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Remote Rural Regions

How proximity to a city influences the performance of rural regions

by Lewis Dijkstra and Hugo Poelman

1. Introduction

This short paper describes the characteristics of remote rural regions and how remoteness can be defined and measured. This new approach combines a new classification of remoteness, based on driving time to the closest city, with the OECD classification of regions into predominantly urban, intermediate and predominantly rural regions[1].

2. Remote rural regions

The distinction between rural regions close to a city and remote rural regions reveals significant differences. Remote rural regions are the only group with a negative population growth. The average population density in remote rural regions is half that of rural regions close to a city. The low overall population density and the absence of a nearby city are probably the main reasons why access levels to passenger flights in remote rural regions are so low.

A comparison between regional population trends and national population trends reveals that remote rural regions are far more likely to have suffered a reduction in the share of their country's population. Four out of five remote rural regions either had a loss of population or grew more slowly than their country's growth rate. The same is true for their share of national GDP[2]. Almost three out of four regions saw their GDP shrink or grow more slowly than their country's rate. This stands in clear contrast to rural regions close to a city which saw better results for these two indicators. The scores obtained by rural areas close to a city were almost identical to the EU-27 average. GDP per head is the lowest in remote rural regions, three index points below rural regions close to a city and substantially lower than in intermediate and urban regions[3].

An analysis of sectoral productivity shows that remote rural regions consistently have the lowest productivity in agriculture, industry and services. Productivity in rural regions close to a city in all three sectors is at least 10 index points higher.

Remote rural regions have the highest share of GVA in the agriculture sector, but also the lowest productivity in this sector.

Remote rural regions have a similar share of GVA in industry to intermediate regions, but industrial productivity is more than 20% below average in remote rural regions, while it is just above average in intermediate regions. Rural regions close to a city have a higher share of industrial GVA than remote rural regions (32% as compared to 29%) with productivity also being higher in rural regions close to a city (88% of the EU-27 average as opposed to 77%).

(1) For ease of reading, 'predominantly' will not be used in the rest of the text. For example, 'predominantly urban regions' becomes 'urban regions', and 'predominantly rural regions' becomes 'rural regions'.
(2) Because changes in population and GDP between 1995 and 2004 varied significantly between countries, a simple analysis of growing or shrinking regions may distort the figures. For example, some categories may appear to have grown because more of the regions in these countries are located in countries experiencing rapid growth, however in reality the regions in this category all grew more slowly than the country they are located in. A more accurate approach is therefore to analyse changes in the share of the national GDP or population.
(3) GDP per head in urban regions may be artificially high due to commuting. Nevertheless, it would still be higher than in rural areas if the figures could be corrected for this bias.

Table 1: Characteristics of predominantly urban, close and remote intermediate regions and close and remote predominantly rural regions

	Predo-minantly Urban	Intermediate			Predominantly rural			EU-27
		Total	Close to a city	Remote	Total	Close to a city	Remote	
Average annual % change in population, 1995-2004	0.29	0.31	0.31	0.24	0.02	0.10	-0.18	0.25
% of regions with a reduced share of national population 1995–2004	55	44	44	48	64	54	81	54
GDP per head 2004, EU-27=100	127	84	84	71	70	71	68	100
% of regions with a reduced share of national GDP 1995-2004	57	55	55	52	64	59	72	58
Population density in 2004 inhabitants/km^2	552	112	114	65	40	51	27	113
Access to flights	1 059	475	483	215	237	286	114	685
Number of NUTS3 regions	416	475	454	21	393	249	144	1 284
Share of NUTS3 regions in %	32	37	35	2	31	19	11	100
Total population in 1000s	215 022	184 143	178 463	5 680	90 506	64 516	25 990	489 671
Share of population in %, 2004	44	38	36	1	18	13	5	100

Table 2: Productivity by sector and share of GVA by sector for urban, intermediate and rural regions (2004)

	Urban	Intermediate			Rural			EU-27
		Total	Close to a city	Remote	Total	Close to a city	Remote	
Productivity 2004, EU-27=100								
Agriculture	273	119	120	97	78	85	64	100
Industry	177	104	104	97	85	88	77	100
Services	167	117	117	135	87	90	78	100
Share of GVA in 2004								
Agriculture	0.8	3.3	3.3	4.3	5.8	5.5	6.8	2.2
Industry	23.7	28.3	28.4	23.9	31.1	31.8	28.9	26.2
Services	75.6	68.4	68.3	71.8	63.1	62.6	64.3	71.6

In terms of services, remote rural regions have a slightly higher share than rural regions close to a city, but again with significantly lower productivity.

