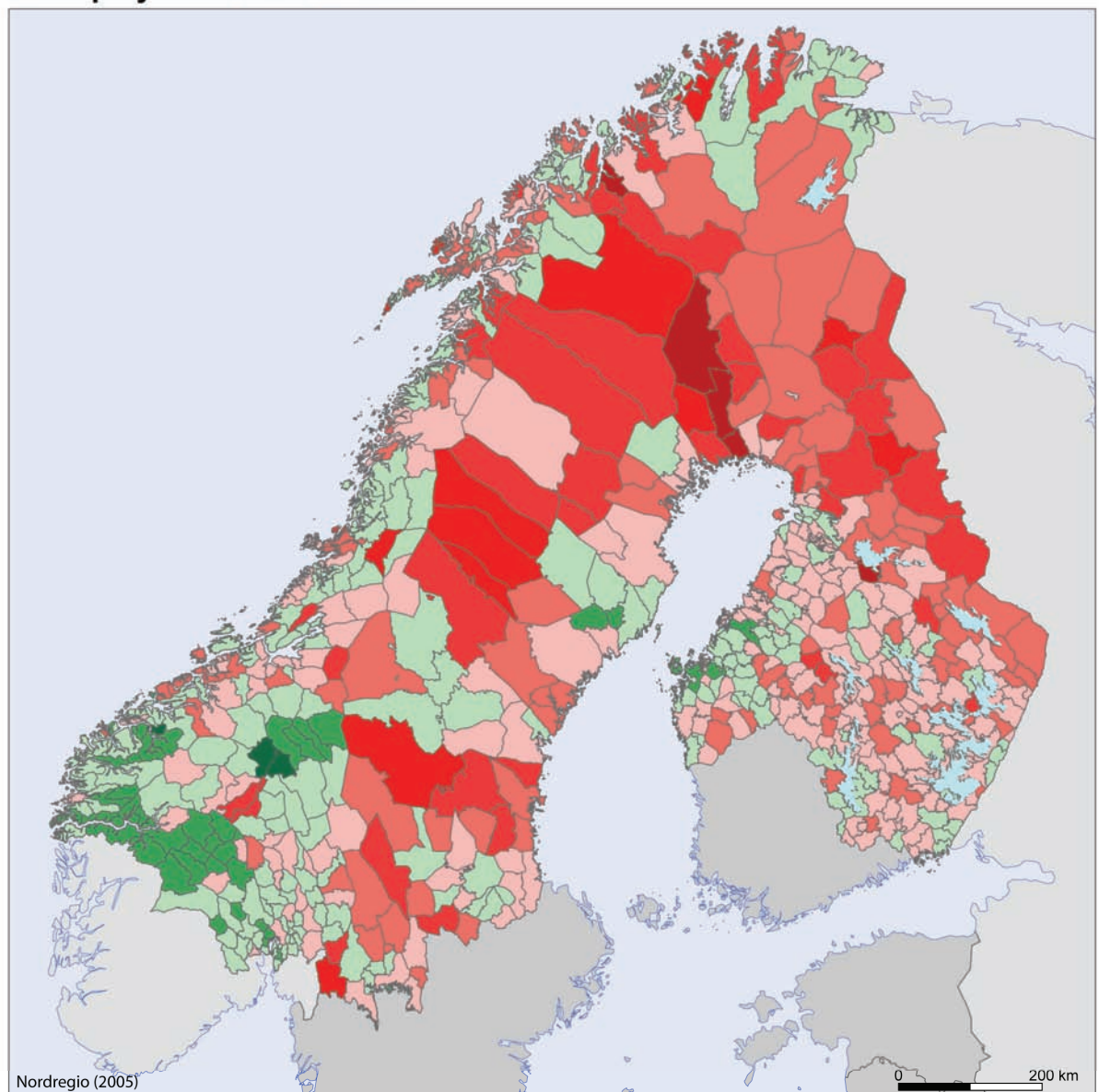
Figures 6.1, 6.2 and 6.3 present municipal unemployment rates in 1991, 1996 and 2001, respectively. The values are standardised according to national average values, as the objective of the present study is to compare the effects of sparse population and peripheral location across the study area, rather than national employment structure structures. The maps give an indication of how well each municipality is performing in terms of employment, as compared to the rest of the country. For 2001, the national registered unemployment rates considered are 10.2% in Finland, 3.7% in Norway and 4.9% in Sweden.

In Norway, the southern part of the country seems to be better off than the northern part. Indeed, even the sparsely populated central parts of southern Norway have relatively unemployment rates down to less than 30% of the Norwegian national average. The contrast with Finland and Sweden is in this respect quite striking, as areas with the lowest population potentials in these countries systematically have unemployment rates above the national average: The North/South contrast, with a dividing line south of Trøndelag, implies that sparsity is not correlated to the same negative unemployment figures in southern Norway as in other parts of the study area.

In Sweden, most municipalities in the study area have unemployment rates above the national average. The few exceptions are mainly situated around the city of Umeå. Unemployment levels twice as high as the national average can be encountered in the northernmost municipalities along the border to Finland, and in some inner parts. In Finland, there is a clear divide between the coastal areas, most of which have an unemployment rate below the national average, and the inner parts of the country. Indeed, the entire Lappi region and most of the Russian border areas are well above the Finnish national average when it comes to unemployment rates. Some municipalities in the southern part of Finland have an unemployment rate below the national average.

Between 1991 and 2001, there seems to have been an increase in polarisation, as relative unemployment levels rose in areas where they were already high. As shown by Figure 6.4, almost all Swedish and Finnish municipalities with a low population potential also have unemployment rates above the national average. The few exceptions here are all contiguous to a municipality with a higher population potential. Sparsely populated areas in Southern Norway are in a different situation, with unemployment rates generally below the national average values in 1991, 1996 and 2001.

Unemployment rates in 1991



Standardised to national averages

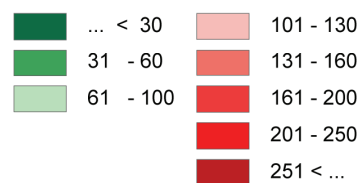
Index 100 = National average

National unemployment rates considered:

Finland: 7,2; Sweden: 2,7; Norway: 5,7 %

Geographical Base: Eurostat GISCO

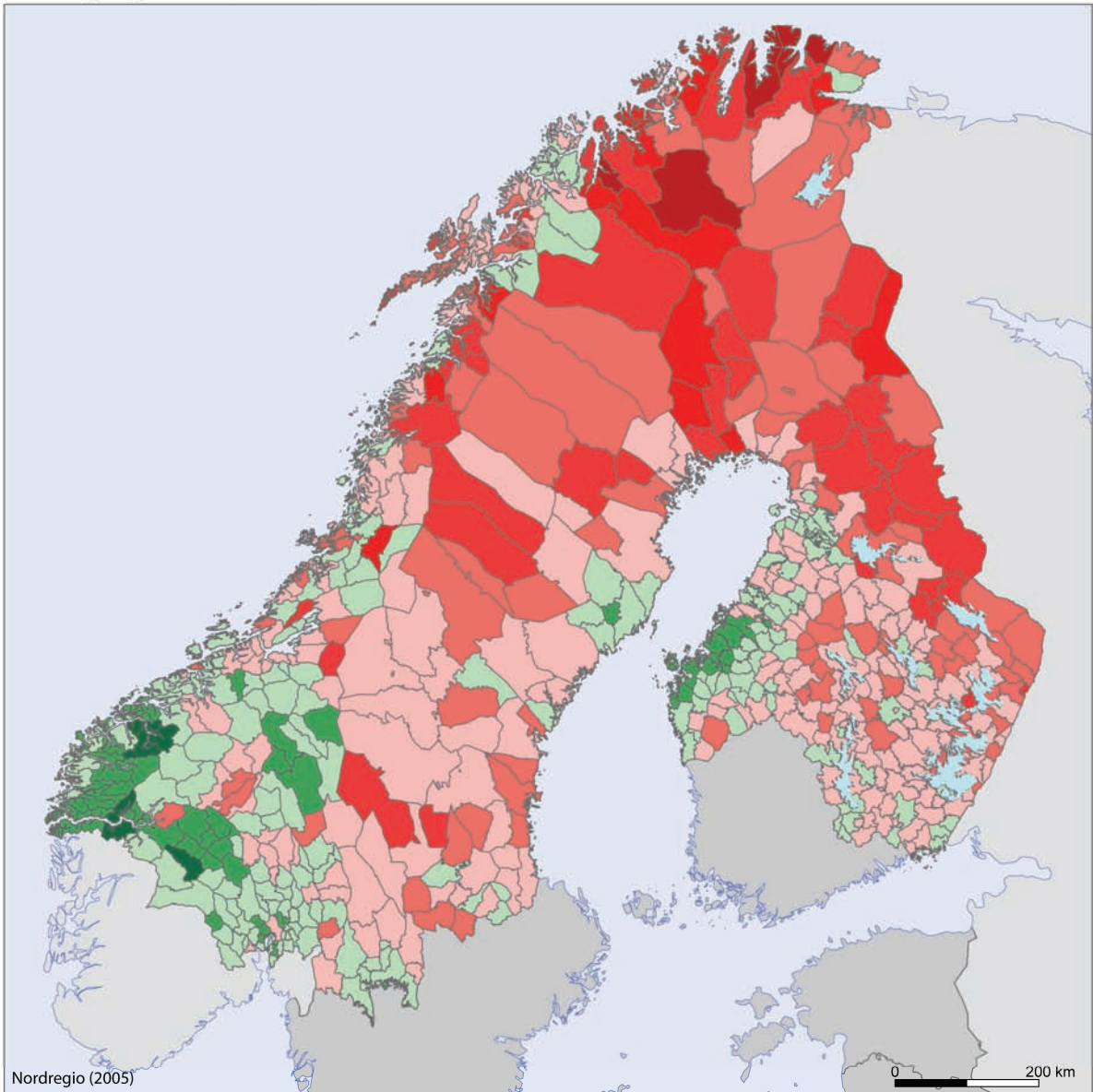
Source: National Statistical Offices



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Figure 6.1. Municipal unemployment rates standardised according to national average values (1991)

Unemployment rates in 1996



Standardised to national averages

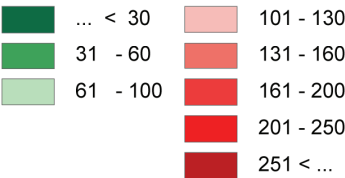
Index 100 = National average

National unemployment rates considered:

Finland: 15,4; Sweden: 10,0; Norway: 5,3 %

Geographical Base: Eurostat GISCO

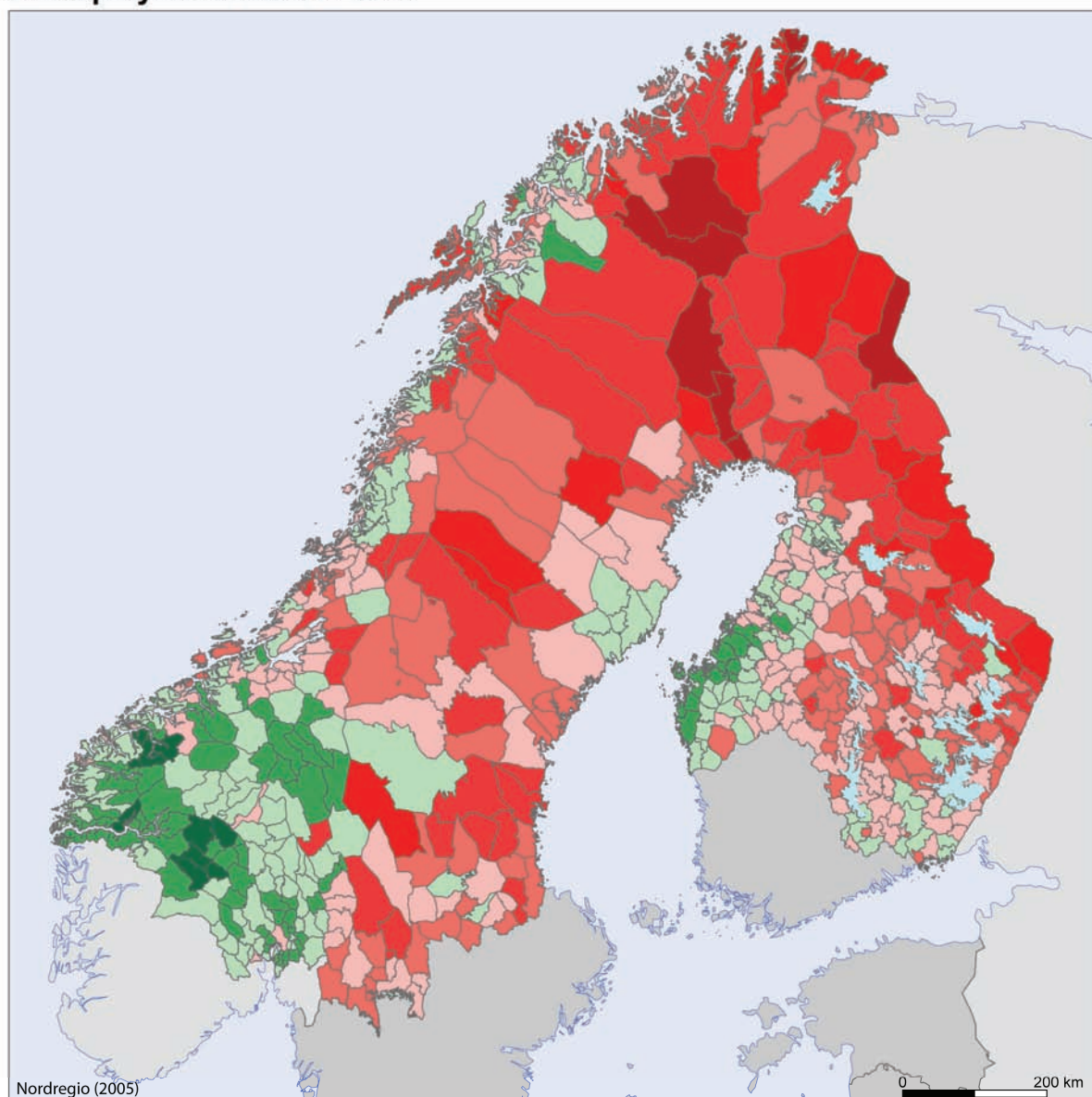
Source: National Statistical Offices



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Figure 6.2. Municipal unemployment rates standardised according to national average values (1996)

Unemployment rates in 2001



Standardised to national averages

Index 100 = National average

National unemployment rates considered:

Finland: 10,2 %; Sweden: 4,9 %; Norway: 3,7%

Geographical Base: Eurostat GISCO

Source: National Statistical Offices

... < 30	101 - 130
31 - 60	131 - 160
61 - 100	161 - 200
	201 - 250
	251 < ...



