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Regional quality of living in Europe

Piet Lagas[1], Frank van Dongen[2], Frank van Rijn[3], Hans Visser[4]

[1] PBL Netherlands Environmental Assessment Agency, The Hague, The Netherlands (email: piet.lagas@pbl.nl)
[2] PBL Netherlands Environmental Assessment Agency, The Hague, The Netherlands (email: frank.vandongen@pbl.nl)
[3] PBL Netherlands Environmental Assessment Agency, The Hague, The Netherlands (email: frank.vanrijn@pbl.nl)
[4] PBL Netherlands Environmental Assessment Agency, The Hague, The Netherlands (email: hans.visser@pbl.nl)

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Abstract. This article sets out the conceptual framework and results of Regional Quality of Living indicators that were developed in order to benchmark European NUTS2 regions. Nine non-business-related indicators are constructed to support the goal of policy makers to improve the attractiveness of regions and cities for people or companies to settle in, and by doing so create economic growth. Each of the constructed indicators represents a pillar of the Quality of Living. The highest indicator scores are found for regions within Switzerland, Sweden, Norway and the Netherlands. Some countries show a wide divergence between regional scores. The southern regions of Italy and Spain, for example, have significantly lower scores than those in the north. In addition, capital city regions have better *RQI* scores. A positive correlation was found between the average *RQI* scores and both GDP per capita and weighted population density. Compared to GDP per capita, weighted population density has a modest influence on the *RQI* score. The European regions are divided into 11 clusters, based upon GDP per capita and weighted population density in order to benchmark a region with its peers.

1 Introduction

An ambition shared by all European countries is to create economic growth. In his book "Triumph of the city: How our greatest invention makes us richer, smarter, greener, healthier and happier" Glaeser (2011) focused on cities as important sources for economic growth and hot-spots of innovation. The Brookings Institution (Katz, Bradley 2013) and McKinsey's Global Institute (Dobbs et al. 2011) emphasized that cities and metropolitan regions are attractive places for people to settle and businesses to operate and are thus the engines for economic growth.

In order to create economic growth, the strengthening of competitiveness is essential; an important aspect of this competitiveness is the "quality of living". The Dutch government (IenM 2012) emphasizes the importance of strong regions with a good "quality of living" as well as good connections to the rest of Europe and the world.

Results from several studies have been published about the attractiveness of the Dutch regions for companies in terms of the economic environment (Raspe et al. 2010, Weterings et al. 2011). The Regional Competitiveness Index (Dijkstra et al. 2011, Annoni, Dijkstra 2013) shows the competitiveness of European regions. These studies mainly took economic

factors into account, without including the "quality of living" factors for residents and employees. Although economic factors are important in determining the attractiveness of regions for companies, the quality of the (social, political, natural, etc.) environment for employees also plays an important role and therefore deserves attention. Currently, "quality of living" is not being monitored systematically.

A set of nine indicators characterizing the Regional Quality of Living Index (*RQI*) aims to fill this gap. These indicators provides a European-wide benchmark of non-business-related indicators that are important to living standards and the quality of the human environment. This set of indicators offers the first comprehensive picture of the "quality of living" in almost all NUTS2 regions of the European continent, including all EU-countries and the non-EU-countries Norway and Switzerland.

Improvement of *RQI* scores may also contribute to achieving the objectives formulated in the Europe 2020 10-year strategy proposed by the European Commission on March 2010 (European Commission 2010) for the economic advancement of the European Union. The results can be used for other purposes as well: to improve the attractiveness of specific regions for students, or in the context of population decline.

A study of the "quality of living" in The Netherlands (Lagas et al. 2014) shows that Dutch regions are doing very well, and are comparable to the highest ranking European regions.

2 Methods

2.1 Theory

A review of the scientific literature on "quality of living" leads to the conclusion that, at present, there is no consensus on either the definition of the concept or specification of the underlying dimensions (Morais, Camanho 2011, van Kamp et al. 2003). Several terms and definitions are presented in the literature for concepts such as "quality of living", "quality of life", "liveability", and "standards of living". "Quality of living", as a concept, is attracting growing interest in the scientific literature. The subject has been picked up from different points of view by various institutes and researchers.

Regional Quality of Living (life) in the European Commission

In the European Union this topic gained more attention as it has become an essential element in the development of cities and regions. A European Parliament resolution (2005) on regional expansion indicates that these places are not only locations where problems are concentrated, but also where the future lies.
In 2008 the Commission on the Measurement of Economic Performance and Social Progress (CMEPSP) was created at the instigation of President Sarkozy of France because he was dissatisfied with the current level of statistical information about the state of the economy and society. The Commission's aim was to identify the limits of GDP as an indicator of economic performance and social progress. It was suggested that more attention should be given to "quality of life" as well as to Sustainable Development and the Environment (Stiglitz et al. 2009). Eurostat recently published new Quality of Life indicators for various countries in Europe (Eurostat 2015a).