The lower level of GDP per head in remote rural regions is in part caused by low productivity in each sector as well as the relatively high share of GVA in the agricultural sector.

3. OECD classification combined with remoteness

3.1. OECD classification into urban, intermediate and rural regions

The OECD classification is based on the share of a region's population living in rural local units. Rural local units in Europe are defined as local administrative units (LAU1 or 2) with a population density below 150 inhabitants/km^2.

- In rural regions, more than 50% live in rural local units.
- In intermediate regions, between 15% and 50% live in rural local units.
- In urban regions, less than 15% live in rural local units.

If a region has an urban centre, a rural region may be reclassified as intermediate, or an intermediate region as urban, depending on the size of the urban centre.

However, from a geographical point of view, the OECD classification does have two shortcomings:

1) the outcome of this approach depends to a large degree on the size of local units and the regions; and

2) this approach does not take into account the characteristics of adjacent regions. For example, in several EU Member States, NUTS3 regions separate cities from their surroundings. The NUTS3 city is classified as urban and the surroundings as rural. If these NUTS3 regions were combined into a single region, it would be classified as intermediate or even urban. In countries with very large local units, units with a small urban centre would be considered rural due to the low overall density[4].

3.2. Remoteness and proximity to a city

A region is considered close to a city if more than half of its residents can drive to the centre of a city of at least 50 000 inhabitants within 45 minutes. Conversely, if less than half its population can reach a city within 45 minutes, it is considered remote. (For more detail, see the methodology section.)

The analysis of remoteness significantly reduces the impact of the two geographic limitations mentioned above. The distortion created by the variation in size of the local units is alleviated by identifying all cities over 50 000 inhabitants in a harmonised manner throughout the EU. In this analysis, small LAU2s have been grouped to created individual cities, and within very large LAU2s, cities have been identified by using a population grid and land cover map. This removes part of the bias stemming from the different sizes of local units. The influence of neighbouring regions is introduced by calculating the driving time to cities over 50 000 *across regional boundaries*.

Of the rural regions, 37% were considered remote. The intermediate regions were almost all considered close to a city (96%), which is a reflection of their nature. These are typically regions which may either be close to a large city or have one or more smaller cities in the region. Given that only 21 intermediate regions were classified as remote, representing only 1% of the EU-27 population, this category is perhaps not the most pertinent from an analytical point of view. Urban regions were, by default, considered to be close to a city.

3.3. Why is proximity to a city relevant for rural regions?

Access to a city is an indicator of access to a wide range of services and opportunities. For example, cities with over 50 000 people are more likely to offer diverse employment opportunities, higher education, specialised health care, a sizeable local market, shops and services such as banking. All of these aspects influence the region's capacity to attract and retain people and also its labour productivity.

4. Why cities over 50 000 inhabitants and why 45 minutes driving time?

For the city size, two different groups were examined: around 500 cities with at least 100 000 inhabitants and around 900 cities with at least 50 000 inhabitants. Proximity to a city is used here as an indicator of access to services and jobs. Therefore, the question is whether or not cities over 50 000 have such services. This varies from Member State to Member State, but notably in Member States with few cities of more than 100 000 inhabitants. These smaller cities tend to play an important role when it comes to providing services. In Finland for example, cities like Joensuu, Rovaniemi and Vaasa, each with approximately 57 000 inhabitants, have a university, polytechnic or both. This is also the case in Slovakia where Žilina, Banská Bystrica and Prešov, all cities with around 80 000 inhabitants, each have a university.

(4) For more information on the OECD classification, see: OECD Regional Typology: Updated Statistics. 12 November 2007, GOV/TDPC/TI(2007)8 by OECD, Paris.