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Figure 6.3. Municipal unemployment rates standardised according to national average values (2001)

Unemployment rates in 2001 and population potential

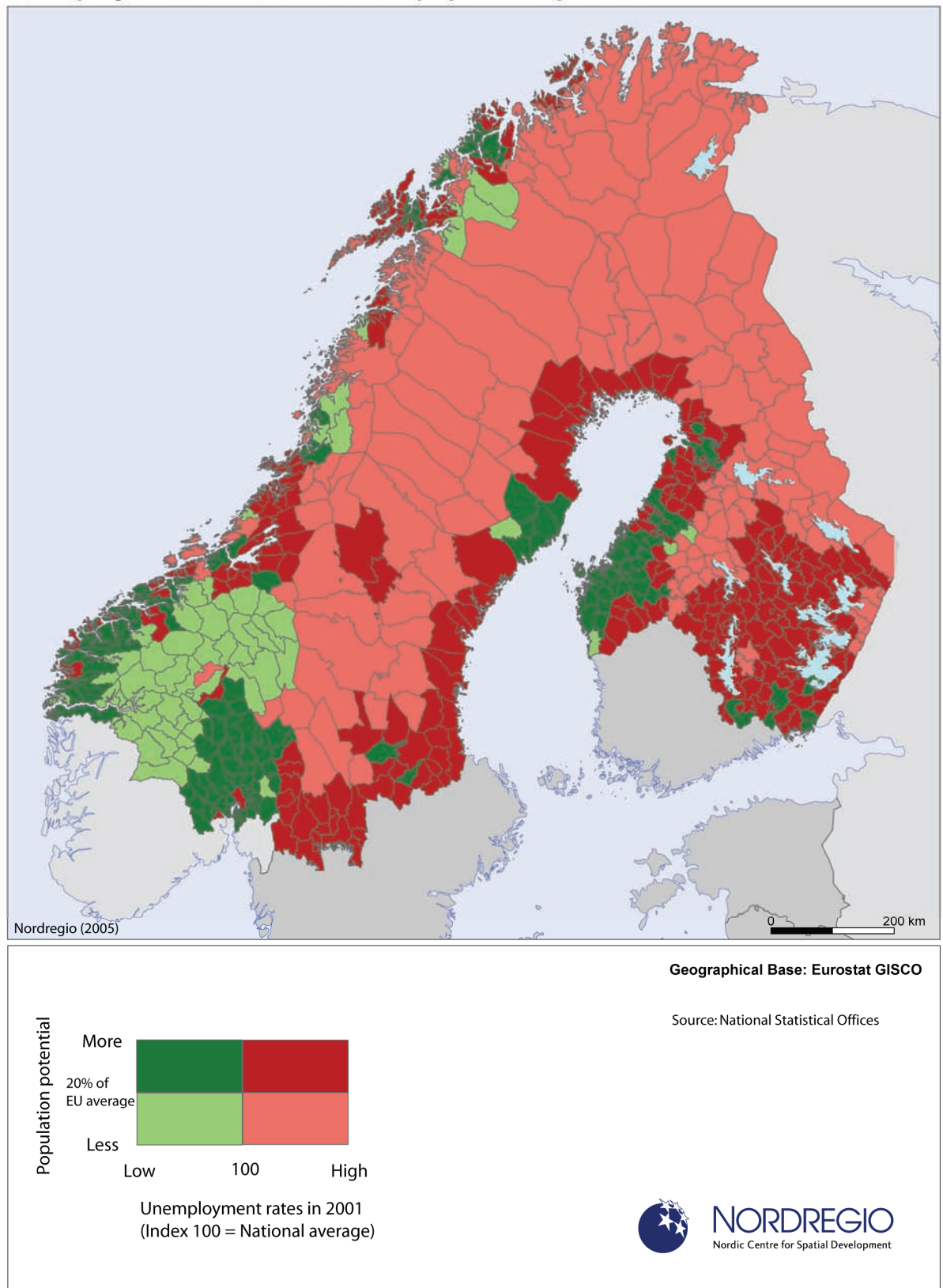


Figure 6.4. Cross-tabulation of population potentials and municipal unemployment rates standardised according to national average values (2001) While unemployment rates are systematically above the national average in the most sparsely populated parts of Finland and Sweden, this is not the case in Southern Norway.

Activity rates

As shown by Figure 6.5, the northern and inner parts of Finland and Sweden have considerably higher proportions of public employment. In order to make the comparison between the three countries relevant, the public sector dependency indicator has been standardized to the calculated national averages: 28.1% for Finland and 36.7% in Sweden.

These areas with a relatively high level of employment in the public sector activity are, in general, also those that also have a low population potential (Figure 6.6). Transfer policies compensating for differences in taxation incomes between municipalities allow for these increased proportions of public employment. Interestingly, however, even the largest cities of our study regions have a public sector dependency ratio that is above the national average for that country. This underlines the active role played by national and local public authorities in maintaining a sufficient level of public services and job opportunities in these areas.

Nonetheless, almost the entire Finnish and Swedish study areas have an activity rate below the respective national averages. The municipalities that are above this mark are the ones hosting a city of regional interest such as Oulu and Vaasa in Finland, and Umeå, Östersund and Gävle in Sweden. The situation is again different for inner parts of southern Norway, which despite their low population potential have activity rates above the national average values, and a lower degree of dependence on public sector employment (Figure 6.7).

Proportion of public sector employment

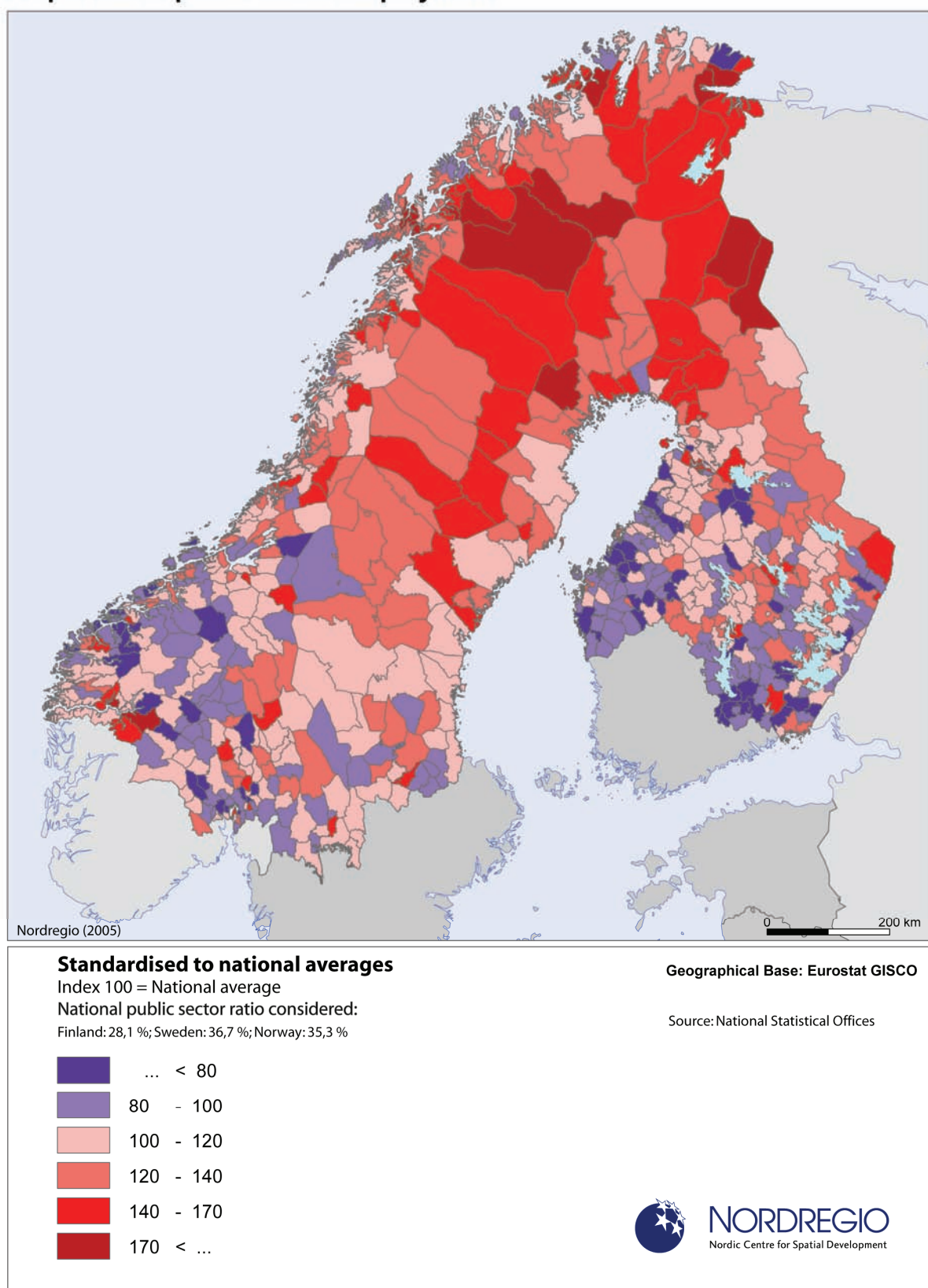
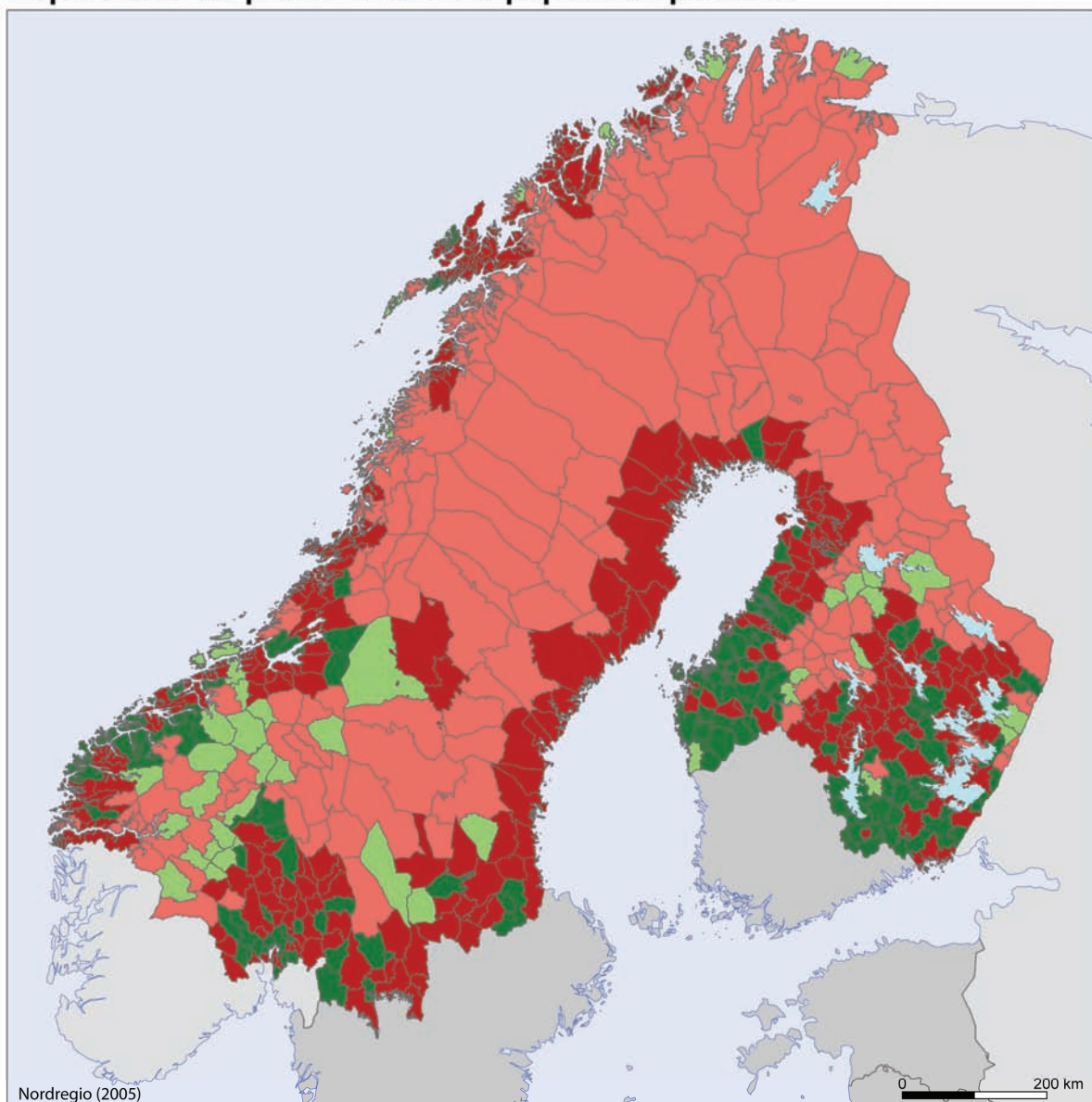


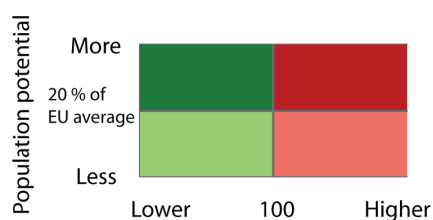
Figure 6.5. Proportion of public sector employment, standardised according to national average values (2001)