Internationally, there are several indices that reflect "quality of living" or "liveability". Several research institutes or business consultants have considered this concept from various angles and at different levels of aggregation.

The Mercer Quality of Living index (Mercer 2010) and the Liveability index (EIU 2015) are used for determining the amount of compensation awarded to workers who temporarily have had to accept a lower standard of living. These indices and underlying indicators are intended for people working for companies in foreign countries. Other indices like International Living (2010) and NUMBEO (2012) focus on holiday and retirement situations. Another difference between several indices found in the literature is the level of analysis. Some international indices were published with a benchmark for countries (International Living 2010, OECD 2012a, EIU 2015). Country data, however,

are not generally representative of regions because of the heterogeneity of countries. City indices are published by institutions, such as in the Quality of Living Index (Mercer 2010), the Economist Intelligence Unit's Liveability Index (EIU 2012) and Monocle's Most Liveable Cities index (Monocle 2011) for a limited number of cities.

Most of the indices mentioned and underlying data are commercially developed and not publicly available. At the moment there is no benchmark for European regions as concerns "quality of living" indices compiled from public data that are freely available.

2.1.1 Quality of living characterized by 9 indicators

Indicators and sub-indicators were chosen that are important for individuals, including their families, working at multinationals, as they may consider settling in a foreign region either for some time or permanently. After reviewing several indicators applied in the Quality of Living Index (Mercer 2010), Liveability Index (EIU 2012) and OECD Better Life Index (OECD 2012a), data was selected for 25 sub-indicators and nine indicators representing our *RQI* (Figure 1).

2.1.2 NUTS 2 regions as level of analysis

Using the Nomenclature of Territorial Units for Statistics (NUTS) for the journal European Regions, developed and regulated by the EU, the choice for the level of analysis was between NUTS0 regions (countries), NUTS1 regions (certain parts of countries), NUTS2 regions (provinces), and NUTS3 regions (city regions) or metropolitan regions (individual cities including smaller cities). The disadvantage of data at the national level is that these data are not representative of important regions within a country, as some countries are very heterogeneous. Italy, for example, where there is a wide divergence between the less developed south and the more developed north. The same applies to Turkey, Flemish and Walloon Belgium, former East and West Germany, and the southern and northern parts of Sweden, Finland and Norway.

Glaeser (2011) focuses on cities as important sources for economic growth, but for "quality of living" the surrounding area is important as well. For people living in cities, elements like Outdoor Recreation, Public Services (e.g. infrastructure around cities) and the Natural Environment are important factors for the Quality of Living. According to Hyslop (2013), metropolitan regions would be the preferred choice. This spatial level however isn't officially regulated by the EU and, consequently, available data are scarce.

Considering the relevance of the spatial level and data availability, data were collected for the European NUTS2 regions (NUTS2 codes 2010). This is in line with former research carried out by the PBL on Dutch top sectors and their European competitors (Raspe et al. 2012). NUTS2 is adopted as the spatial level of analysis by several other researchers, like the EU Regional Competitiveness Index (Dijkstra et al. 2011, Morais, Camanho 2011). In our study the non-EU member countries Norway and Switzerland were also taken into account because they are an integral part of the European economic system as members of the European Free Trade Association (EFTA).

2.2 Methods of data handling

The methods of data handling for creating the *RQI* were performed according to the OECD handbook on constructing composite indicators (Nardo, Saisana 2008). Data from reliable public sources like Eurostat, ESPON, Worldbank, OECD and several other sources (Lagas et al. 2014) are used in this study. Most of the data were available for the NUTS2 level. In other cases data available for NUTS0, NUTS1 or NUTS3 and City level were used to calculate regional indicator scores (Appendix A.2). Depending on the nature and availability of the data, imputations are carried out.

City data from several databases (e.g. Eurostat: Urban Audit - 418 'key cites') were used for the calculation of the regional sub-indicators. We made the assumption that the living conditions of the inhabitants of the largest cities are representative of the majority of the population of the region. When a region contained two or more cities a population weighted average value was calculated and considered as representative for the region.