The impact of excluding cities with inhabitants between 50 000 and 100 000 is substantial in these two countries. In Slovakia, five out of eight regions would be remote when considering only cities over 100 000, while all regions would be close to a city if cities above 50 000 were included. In Finland, including cities with more than 50 000 inhabitants would decrease the number of remote regions from 15 to 9 out of a total of 20 regions.

In Poland, France, the Czech Republic, Bulgaria and Romania, many more regions would also become remote if cities with populations between 50 000 and 100 000 were excluded. However, in several countries, both approaches produce the same classification. In the UK, Germany, Spain, Portugal, the Netherlands, Belgium and Hungary, it makes very little difference whether all cities over 50 000 are included or only those above 100 000.

Table 3: Number and share of remote regions according to travel time

Driving Time		
30 Minutes	45 Minutes	60 Minutes
321	174	115
25%	13%	9%

For the driving time to cities over 50 000, three thresholds were considered: 30, 45 or 60 minutes. The driving time was calculated from the city centre. Therefore, for large cities, driving time from the edge of the city to the centre was often 30 minutes or more. However, people do not necessarily need to reach the city centre to access some of the jobs or services. The impact of travel time on the share of remote regions is also worth considering. Using 30 minutes means that one in four regions were remote. At the other extreme, 60 minutes means that less than one in ten were remote. Using 45 minutes, a reasonable maximum daily commuting time, saw one in eight regions classified as remote with a plausible geographic pattern.

For a region to be considered remote, more than half of its population needs to live more than 45 minutes away from a city. The choice to use at least 50% ensures that the designation of remote or close applies to the majority of the residents.

The main goal in establishing this classification was to make a clear distinction between rural regions with different development patterns. The combination of cities over 50 000 and 45 minutes revealed the most marked distinction between rural regions.

5. Conclusion

The distinction between remote rural regions and rural regions close to a city complements the OECD's regional EU typology in a way which is very relevant to policy making.

Remote rural regions are clearly faced with a different set of problems than rural regions close to a city. This is clear from the lower levels of productivity and GDP per head and the declining population of remote rural regions.

6. Methodology

The proposed urban/rural typology combines two dimensions:

- categorisation based on local population density and on the presence of main cities;
- categorisation based on the remoteness of regions, compared to city centres.

6.1. Categorisation according to population density

NUTS3 regions can be categorised as urban, intermediate or rural, using the OECD methodology of categorisation of TL3 regions[5].

As the OECD does not cover all EU Member States, and the TL3 breakdown is not identical to the NUTS3 breakdown, the OECD methodology has been reproduced to categorise the NUTS3 regions outside the OECD TL3 scope.

This involved using LAU2 population density data, categorising NUTS3 regions according to local density patterns, and taking into account the presence of bigger cities in intermediate or rural regions. For the latter step, we used the Urban Audit (2007) cities to identify the presence of bigger cities.

6.2. Assessment of remoteness of regions

All NUTS3 regions can be characterised as "remote" or "close to a city", depending on the distribution of the regional population in relation to selected cities. In our definition, a region is labelled "remote" if at least half of its population lives at more than 45 minutes by road from any city of at least 50 000 inhabitants.

6.2.1. Estimating accessibility around cities

The accessibility by road of city centres is estimated by creating "service areas" around points representing cities of at least 50 000 inhabitants. To define the city points,

(5) See footnote 4.

preference is given to the Urban Audit[6] cities with more than 50 000 inhabitants. These cities were defined taking into account the size of local administrative units (LAU2). In countries with very small LAU2s, these were grouped, as for example in France. In countries with very large local units, the distribution of the population within these units was seen as determining whether or not an urban centre over a certain size existed. This was used in the case of several Nordic and UK cities.

To obtain a more complete collection of cities, points were added for the urban morphological zones[7] (UMZ) of more than 50 000 inhabitants, provided that they did not coincide with Urban Audit cities. Urban morphological zones are defined by the European Environmental Agency based on clusters of urban land use classes, which ensures that the size of local administrative units does not distort the outcome. The population of these UMZ is estimated using a raster-based population distribution[8].

Around all the selected cities, service areas representing a maximum travel time of 45 minutes were created. Once these merge, the entire territory of the Union is divided into two types of area: those close to cities, and those that are more remote.