Dependence on public sector and population potential



Geographical Base: Eurostat GISCO

Source: National Statistical Offices



Dependence on public sector employment

Dependence on public sector employment calculated as the share of public sector employment with respect to total employment

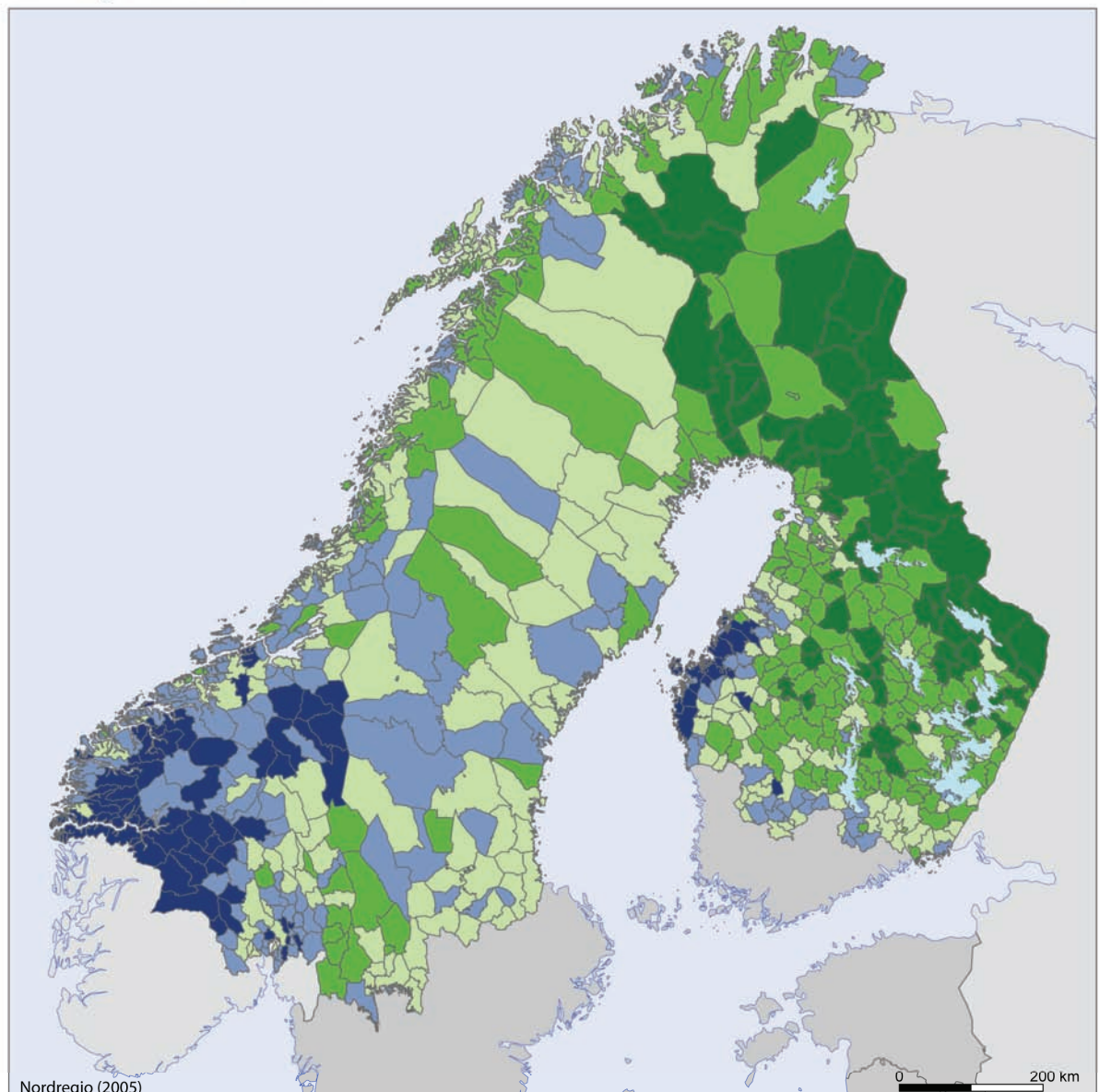
Index 100 = National average



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Figure 6.6. Cross-tabulation of population potentials and dependence on public sector employment (2001)

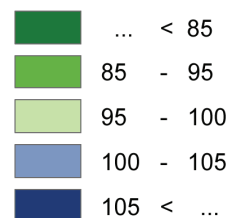
Activity rates in 2002



Standardised to national averages

Index 100 = National average

Proportion of employed persons out of the population aged between 15 and 64 years



National activity rates considered:

Finland: 64,6 %; Sweden: 70,8 %; Norway: 76,6 %

Geographical Base: Eurostat GISCO

Source: National Statistical Offices



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Figure 6.7. Activity rates standardised according to national average values (2001)

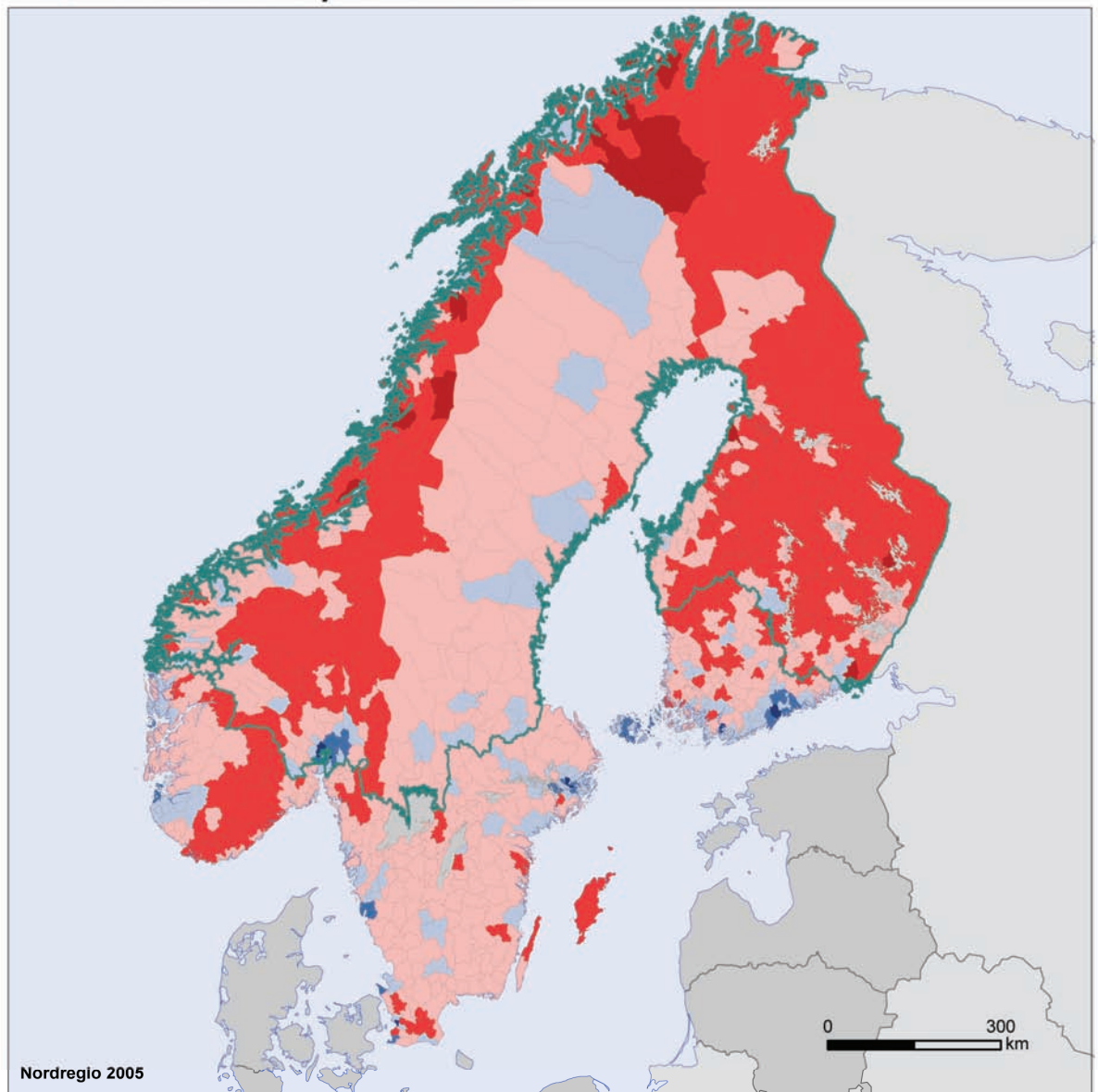
6.2. Sources of income

A significant proportion of the economies of these sparsely populated Nordic areas are based on income from transfers. Two main dimensions should be taken into account in this respect: On the one hand, transfers between municipalities and the location of state-owned public bodies *de facto* imply a transfer of tax resources within each country. On the other hand, the inhabitants of each municipality benefit from transfers of income to different extents, depending on the age structure, the number of unemployed persons, etc. We have here chosen to focus on the latter aspect, identifying whether the inhabitants of sparsely populated areas have higher or lower average income from activity, and whether transfers constitute a higher or lower proportion of their total income.

Figure 6.8 shows the ratio of earned income to the population aged 20 to 64, i.e. the population in working age. Two distinct pictures appear in Sweden, one the one hand and Finland and Norway, on the other: In Sweden, the contrasts are relatively weak. One can find income levels above the national average not only in cities, but also in some peripheral municipalities such as Jokkmokk and Kiruna. In Finland, stronger contrasts can be observed, and the lowest values can be found practically throughout the study area. This reflects the traditionally stronger welfare contrasts in Finland. Norway also has relatively strong contrasts. The lowest values are to be found in Northern Norway, but inner parts of southern Norway also have values below the national average.

In Figure 6.9, we look at the proportion of transfer income in each municipality (considering pensions, unemployment and sickness benefits only). In this respect, the three countries are more similar, as most study area municipalities devoid of major urban centres have proportions of transfer income that are generally more than 25% higher than the national average. The combination of an ageing population and high unemployment rates is the key parameter here.

Standardised income *per inhabitant*

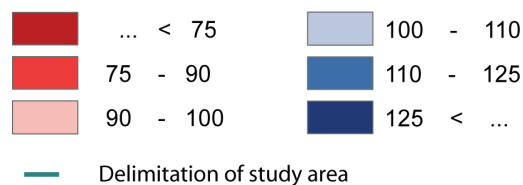


Earned income *per inhabitant* aged between 20 and 64 years

Standardised to national averages
Index 100 = National average

Geographical Base: Eurostat GISCO

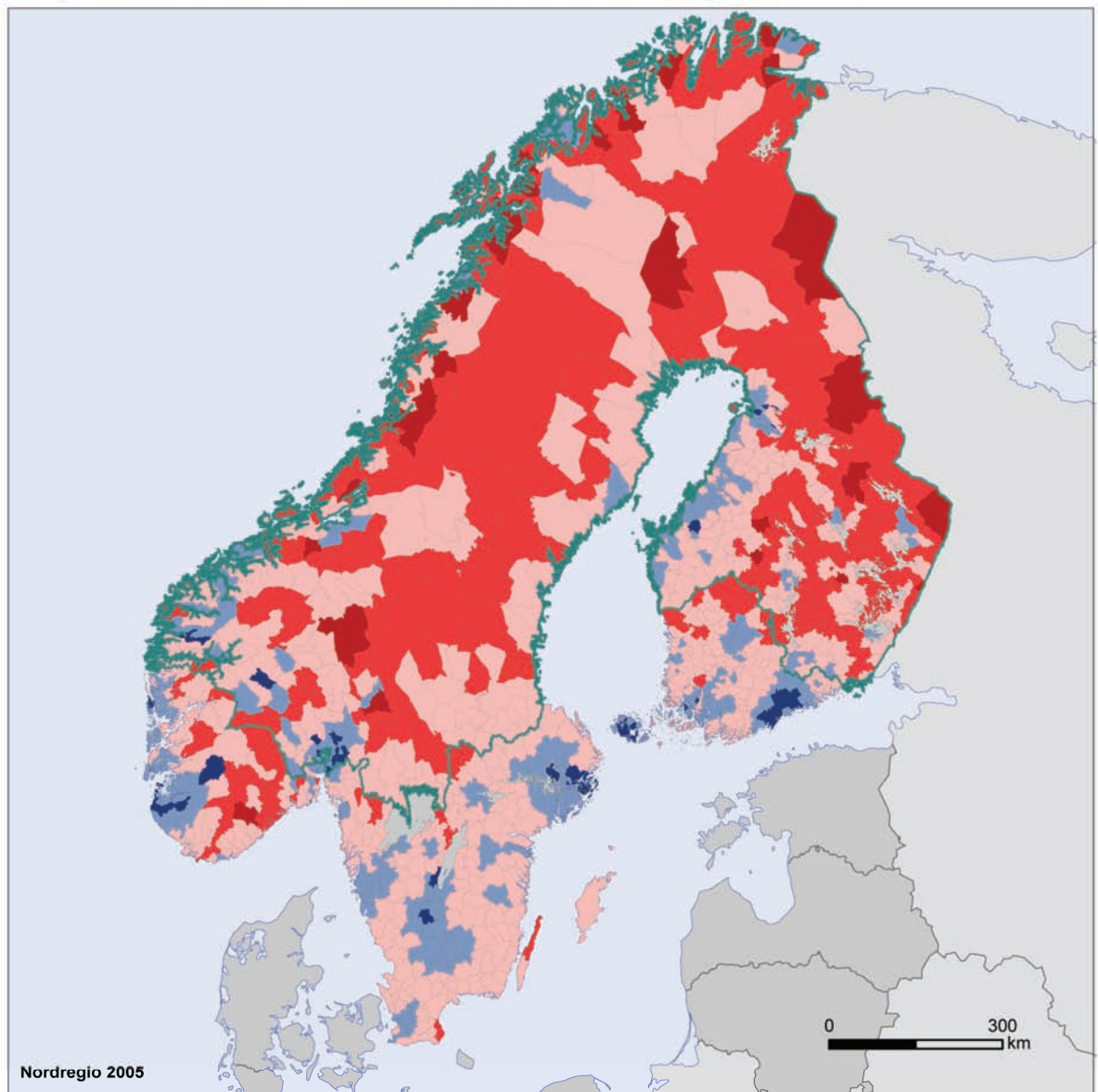
Source: National statistical offices



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*Figure 6.8. National variations in the ratio of earned income to the population aged 20 to 64
Contrasts are significantly larger in Norway and Finland than in Sweden.*

Proportion of transfer-income out of total municipal income



Proportion of transfer-income (i.e. pension, unemployment, sickness and maternity benefits) out of the total income (transfers *plus* capital and earned income) by municipality

Geographical Base: Eurostat GISCO

Index 100 = National average

Source: National statistical offices



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Figure 6.9. National variations in proportions of transfer-income
Study area municipalities are characterised by considerably larger proportions of income from transfers, in all three countries. This however does not concern the main cities.