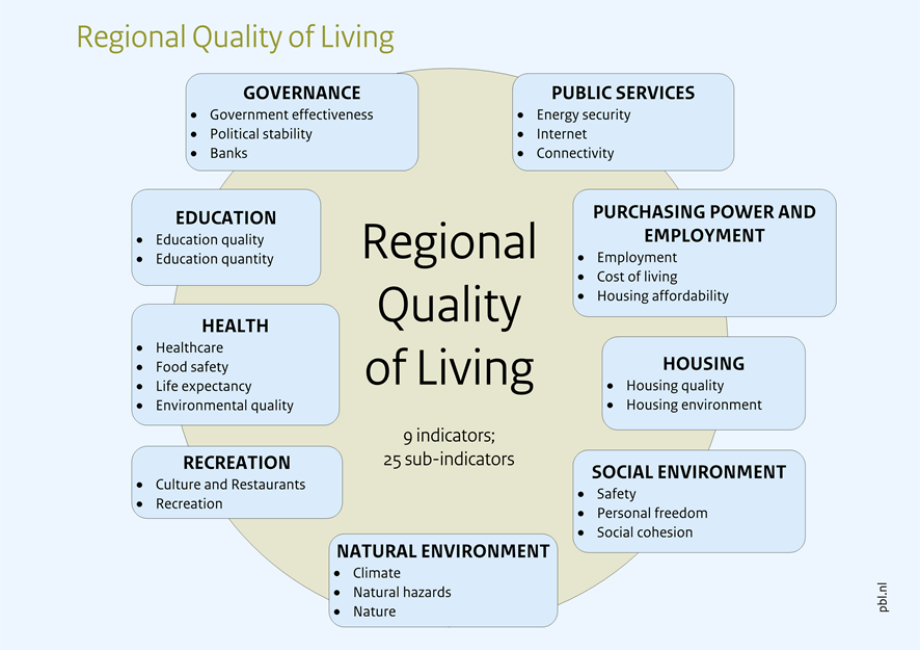


Figure 1: Indicators and sub-indicators to characterize the Quality of Living

Measurements of the indicators in the *RQI* were based preferably upon objective data, however we also used subjective data when objective regional data was unavailable.

2.2.1 Calculation of indicators and sub-indicators

Most of the indicators were calculated with at least two and up to seven underlying data sources (Appendix A.2). All sub-indicators and underlying data sources were scored using the Max–Min method: The score was normalized/scaled on the basis of the minimum and maximum score, resulting in a scoring between 1 and 10. For all indicators, a score of 10 represents the best and 1 the worst. Consequently, a low score does not automatically mean that the situation is bad or unacceptable, because only relative scores were calculated. Similarly, a high score does not necessarily mean a good or acceptable situation.

In some situations, outliers led to very high or very low average values of the data set or to a skewed distribution. When the average of the scaled data was lower than 4 or higher than 7, Winsorisation of the data was applied by taking the 95 percentile value as the maximum and/or the 5 percentile value as the minimum (Nardo, Saisana 2008).

When data were unreliable or unexplainable 'no data' (nd) were used. Expert judgement was applied to decide whether data were acceptable or not. For example, 'nd' was entered for the Spanish, Portuguese and French islands off the European continent and for some data sets for Iceland and non-EU countries, such as Turkey, Switzerland, Norway, Croatia, Liechtenstein and Macedonia. Most of the analyses were therefore performed for 305 NUTS2 regions.

Some regions are merged with surrounding ones to correct the bias resultant from commuting patterns. This was done for Wien (AT12+AT13), Greater London (UKl1+UKl2+UKH2+UKH3), Berlin (DE30 +DE40), Greater Amsterdam (NL23+NL32), Praha (CZ01+CZ02) and Brussels (BE10+BE24+BE31). The adopted merge criteria are based on the new harmonized EC-OECD definition of cities and commuting zones (OECD 2013). If a city and its commuting zone covers multiple regions, and more than forty percent of the population of a region lives inside that city and commuting zone, then these regions were combined (Annoni, Dijkstra 2013).

2.2.2 Merging national data and regional perception data

When only objective data were available at the national scale and perception data available at the regional scale, we used these perception data for regional differentiation. The national average of the perception data for different regions inside a country was calculated. The deviation of this national average for a region was then used to calculate a regional value (Charron et al. 2012).

For example, the country sub-indicator A tells that Italy scored 7, while the regional sub-indicator B tells that the South Italian region scored 5 and the North Italian region scored 8, and the country average for all regions is 7.4. Thus the results after considering two sub-indicators are that the North Italian region scored 7*(8/7.4)=7,57 and the South Italian region scored 7*(5/7.4)= 4.72.