6.2.2. Estimating distances by road

The initial road network needed to be adapted to obtain a more realistic estimate of travel time.

Speed limits are attributed to road segments, taking into account the road category and a table of speed limits by category and country. The resulting crossing time per road segment is further adjusted to take into account the influence of the terrain and congestion risks.

An approximation of the influence of the terrain is derived from the digital terrain model. The slope raster, calculated from the terrain model, is re-classified into 3 slope classes. The road network is overlaid with these slope classes. Each resulting road segment receives an index, according to the slope class. For slopes of 0 to 5%, the index is 1. For slopes of 6 to 10%, the index is 1.2, whereas for slopes of 11% or more, the index is 1.5. The indices are used as impedances on speed. Thus, the initial crossing time is multiplied by the slope index to take into account the average slope conditions related to the segment.

In a similar way, an approximation of congestion risks is derived from the urban morphological zones (UMZ). The road network is overlaid with the extent of the urban morphological zones, i.e. with a generalised version of the main built-up areas. When a road crosses a UMZ, the crossing time is multiplied by 1.5 on motorways, and by 2 on other roads.

6.2.3. Estimating population in remote areas

To estimate the regional population living close to cites or in more remote areas, we need the population distribution over the entire territory. This distribution is modelled using the population disaggregation grid as produced by the Joint Research Centre[9]. By overlaying the population grid with the service areas, we obtain an estimate of regional population inside and outside the service areas.

It has to be noted that the population distribution given by the disaggregation grid tends to underestimate populations in urban areas. Yet this underestimation is constrained within the limits of the LAU2 units. Where LAU2 units are reasonably small, the error incurred can be disregarded. The situation is more problematic in sparsely populated areas with large LAU2 units. To overcome this problem, the population distribution for Sweden[10] and Finland[11] was taken from grids representing registered population, instead of the modelled distribution.

The calculated population outside the 45 minute service areas is expressed as a percentage of the total regional population. Where the percentage exceeds 50%, the NUTS3 region is labelled "remote".

6.3. Combining the two dimensions of the categorisation

The final typology combines the two dimensions previously discussed, by creating five classes of NUTS3 regions:

- urban regions
- intermediate regions close to a city
- intermediate, remote regions
- rural regions close to a city
- rural, remote regions.

(6) For more information on the Urban Audit, please consult the Eurostat website where methodological information and the latest data can be found. In addition, www.urbanaudit.org provides information in a format easily accessible to a wide audience.
(7) European Environmental Agency, 2007, Urban morphological zones 2000, EEA, Copenhagen. http://dataservice.eea.europa.eu/dataservice/metadetails.asp?id=995
(8) See footnotes 9, 10 and 11.
(9) Joint Research Centre, 2007, Population density disaggregated with CORINE land cover 2000, EEA, Copenhagen. http://dataservice.eea.europa.eu/dataservice/metadetails.asp?id=1018
(10) Sources: raster data on population in Sweden: Statistics Sweden.
(11) Sources: raster data on population in Finland: Statistics Finland, Population Statistics.

6.4. Perspectives for further analysis

It should be remembered that the results of this analysis are dependent on the quality and availability of several data sources. The strength of the current approach clearly lies in the fact that harmonised definitions and data sets have been used where possible. However, an analysis based on better and/or more precise data might yield different results.

The following have been identified as possible areas for improvement and/or further analysis:

- the OECD definition of urban/rural areas initially uses population density at LAU2 level. Consequently, the results are dependent on the size of the LAU2 units, which is somewhat variable from country to country. An alternative method could be to test the use of a density threshold at raster cell level;
- the road network used should be as complete and harmonised as possible, in terms of both thematic extent (road categories, density) and time stamp. The use of a more detailed road network (e.g. EuroRegionalMap) would yield more precise and smaller service areas, and consequently result in larger "remote" areas;
- slope impedances are clearly dependent on the resolution of the digital terrain model. The use of a more precise DEM could be tested (e.g. SRTM), especially in combination with a more precise road network;
- the collection of city points currently contains Urban Audit cities and additional UMZ centroids. This implies some mixture of functional, administrative and morphological definitions;
- the results of the typology would gain in precision if they could use a population raster based on recent and registered population figures, rather than on a modelled population distribution.