6.3. Educational attainments

The assessment of the situation as regards the educational attainment of the population gives valuable input to the design of development strategies for these areas. The educational attainment indicator relates to the highest degree obtained by a person. For instance, an individual who has achieved a tertiary degree will be counted in the tertiary educational attainment indicator and not the secondary one. Due to differences in statistics between the three countries considered, the educational attainment indicator is based on information on the following basic population: people aged between 16 and 64 in Sweden and people over 15 years of age in Finland.

Figures 6.10 and 6.11 present the secondary and tertiary educational attainment, crossed with the population potential indicator, in order to underline the perspective of the sparsely populated areas. The two maps provide complementary sets of information and therefore need to be analysed together.

Most of the municipalities of the study area have a proportion of persons that have completed upper secondary education, but that then have not pursued their studies any further, which is higher than the national average,. This is especially true for Sweden. In Finland and Norway, the situation is more nuanced, as significant parts of the study area have municipalities where this category is under-represented. This implies an over-representation of persons that have not completed secondary education in these parts of Finland and Norway.

Geographical patterns are much more homogenous across the study area when it comes to the proportion of persons having completed tertiary education. Not surprisingly, the municipalities that have a proportion superior to their respective national average are the ones surrounding the most important cities of that area, e.g. Tromsø, Bodø and Trondheim in Norway, Umeå, Luleå and Karlstad in Sweden; and Rovaniemi, Oulu and Vaasa in Finland. Persons with a tertiary educational degree are concentrated in and around the regional capitals.

Secondary educational attainment and population potential

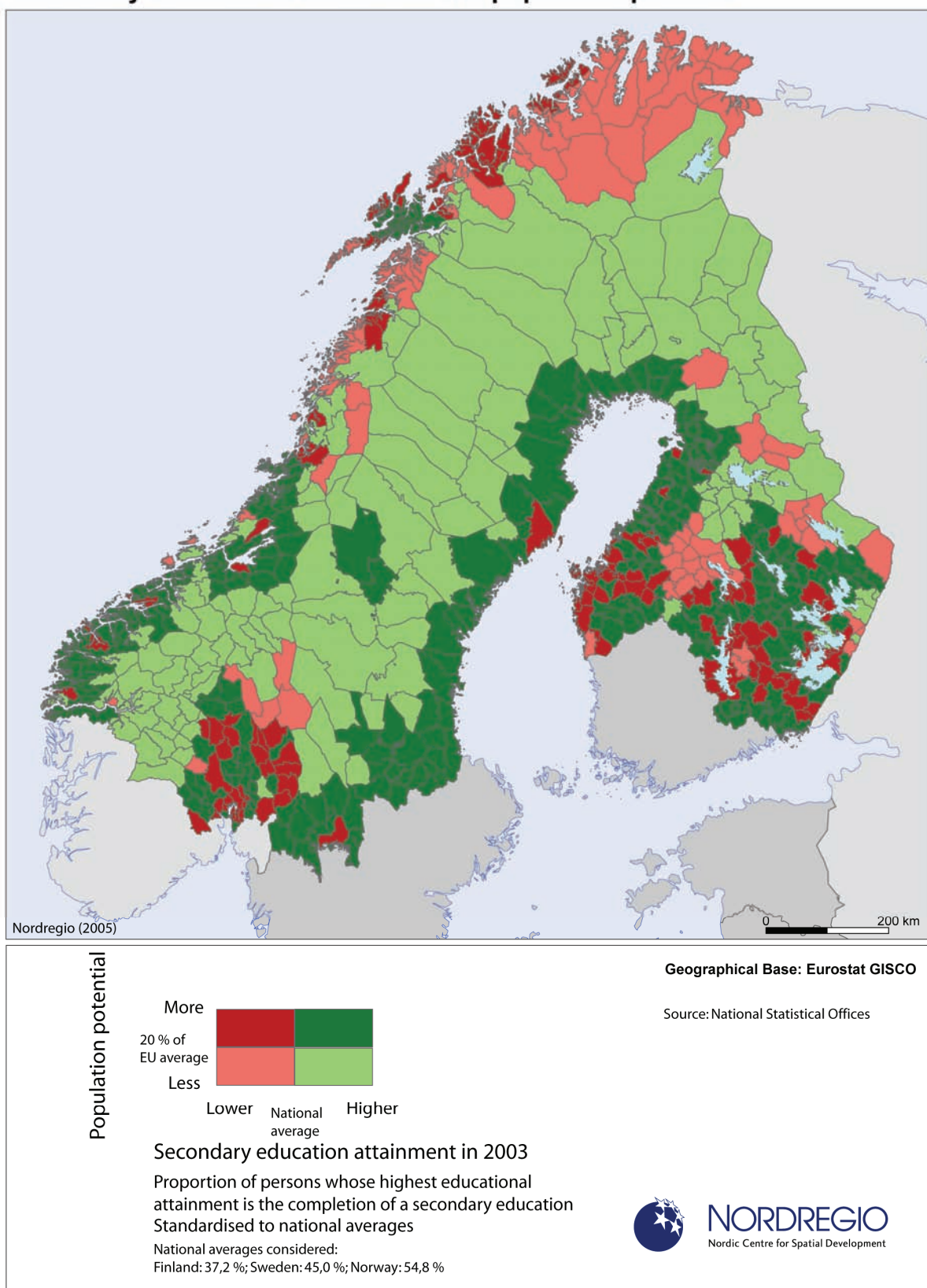


Figure 6.10. Cross-tabulation of population potentials and proportions of persons having a secondary degree only (standardised according to national average values)

Tertiary educational attainment and population potential

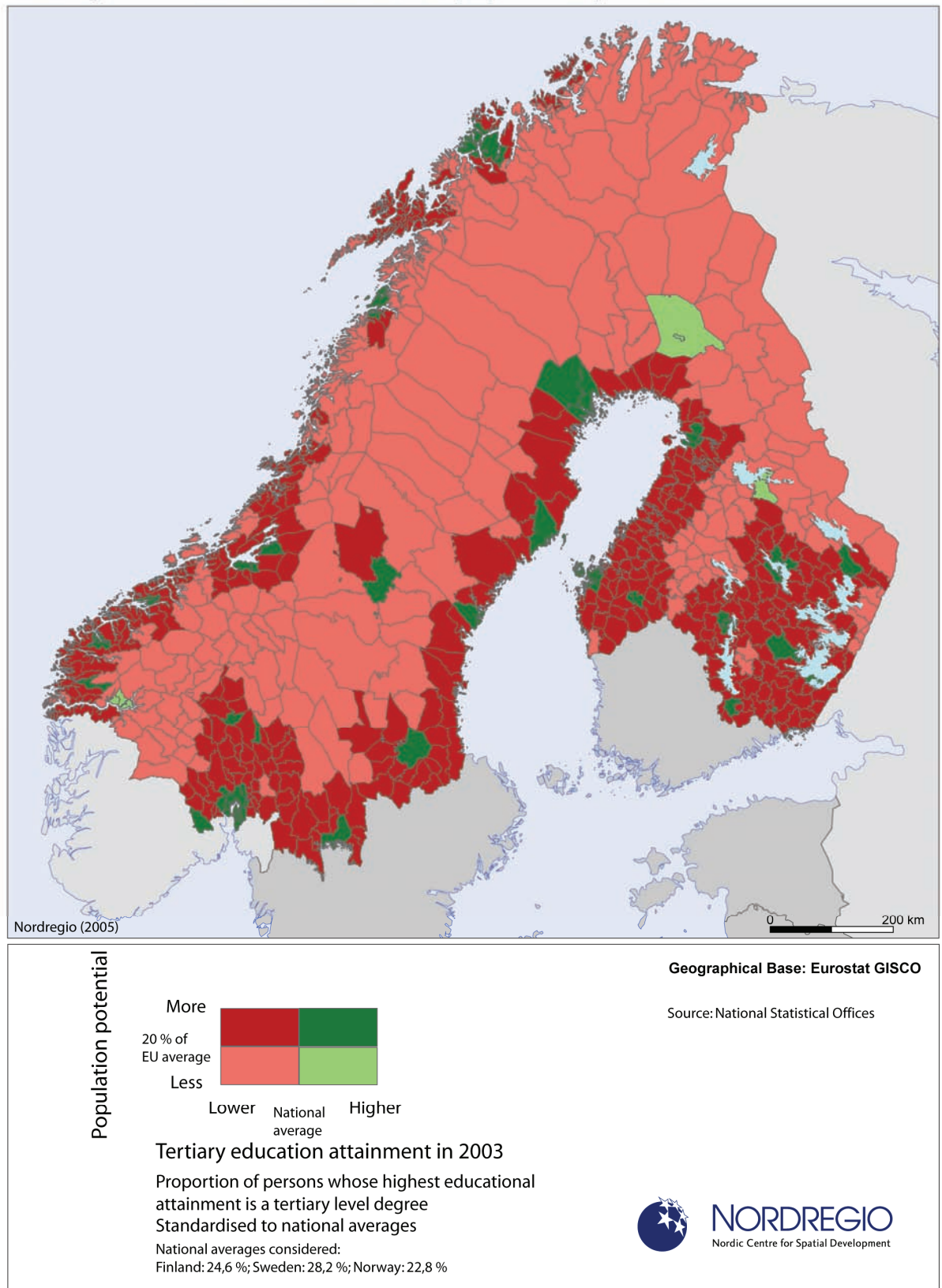


Figure 6.11. Cross-tabulation of population potentials and proportions of persons having a tertiary (university or equivalent) degree (standardised according to national average values)

6.4. Wealth production

As illustrated by Figure 6.12, the GDP rates *per inhabitant* in purchase parity standards (PPS) observed in the peripheral Nordic regions are generally close to the EU average. It is however important to note that the proportion of the GDP based on primary activities such as forestry and hydraulic energy production is up to three times higher in these regions than in Sweden and Finland as a whole. These activities have a small impact on the local economies, as they employ relatively few persons.

It should also be noted here that East Finland is in a particularly difficult situation within the study area, with GDP values *per inhabitant* below 80% of the EU average in the NUTS 3 regions of Etelä-Savo and North Karelia.

Northern Swedish and Finnish NUTS 3 areas are considerably larger than in other parts of Europe (Figure 6.13). It is therefore appropriate to compare values at NUTS 5 and NUTS 4 level for these countries, with NUTS 3 values for the rest of Europe. This reveals strong contrasts between the main cities and the peripheries in the Finnish parts of the Study area. The contrast between the results at NUTS 3 and NUTS 4 level is particularly striking in Northern and Central Finland. In Sweden, a more complex pattern of municipalities with high and low GDP values is revealed. High values for example appear in some peripheral municipalities with a very sparse population, but major natural resources such as hydraulic energy or mines. These high values do not necessarily reflect a dynamic economy, as the income from these activities only to a small degree benefits local communities.

GDP values are unfortunately not available below NUTS 3 level for Norway.