2.2.3 Distance decay method

The potential value scores were calculated for some sub-indicators by distance decay modeling and regional imputation (Equation 1). The values for a and b are estimated from empirical data. A matrix was developed for this purpose, containing the distances between all NUTS2 regions (316x316 matrix). For instance, we assumed that having a university within a distance of fifty kilometers gave a benefit of 60% and within a distance of one hundred kilometers a benefit of 10%.

$$P_i = \sum_{j=1}^{N} \frac{x_j}{1 + \exp(a + b \ln(d_{ij}))} \tag{1}$$

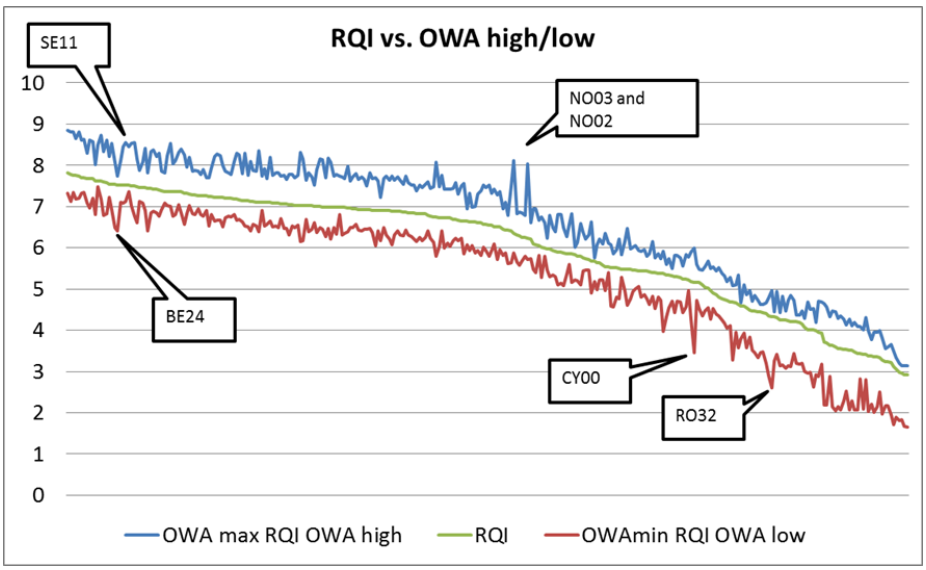
where P_i is the potential score of region i, x_j is the number of universities in region j, and d_{ij} is the distance between region i and region j. The parameter a controls the decay of the curve, b the steepness of the curve.

2.2.4 Weighting and sensitivity

Although the primary aim of this study is to construct a set of indicators to monitor the "quality of living", we constructed the *RQI* to compare the overall performance of regions. The *RQI* value is calculated as the average of the nine quality of living indicators, using an equal weighting method. We deliberately chose not to apply a specific weighting scheme, because we consider all nine categories of the *RQI* as important pillars in the "quality of living". The process of assigning weights is subjective by nature, it generally depends on the objective of the index in question. Equal weighting schemes are often used in the literature for composite indicators. After testing several weighting methods equal weights were chosen in a recent study (Sharpe, Andrews 2012). The study concluded that all methods have advantages and shortcomings and that weighting can be influenced by personal valuations.

Furthermore, we do not expect that there is a causality between the indicators other than that they are possibly influenced by common underlying factors like the regional GDP per capita. An advantage of equal weights is that weights do not change when data are updated, which is a disadvantage of weighting methods using the Data Envelop Analysis such as in Benefit of the Doubt (Cherchye et al. 2006). Therefore for the determination of the *RQI* the average score of the nine quality of living indicators was calculated.

The Ordered Weighted Averaging method (Yager 1996) was used to check for compensability effects. The *RQIOWA-max* and a *RQIOWA-min* were calculated (Figure 2). *RQIOWA-max* is the result of a calculation when the best characteristics of a region are focused on by applying higher weighting factors to these indicators (Equation 2). A weighting of 9 for best scoring category; 8 for the second best and 1 for the worst scoring category. *RQIOWA-min*, in parallel fashion, uses the same calculation method where the worst indicator scores for a region are given the highest weights. This weighting scheme is based upon our decision that no indicator should weigh more than 20% and no less than 2% for the total Index.



Note: Next to the *RQI* curve for 316 regions the corresponding *RQIOWA-max* and *RQIOWA-min* score curve are shown (see Equation 2).

Figure 2: Analysis of compensability effects by determination of Regional Quality of Living applying the equal weighting method and the Ordered weighted Averaging method

$$RQIOWA(c_1, c_2, \ldots, c_9) = \frac{\sum_{i=1}^{9} c_{(i)} w_i}{\sum_{i=1}^{9} w_i} \tag{2}$$

In this equation c_i indicates the score for category i, $c_{(i)}$ the scores in the respective order. The w_i are weighting factors, ranked from high to low. *RQIOWA* symbolizes the Ordered Weighted Averageing value for *RQI*.