6.5. Data sources

The analysis required the following data sources:

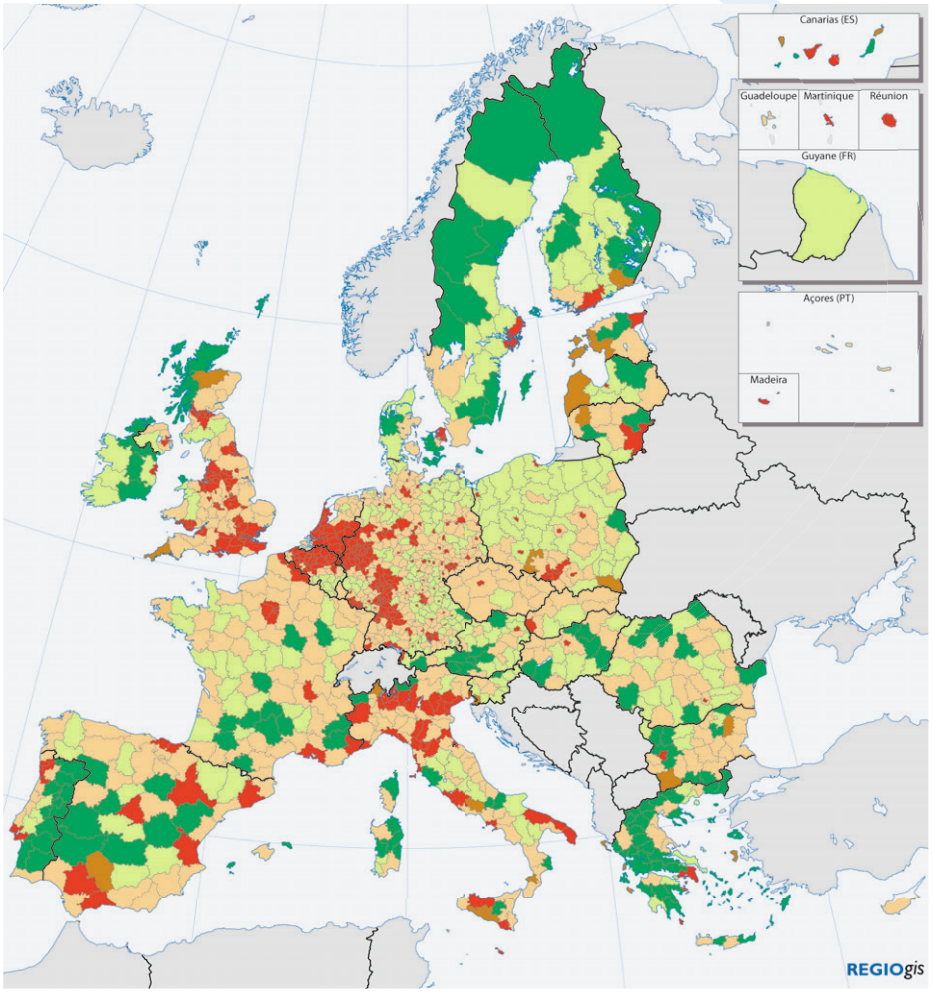
- Regional boundaries: NUTS3 boundaries, corresponding to the NUTS breakdowns valid in 2008 and in 2007 (GISCO and REGIO-GIS);
- local (LAU2) boundaries, corresponding to the census 2000-2001 status, and combined with LAU2 census-based population and population-density figures (GISCO);
- urban/rural classification of TL3 regions by the OECD;
- road network: EuroGlobalMap network (EuroGeographics Association), completed with GISCO road network segments for missing countries (especially Bulgaria);
- digital elevation model (GISCO DEM_WD_3M);
- point locations of Urban Audit 2007 cities (REGIO-GIS) and of Urban Morphological Zones (UMZ) (EEA). This point layer is available on the Inforegio webpage where this paper is published: http://ec.europa.eu/regional_policy;
- extent of morphological agglomerations: UMZ layer (EEA);
- population disaggregation grid (JRC), combined with raster results of registered populations for Sweden and Finland (NSIs, processed by REGIO-GIS).