GDP in EU 25 and Norway in 2002

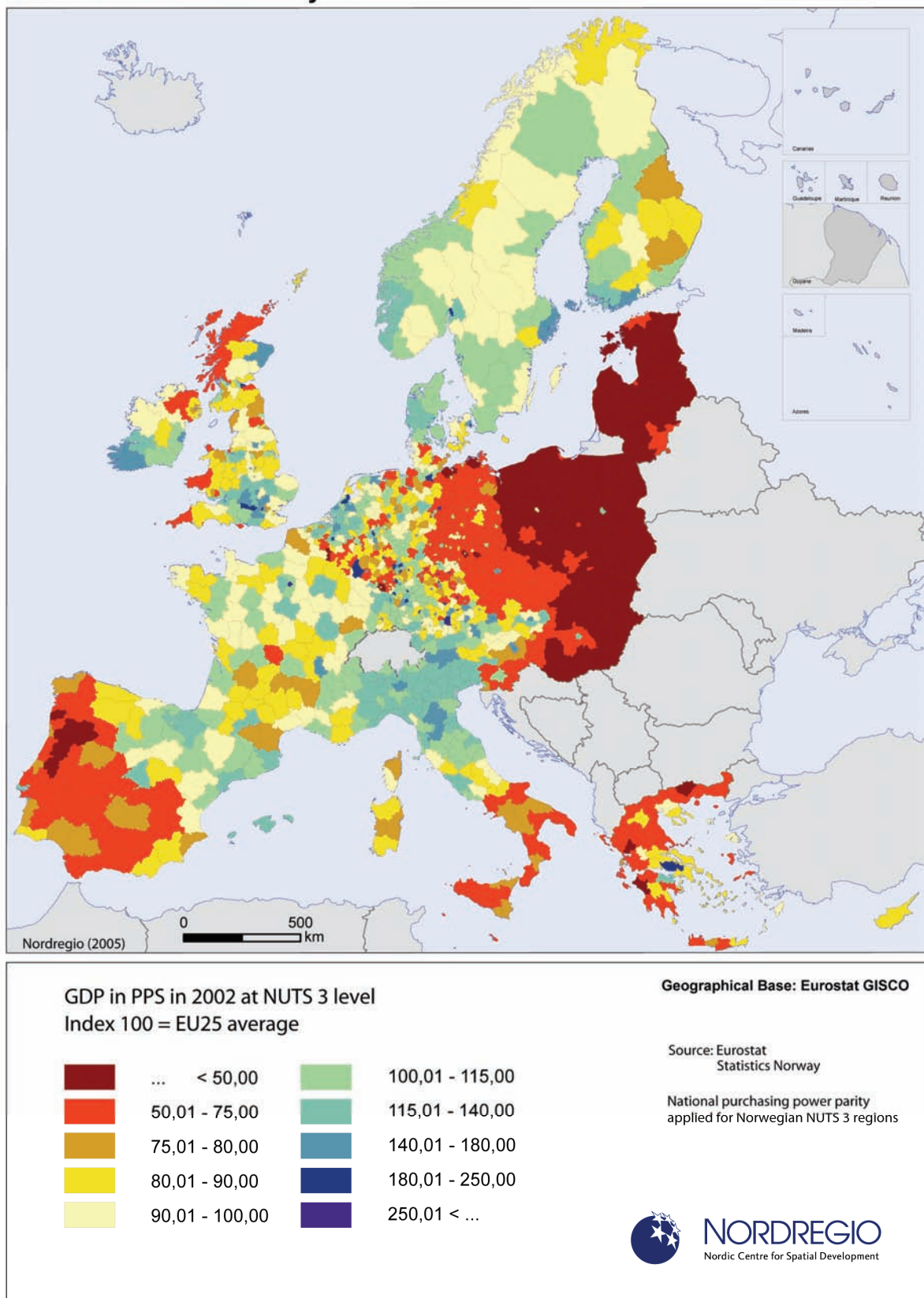


Figure 6.12 GDP levels in PPS at NUTS 3 level (2002)

GDP in EU 25 and Norway in 2002

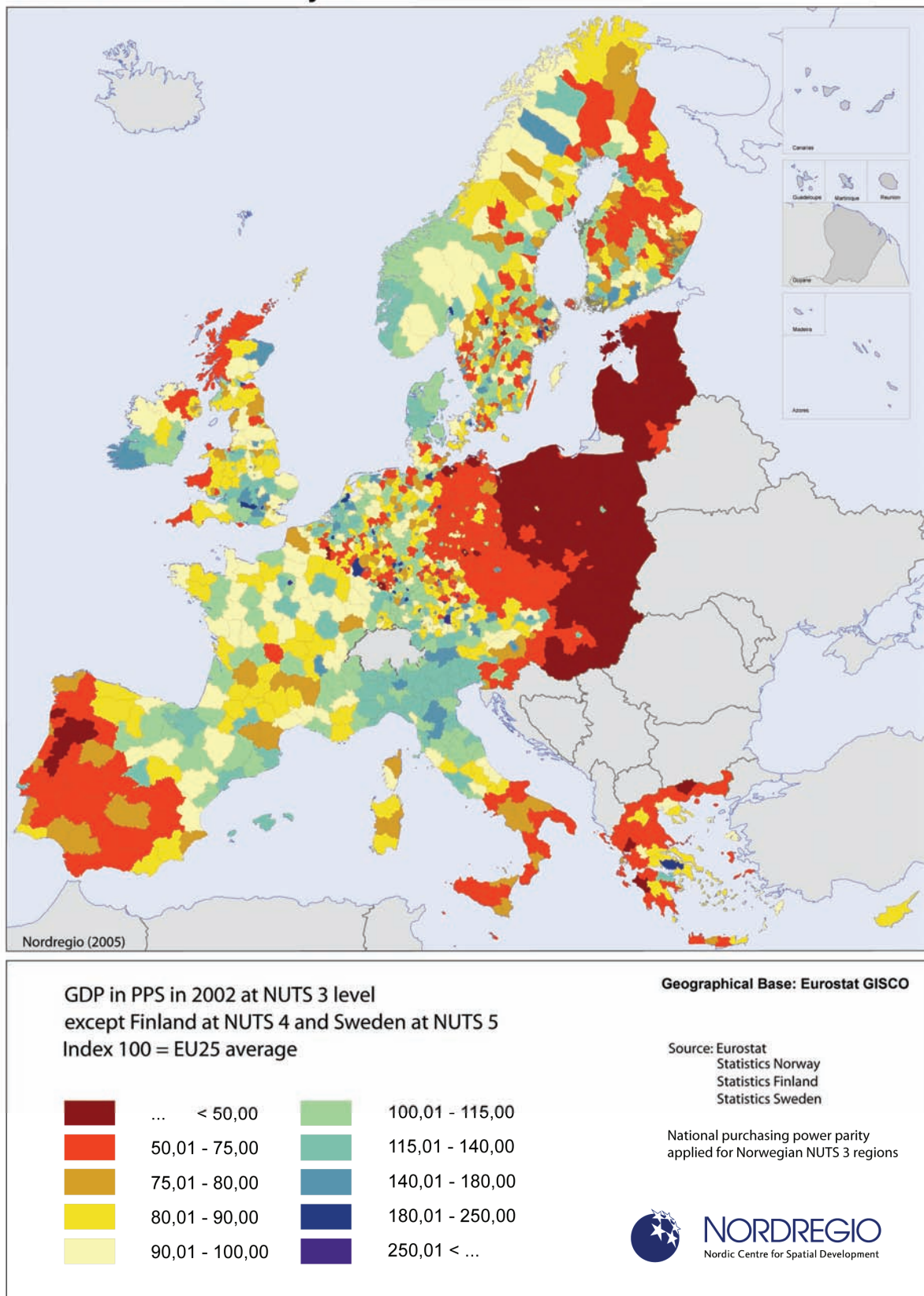


Figure 6.13 GDP levels in PPS at NUTS 3 level, except Sweden (NUTS 5) and Finland (NUTS 4) (2001). GDP levels are not available below NUTS 3 level for Norway.

Conclusion

All of the socio-economic parameters envisaged here have shown that the sparsely populated areas are generally in an unfavourable position, even in terms of GDP where the regional average values fail to render the strong local contrasts. There is, also, a high level of dependency on public employment, and a higher proportion of transfers in the total income of the inhabitants. Finally, we have observed polarising trends in terms of unemployment between 1991 and 2001, as unemployed persons are increasingly over-represented in sparse and peripheral municipalities.

The main challenge in the years to come is to design a growth policy that fully uses the potentials of the main cities of the study areas, without concentrating the regional population to these main nodes. It is therefore necessary to look at the economic role that secondary nodes can play, so that they can actively contribute to maintaining a territorial balance in respect of population structures. Creating institutional and financial structures facilitating the elaboration and implementation of individualised strategic development plans by local actors in these secondary cities should therefore be a priority.

The further development of knowledge centres, research institutes and industries, for example around existing primary activities in the Northern peripheries, is a second main priority. One objective of this policy is to compensate for the continued decline of employment opportunities in these branches through continual innovation, by building on sectors within which there is an established local expertise. In this respect, the low level of educational attainment in some parts of the Nordic peripheries poses a significant challenge yet to be overcome.

7. Terrain and climate

We have already touched upon the climatic aspects of the Nordic sparsely populated areas, with regard to road maintenance and maritime accessibility. The present chapter gives a more complete description of the climate encountered in these areas, in a comparative European perspective. The final sub-chapter then deals with the extent and position of protected areas within the study area.

7.1. Climatic conditions in the Nordic peripheries

Climatic conditions provide both opportunities and constraints for economic activities in regions. The main driving forces are temperatures, rainfall, and sunshine duration, which affects the vegetation periods and so the natural land coverage of regions. These conditions of course do also affect human activities in one way or the other. Just to mention a few such impacts, the energy consumption for heating systems or air conditioning is directly related to the prevailing temperature; the vegetation period also has an influence on the possibilities for agriculture, farming and forestry in a region. We shall look at three aspects of climate in this section, namely temperature, amount of sunshine and rainfall.

Figures 7.1 and 7.2 show the lowest monthly average temperatures and the highest monthly average temperatures, respectively, measured as long-time averages. These maps illustrate the interaction between various factors: on the one hand temperatures decrease in areas of high altitude or latitude; on the other, oceanic influences reduce the range of temperatures observed throughout the year, especially in the Western parts of the continent.

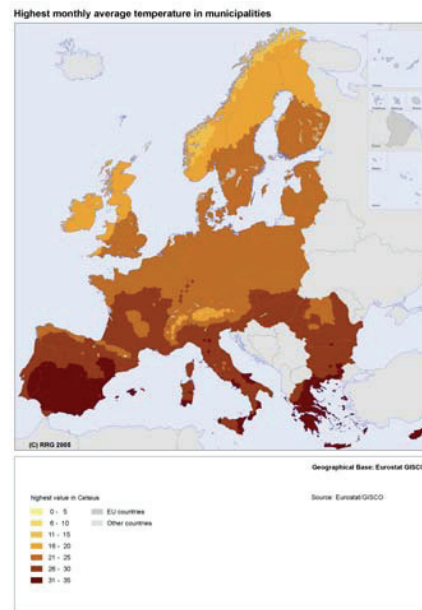
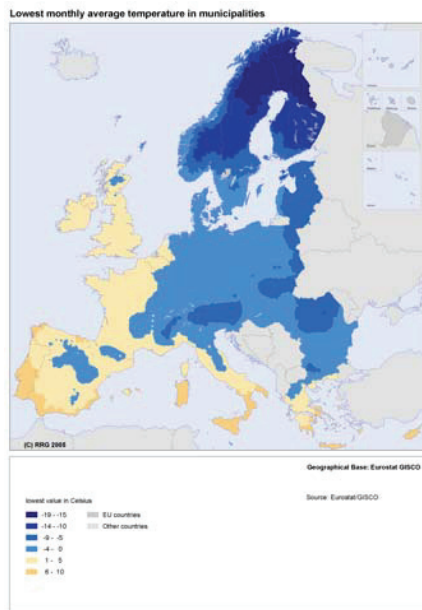


Figure 7.1. Lowest monthly average temperature Figure 7.2. Highest monthly average temperature

The temperature contrast index which was developed for the DG Regio “Mountain Study” (Nordregio, 2004, 23) (Figure 7.3) summarises the effects of both the highest and lowest average temperatures into one value: Although there are many parts of Europe that experience low long-time average monthly temperatures (see by Figure 7.1), and although there are also other areas in Europe yielding relatively moderate to low highest monthly average temperatures (e.g. Scotland and Ireland) (see Figure 7.2), the northernmost parts of Finland, Sweden and Norway stand out as unique with respect to the overall temperature contrast index. Only some small ‘cold spots’ in the Alps display temperature contrasts that are as extreme as those encountered in the study area.

Another important climatic factor here is the amount of sunshine. This amount is quantified by the long-time mean annual radiation measured in kWh/m² (see Palz and Greif, 1995) (Figure 7.4). A radiation of less or equal to 2.20 kWh/m² can only be found in Iceland and the northernmost regions of Finland, Sweden and Norway. Similar extreme values of less or equal to 2.60 kWh/m² can then only be found in a strip stretching from Northern Scotland to the area of Liverpool/Manchester/Birmingham.

A third important climatic condition (apart from temperature and radiation) is the amount of rainfall, i.e. the average yearly amount of rain per square metre (Figure 7.5). Here again the oceanic-continental gradient with predominant west wind areas can be

observed: Many windward areas in Europe experience significantly higher average yearly amounts of rain than the leeward sides of the massif ranges. These effects can clearly be seen in Norway, western parts of Scotland, Wales and Ireland, but also further away from the Atlantic Ocean, e.g. in respect of the Adriatic coast of Croatia and Bosnia-Herzegovina. The inner parts of the Alps and of the Pyrenees also experience extreme rainfall conditions with more than 3 000 ml/m² on average *per annum*. In contrast, many leeside areas showing low amounts of rain can be identified. For example, the driest area in continental Europe is the Central plateau of the Iberian peninsula with less than 200 ml/m² on average *per annum*. In contrast to the rain-fed coastal western coast of Norway, the northernmost parts of Finland and Sweden are among the driest in Europe, together with the leeward areas of Spain, Romania and central Poland, all of which have an average rainfall ranging between 250 and 500 ml/m².

7.2. Assessing the economic effects of extreme climatic conditions

Extreme climatic conditions lead to a range of additional costs for individuals, economic actors and public authorities. These span from operating costs for icebreakers in order to keep the Baltic seaports open in the winter months (see Figure 5.18), to additional domestic and industrial heating expenses and specific technological constraints building and running a water supply system that can resist extreme negative temperatures. As described under point 5.6, climatic constraints also induce higher road construction and winter maintenance costs: In 2001/2002, these road maintenance costs alone amounted to about 0.15% of the GDP in the Lappi (Finland). The corresponding ratios were about 0.12% in the Norrbotten and Västerbotten (Sweden), over 0.20% in Nordland and Troms (Norway) and over 0.70% in Finnmark (Norway). These costs in other words represent a significant additional financial burden for the concerned public authorities in some of the northernmost Nordic regions.

The general additional economic cost of these climatic constraints can however not be quantified, as they are incorporated in expenses which depend on a number of other factors.