The regional classification of all NUTS3 regions can be found in a spreadsheet on the Inforegio webpage where this paper is published: http://ec.europa.eu/regional_policy

Urban-rural typology of NUTS3 regions

- Predominantly urban regions
- Intermediate regions, close to a city
- Intermediate, remote regions
- Predominantly rural regions, close to a city
- Predominantly rural, remote regions
- No Data

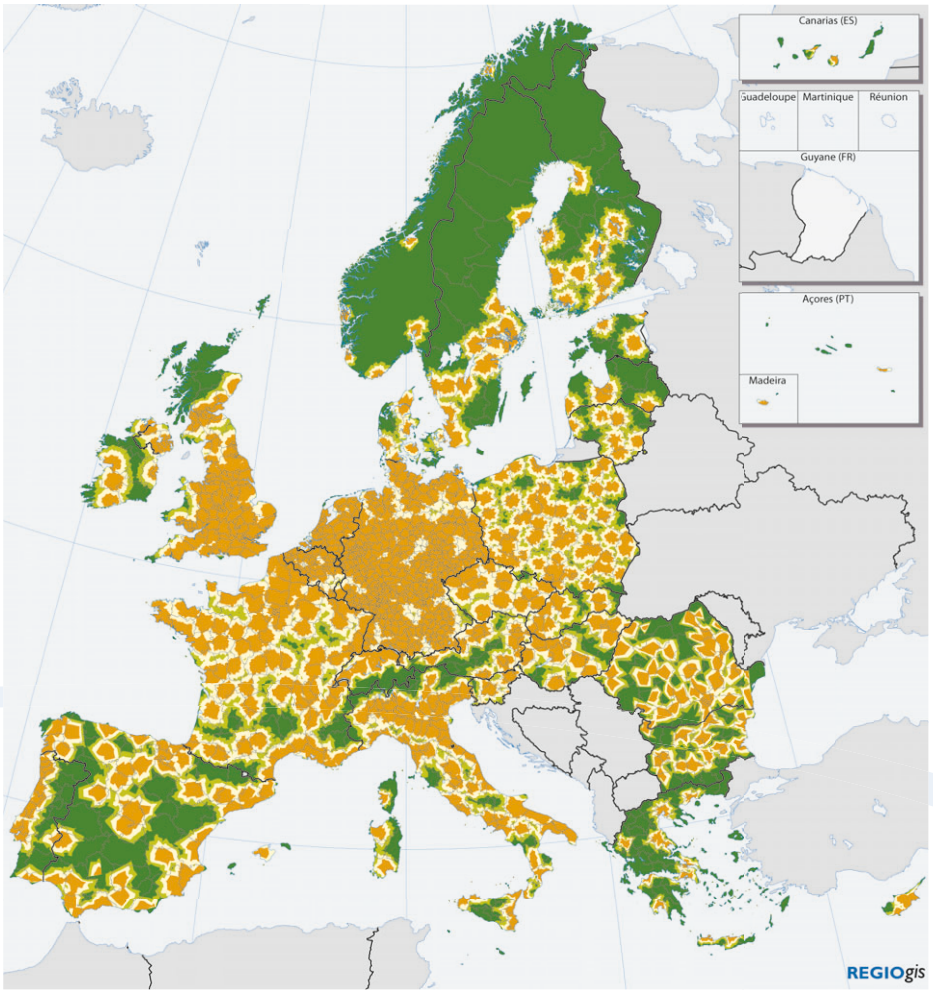
Close to a city: at least 50% of the population of the region lives at less than 45 minutes travel by road to a city of at least 50 000 inhabitants
Sources: OECD (revised classification 2007), Eurostat, EuroGeographics, EEA, JRC, Statistics Finland, Statistics Sweden, REGIO-GIS



Accessibility by road to cities with at least 50 000 inhabitants

- 0 - 30 minutes
- 30 - 45 minutes
- 45 - 60 minutes
- > 60 minutes

Sources: Eurostat, EuroGeographics, EEA, JRC, Statistics Finland, Statistics Sweden, REGIO-GIS



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