Temperature Contrast Index in Europe, Isolines

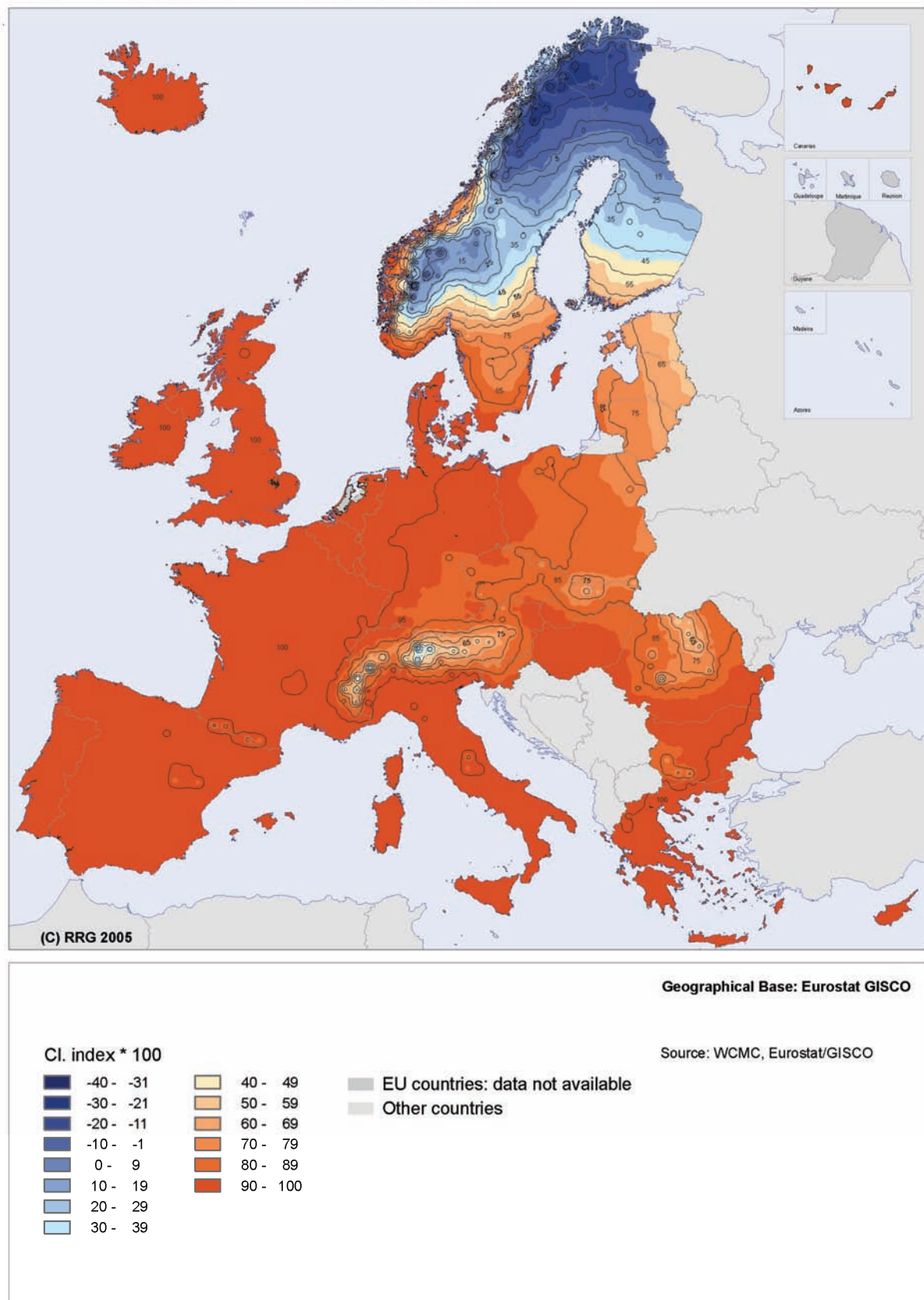
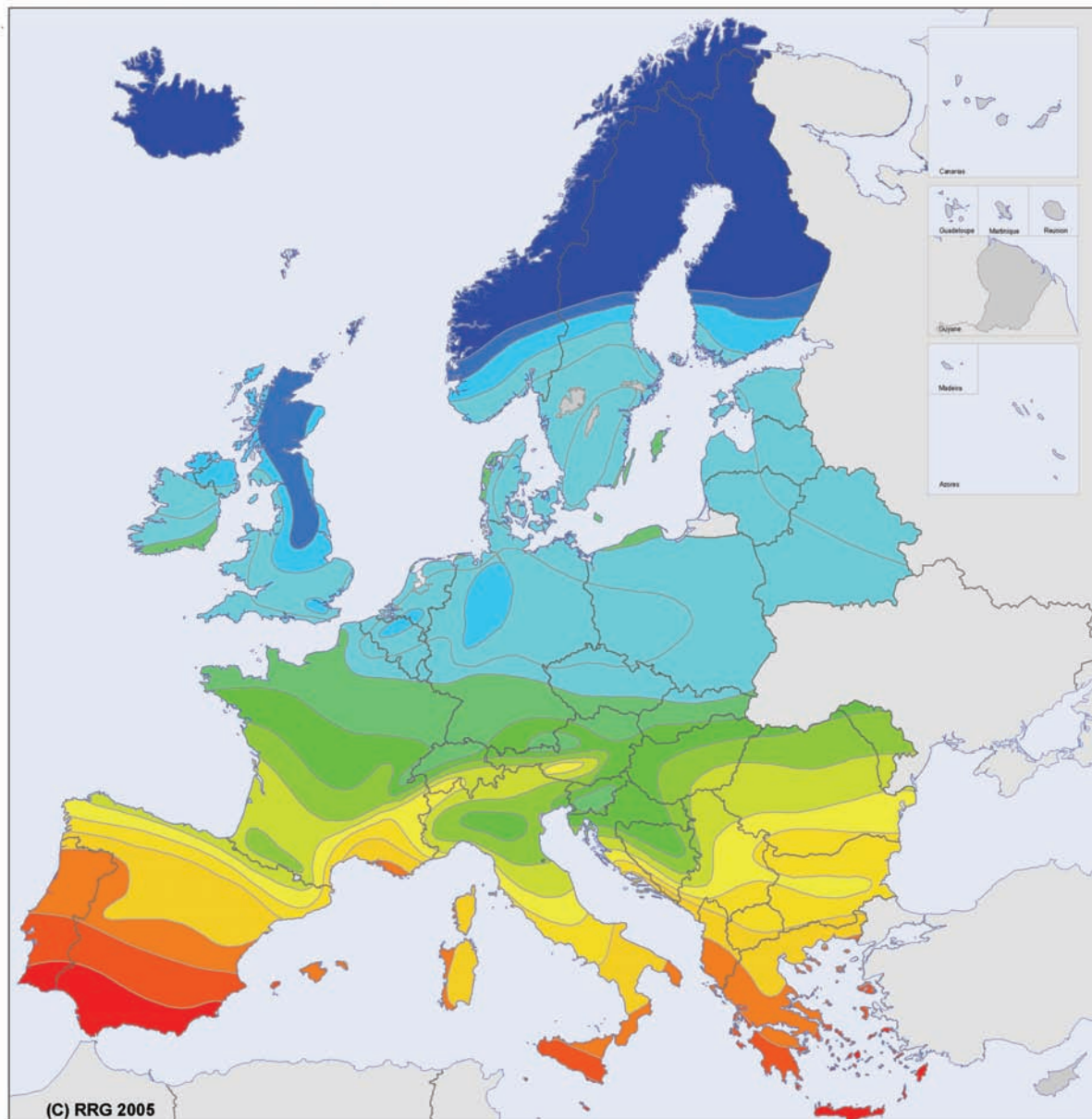


Figure 7.3. Temperature contrast index.

Mean annual radiation across Europe



Geographical Base: Eurostat GISCO

kWh/sqm

Source: Palz and Greif, 1995

0 - 2,20	3,41 - 3,60	4,81 - 5,00
2,21 - 2,40	3,61 - 3,80	EU countries: Data not available
2,41 - 2,60	3,81 - 4,00	Other countries
2,61 - 2,80	4,01 - 4,20	
2,81 - 3,00	4,21 - 4,40	
3,01 - 3,20	4,41 - 4,60	
3,21 - 3,40	4,61 - 4,80	

Figure 7.4. Mean long-time annual radiation (Palz and Greif, 1995).

Average yearly amount of rain

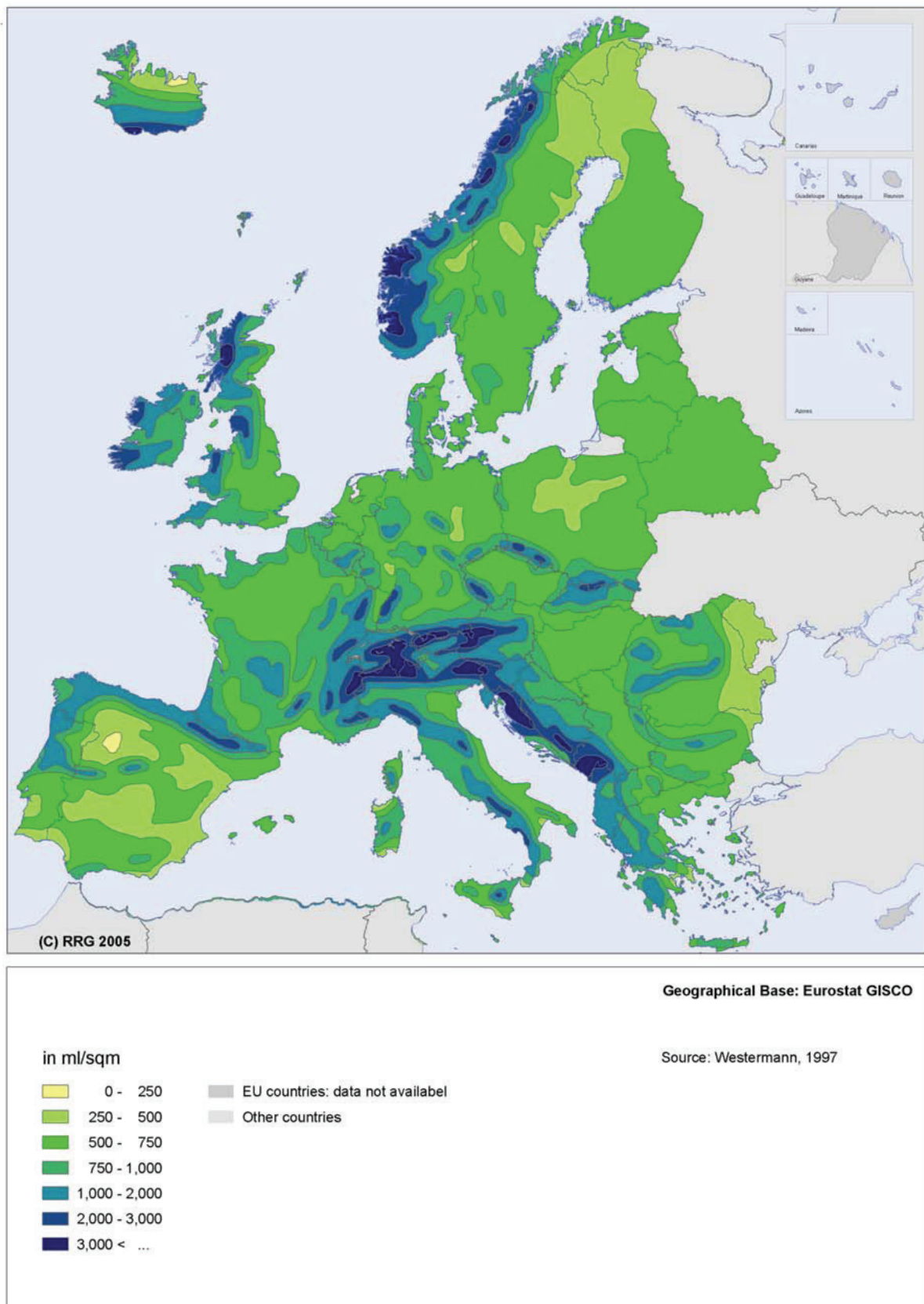


Figure 7.5. Long-time average rainfall across Europe (Westermann, 1997).

The northernmost sparsely populated areas of Finland, Norway and Sweden do have specific handicaps with regard to the climatic conditions. The combination of exceptionally cold winters, cool summers and a low yearly amount of sunshine create difficult conditions. Altogether, these climatic conditions significantly affect the natural land coverage and limit the possibilities for agriculture, farming and forestry in these areas.

7.3. Land use

Due to the extreme climatic conditions, as outlined in the previous sections, and the short vegetation period in the northernmost regions, there are in consequence few opportunities for agriculture in the northernmost regions:

The northernmost regions of Finland, Sweden and Norway are characterised by a very reduced proportion of arable land (Figure 7.6), as hardly any municipalities display a proportion of arable land exceeding 10%. Coniferous forests cover the major part of northernmost regions of Sweden and Finland, (Figures 7.7 and 7.8). In this respect, these regions are to some extent similar to many mountain areas in Europe (e.g. the Alps, Massif Central in France, the Pyrenees, and the Highlands in Scotland). However, while these mountain areas often combine agricultural land in the valleys with forested areas on the hillsides, the northernmost regions of Sweden and Finland rely almost exclusively on forestry. Forestry-related industries therefore play a greater role, and the reduced need for manpower due to mechanisation has in some parts had a more direct demographic impact.

Generally, while most parts of Europe display a patchwork of different land covers (Figure 7.8), a high degree of homogeneity prevails in Finland and Sweden: there are large continuous areas of coniferous forests, with interstitial areas of grassland (e.g. along the lakes in Finland). In Norway, barren lands and grasslands (tundra) prevail in most of the study area, interrupted by forested parts. One however finds extensive forested areas in the south-eastern regions of the study area.

Proportion of arable land within municipalities

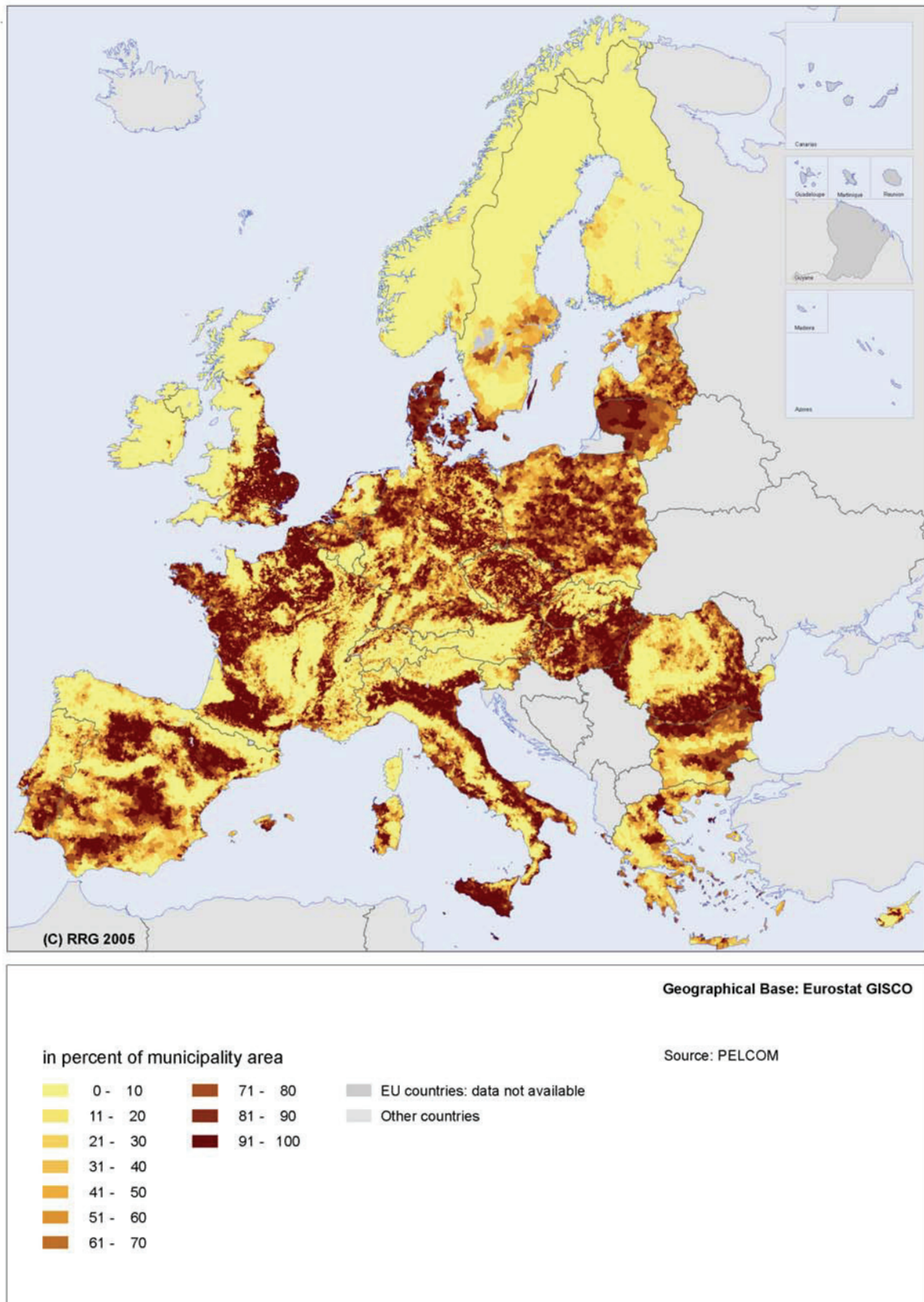


Figure 7.6. Proportion of arable land within municipalities

Proportion of forests

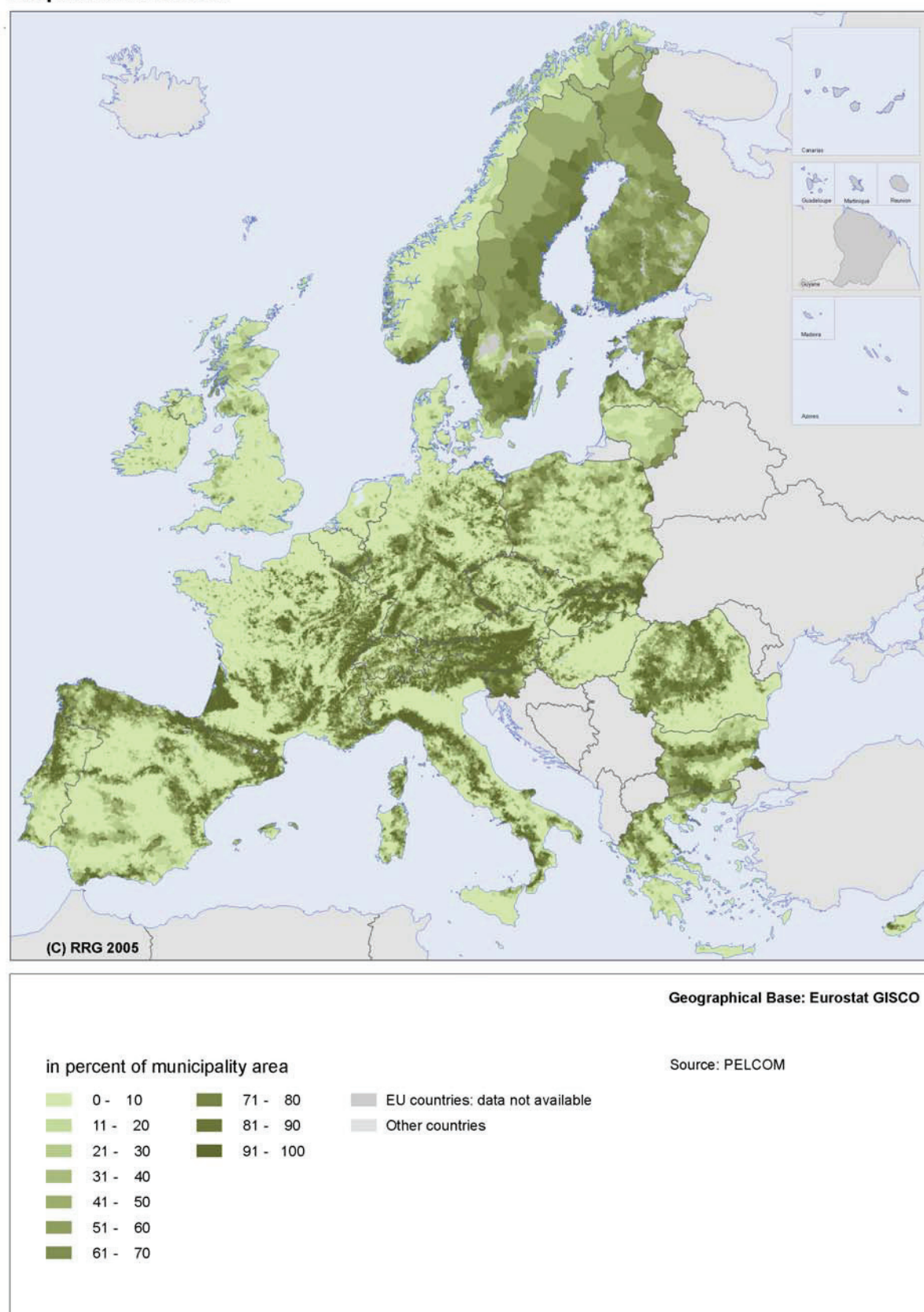


Figure 7.7. Proportion of forests in municipalities

Land cover and land use in the northernmost regions

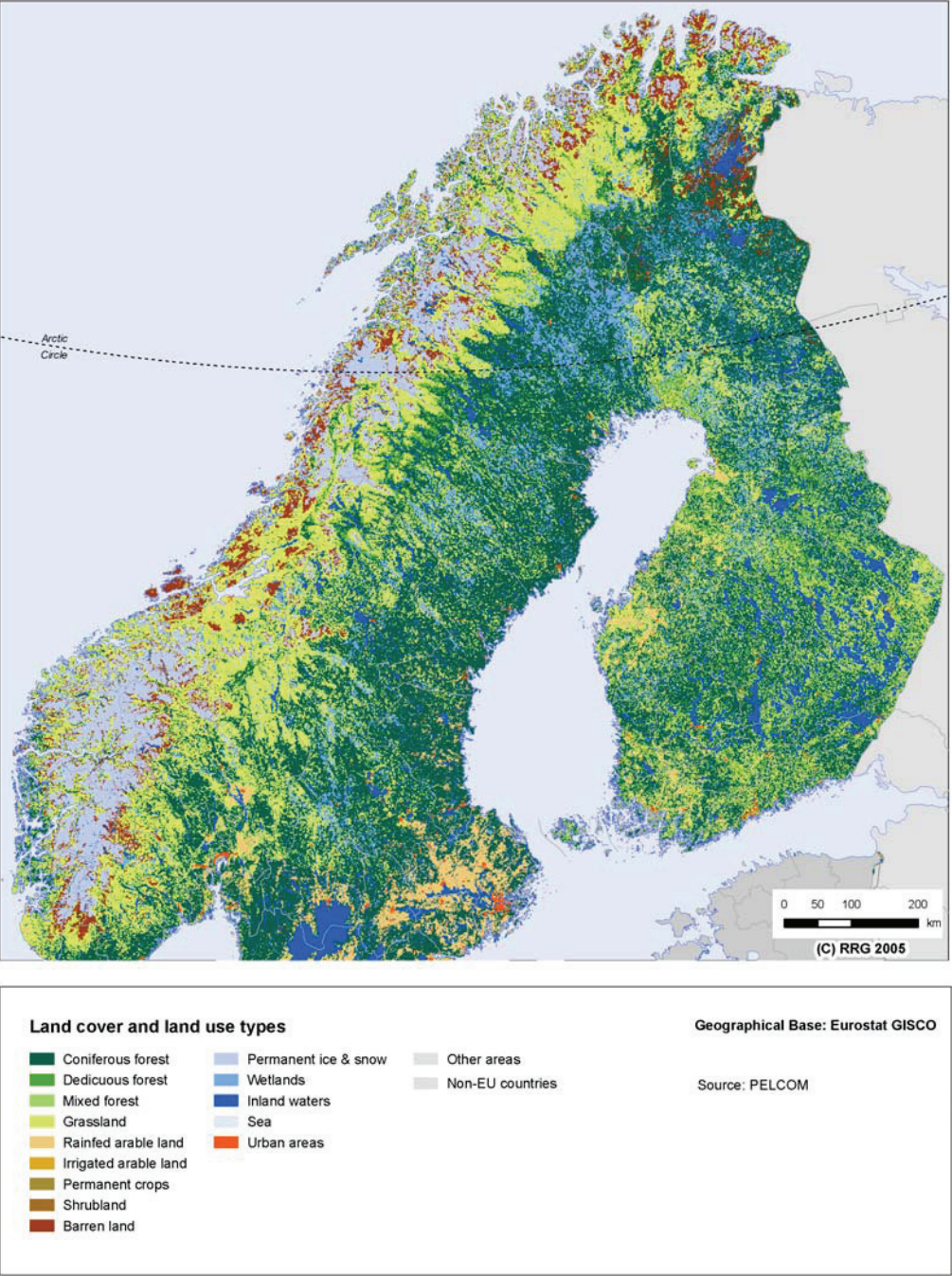


Figure 7.8. Land uses in the study area (Source: PELCOM)

7.4. Protected areas

Major protected areas are to be found in the inland areas, especially along the national borders, mostly in areas previously identified as uninhabited. Conflicts in terms of land use and land ownership however arise, especially in relation to the rights of the Sami population and particularly in respect of reindeer grazing.

Table 7.1 Percentage of protected areas on total NUTS-3 region area in the study area.

NUTS-3 code	Name	Total area (km ²)	Protected area (km ²)	%
FI131	Etelä-Savo	14 435.8	2 266.9	15.7
FI132	Pohjois-Savo	16 509.6	477.8	2.9
FI133	Pohjois-Karjala	17 782.1	1 205.1	6.8
FI134	Kainuu	21 566.9	1 729.2	8.0
FI185	Päijäti-Häme	5 132.8	211.0	4.1
FI186	Kymenlaakso	5 106.4	144.9	2.8
FI187	Etelä-Karjala	5 673.7	192.2	3.4
FI193	Keski-Suomi	16 582.2	827.3	5.0
FI194	Etelä-Pohjanmaa	13 457.4	405.8	3.0
FI195	Pohjanmaa	7 675.0	344.0	4.5
FI1A1	Keski- Pohjanmaa	5 285.6	432.2	8.2
FI1A2	Pohjois-Pohjanmaa	35 291.3	3 804.5	10.8
FI1A3	Lappi	93 002.8	35 972.4	38.7
SE061	Värmland	21 790.1	987.7	4.5
SE062	Dalarna	30 327.7	2 449.5	8.1
SE063	Gävleborg	19 634.7	240.0	1.2
SE071	Västernorrland	21 678.2	288.0	1.3
SE072	Jämtland	49 443.4	5 020.6	10.1
SE081	Västerbotten	55 401.2	7 654.6	13.8
SE082	Norrbotten	98 910.7	23 925.1	24.2
NO012	Akershus	4 568.3	137.9	3.0
NO021	Hedmark	27 134.1	2622.7	9.7
NO022	Oppland	25 158.1	3823.0	15.2
NO032	Buskerud	14 655.1	1395.0	9.5
NO052	Sogn og Fjordane	18 893.2	2927.2	15.5
NO053	Møre og Romsdal	14 685.5	3003.5	20.4
NO061	Sør Trøndelag	18 754.1	3048.4	16.2
NO062	Nord Trøndelag	22 119.1	3386.9	15.3
NO071	Nordland	37 465.1	5212.6	13.9
NO072	Troms	25 651.1	2985.6	11.6
NO073	Finnmark	49 235.3	3028.8	6.1

Sources: own calculations, based on: UNEP-GRID Arendal (2005), Directorate of Nature Management (Norway, 2005), Circumpolar Protected Areas Network (CPAN), Conservation of Arctic Fauna and Flora (CAFF), Finnish Environment Institute (2005), Naturvårdsverket (2005).

In case of Sweden, only National Parks, Natural Reserves and Natural Protection Areas were used. Other types of protected areas such as biotope, landscape or water protection areas, cultural reserves or natural memories were not used.

Protected areas on sea excluded from summary statistics.

Altogether, the national parks, reservations and other protected areas that have been identified cover an area of 120 150 km² in the northernmost regions, which accounts for about 14.7% of the total study area. Table 7.1 indicates the extent of protected areas for each of the NUTS-3 regions in the study area.

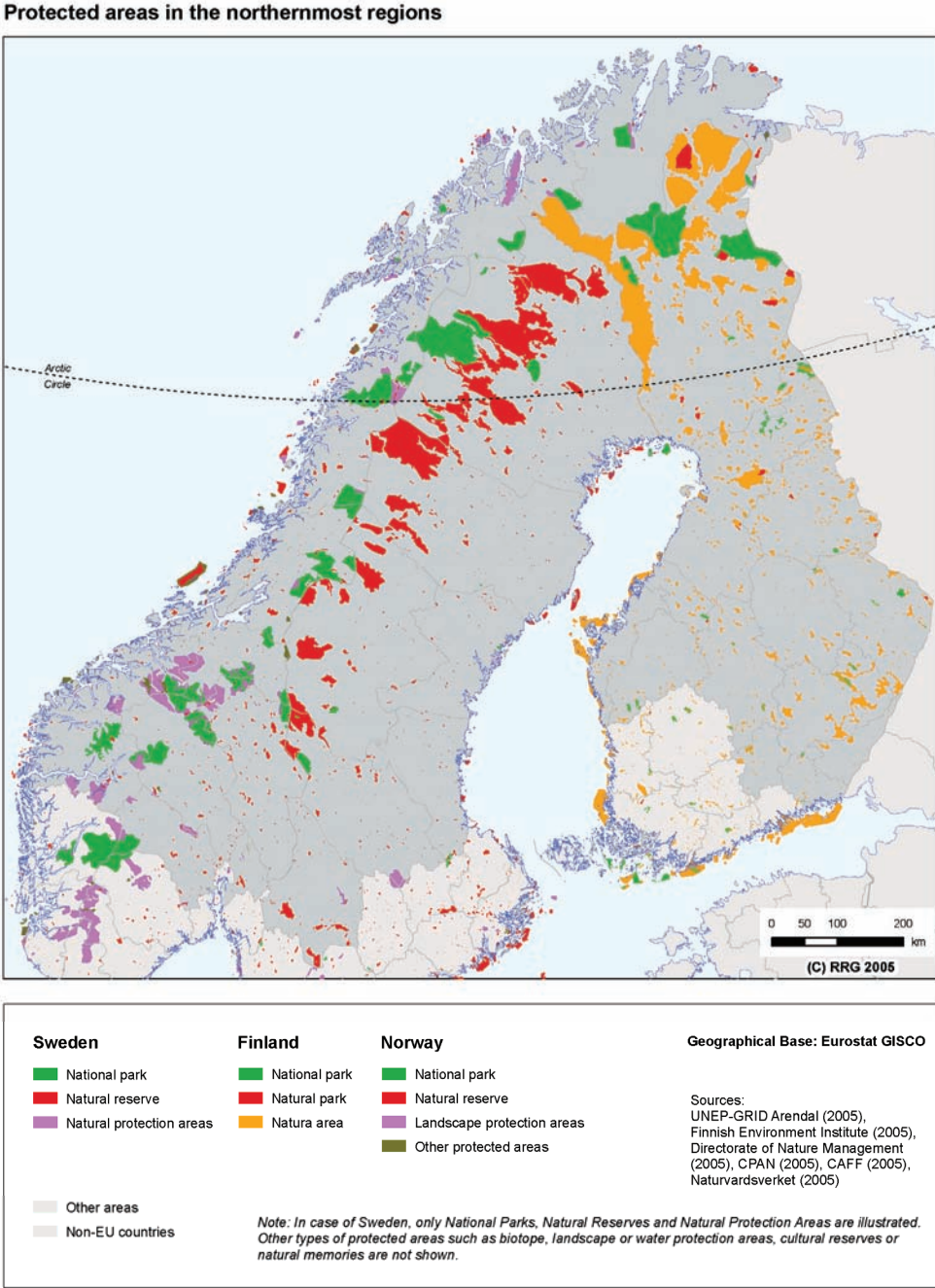


Figure 7.9. Protected areas and national parks in the northernmost areas

The most sparsely populated parts of Norway, Finland and Sweden have the most extensive protected areas.

Conclusion

This overview of climatic and land use aspects confirms the relatively unique profile of the Nordic sparsely populated areas from a European perspective, especially with regard to temperature and radiation levels. The quantification of the economic effects of these constraints is however close to impossible, as there is no valid point of comparison available. It is nonetheless obvious that the extreme climatic conditions induce additional costs in the Nordic sparsely populated areas, with regards to the construction and operation of transport infrastructure as well as energy and water supply, and also as far as expenses for heating and lighting are concerned.

In a general context of progressively declining access to fossil energy, a strategic policy to meet the specific energy needs of the Nordic sparsely populated areas needs to be developed. Wide areas of woodland could be further exploited in order to meet some of these local energy needs. Incentives should be developed in order to prepare the Sparsely populated regions for an upcoming shift in the energy supply situation.

8. Conclusions: The Northern Periphery Problem - A Syndrome of Disadvantage

In reviewing the contents of the above report it is clear that the regions of the Northern Periphery of the Nordic countries experience what may be termed a “syndrome” of disadvantage. The term is appropriate, since as in a medical syndrome, the situation is characterised by a number of associated symptoms of disadvantage, which, although they mutually reinforce the overall disadvantage experienced by these regions, are not necessarily connected in a causal sense. Thus, as we noted in the introduction, though sparsity, peripherality and structural weakness (i.e. dependence upon primary industries), are different problems, with distinct causes, they often co-exist, and together contribute to a very substantial cumulative barrier to regional development. This situation is illustrated in Figure 8.1 below.

Figure 8.1 has a two-dimensional layout, so that both horizontal and vertical position is important. The top section of the diagram relates to the physical geography and location of the regions, whilst below we find the economic/business and demographic/social aspects.

On the left of the diagram are located a number of basic handicaps (top heading) and historic legacies (lower heading). These are in a sense, fixed preconditions, and include climate, peripherality, sparsity, and the legacies of long-term demographic trends.

In the central section of the diagram we find various processes and characteristics, which derive from the basic handicaps, often exacerbating the wider regional problem. For instance climatic constraints result in limited agricultural opportunities, travel and transport disruption, the increased cost of infrastructure provision, and so on. Local accessibility problems, peripherality, and the historic dependence upon the primary sector interact in various ways to impose structural constraints on economic growth, as well as high costs for materials and distribution, inadequate access to modern logistics systems, a lack of agglomerative advantage and “attenuated” business networks.

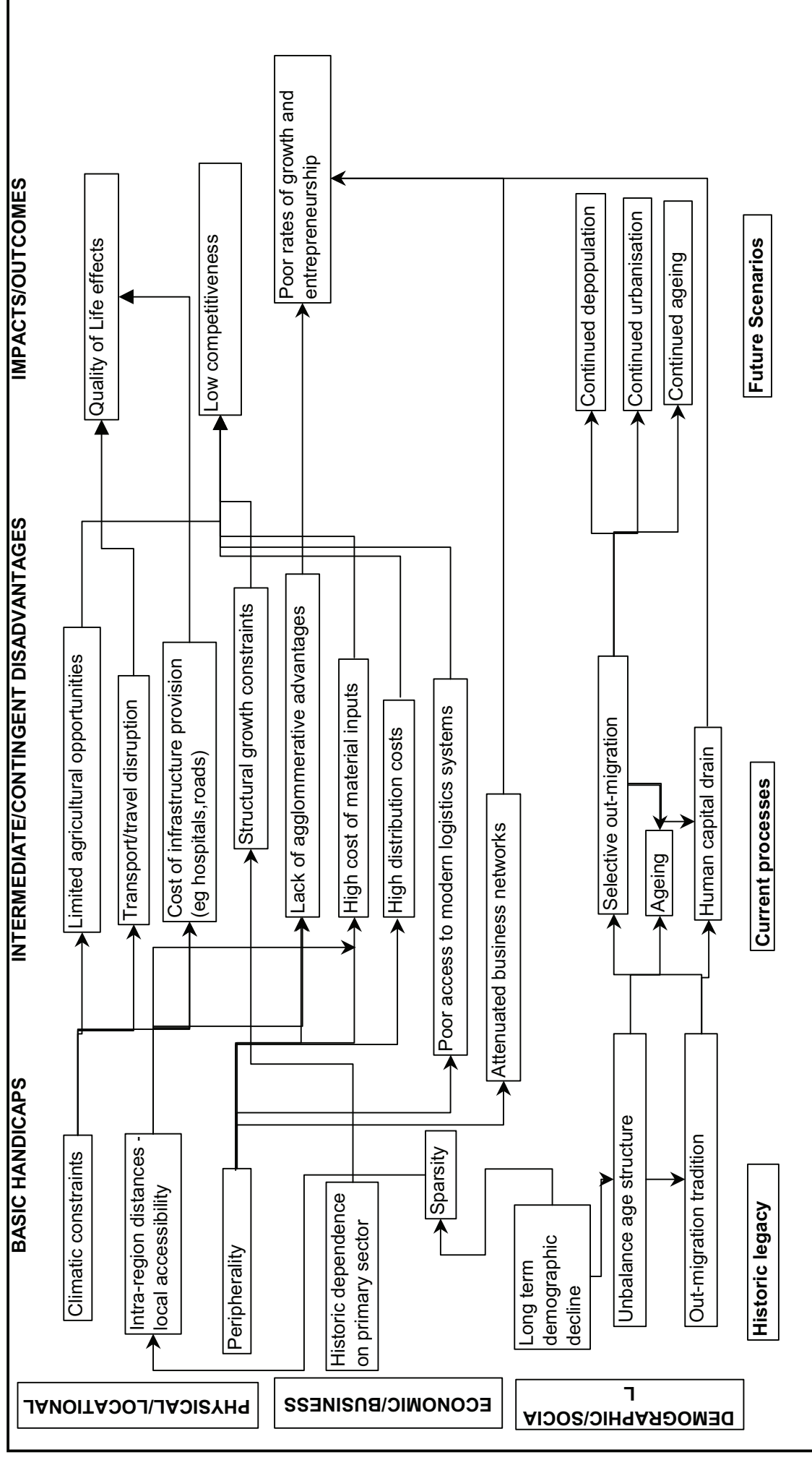


Figure 8.1. The Northern Periphery Syndrome of Disadvantage

The historic legacy of demographic trends (driven by selective out-migration) is self-perpetuating, driven by an ageing of the population and the drain of human capital out of the periphery and towards the south.

The last column, on the right, shows the final impacts of these processes, (and the likely outlook for the future, in the absence of effective intervention), such as low competitiveness, poor rates of entrepreneurship and innovation, and a continued “downward spiral” in terms of demographic development.

Possible Policy Implications

The recognition of the “syndrome” has several potential implications for policy:

- Since the syndrome is made up of several components of disadvantage, which are, to a degree at least, independent in terms of their causes, it follows that no single approach (addressing for example, sparsity, peripherality, migration, or structural issues alone) is likely to be effective.
- Some of the basic handicaps (such as climatic constraints) are clearly not mutable, and in this case it is appropriate to consider measures, directed at “softer” issues, mostly located in the centre of the diagram, (such as improving human and social capital, developing more effective business networks, better governance, and so on), which may compensate or ameliorate.
- Other “basic handicaps” such as peripherality, poor local accessibility, or sparsity exacerbated by migration, although not fixed physical characteristics (in the same way as climate is), are probably almost as difficult to “turn around”, simply because, in a free market economy accessible regions are generally the motors for growth, drawing on resources from the periphery, and therefore always “ahead”. This too leads to the conclusion that development policy for the periphery should focus upon “soft factors” which may better equip the population and businesses to survive within their challenging environment. "Hard" measures such as infrastructure building are nonetheless needed in certain parts, e.g. where transport bottlenecks hampering industrial development have been identified. Such projects can also act as catalysers of improved regional cooperation and governance.

- In considering policy development for sparsely populated and peripheral regions it is important to recognise and make full use of the particular assets of such regions as locations for “footloose” economic activities. A number of Alpine and peripheral cities have already demonstrated that a favourable environment and quality of life can attract highly qualified personnel, if the appropriate structures are established in terms of public research and higher education.
- It is worth stressing the fact that although many of the improvements in telecommunications and information technology in recent years have tended to benefit accessible regions more than sparsely populated or remote ones, they do, nevertheless offer new opportunities for the latter. Again, providing that basic cost differentials (due to differences in market size) can be overcome by public support, the key issue is likely to be human capital (i.e. informing local entrepreneurs of the opportunities, and the training of the local workforce).

Although the above points are far from comprehensive, a basic principle is clear: In order to effectively address the effects of the basic handicaps of the Northern Periphery, it will be necessary to focus efforts upon “Intermediate/Contingent” processes, and to develop imaginative “softer” approaches to the “syndrome” of disadvantage. A “direct assault” on peripherality for instance through improvement of transport and travel infrastructure, may well have a perverse, “pump effect”, and actually exacerbate long established core-periphery processes, by allowing businesses in accessible regions to compete in the periphery.

By combining its strategic role as a centre of expertise for high technology products and services, as a producer of raw material and processing industry products and as a gateway for products from Russia and northern Eurasia, the sparsely populated areas of the Nordic countries hold the key to a strategic role in the European context. It is however important to ensure that these development perspectives are implemented with a focus on the interests of these Nordic peripheral regions. Coordinating regional actors and national stakeholder through appropriate transnational governance structures is therefore of primary importance.

Through the implementation of three above mentioned development strategies, the Nordic sparsely populated areas have the potential to contribute to the achievement of

the Lisbon agenda, i.e. making Europe the most competitive economy in the world. Compensating for the higher relative cost of building and operating infrastructure in these areas is in other words likely to be profitable for the European economy as a whole. A European policy compensating for concentrating trends in the economy can ensure that the current and potential human capital, natural resources and strategic transport nodes within the peripheral and sparsely populated regions are made available to the European economy. A European regional policy can in other words constitute an original contribution to the Lisbon agenda, by identifying territories where current market mechanisms fail to take advantage of the existing resources. The Nordic peripheral sparsely populated areas constitute one type of such areas.

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