Figure 2 shows that the scores of NUTS2 regions will change when either the best characteristics of a region or its worst characteristics are made the focus.

The results show that for some regions a higher ranking will be realized with *RQIOWA-max*, but will realize a lower ranking with *RQIOWA-min*, especially for some regions that have one extremely low score for one indicator (e.g. some Norwegion regions, shown in Figure 2). The opposite can be seen for regions with only one very good score (e.g. the Cyprus and Romanian region Bucaresti-Ilfov). For example, results for the regions of Bucuresti and Stockholm are thus:

RO32 Bucuresti-Ilfov: *RQIOWA-max*, *RQI*, *RQIOWA-min* respectively: 4.9, 4.3, 2.6 with rankings: 227; 246; 256.

SE01 Stockholm: *RQIOWA-max*, *RQI*, *RQIOWA-min* respectively: 8.6, 7.5, 7.1 rankings 12, 13 , 12.

3 Results

3.1 Map of European regions

On a map of the European regions (Figure 3) the highest values for the *RQI* can be seen in western Europe. A gradient from south to north and from east to west can be observed.

3.2 Capital regions in European countries

For most countries, the capital city region scored relatively higher than other regions in that country (Figure 4). Countries where their capital city region has extremely high

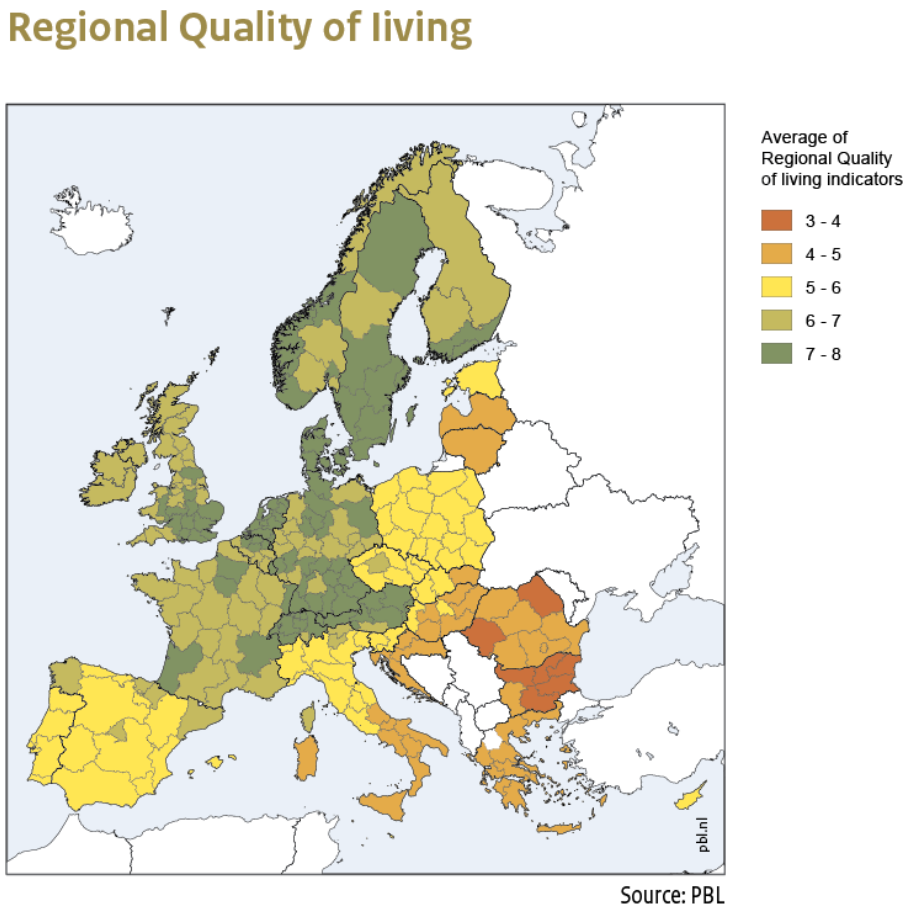


Figure 3: The Regional Quality of Living Index for European regions. Calculated as the average score of nine *RQI* indicators, each scaled 1 to 10

RQI scores are Norway (Oslo region), France (Paris, Iles de France region), Ireland (Dublin region), Czech (Prague region), Slovakia (Bratislava region) and Bulgaria (Sofia region, Yugozapaden region). This is in line with the statement of Glaeser (2011) that metropolitan city regions are important sources for economic growth and should therefore hold a better "quality of living". The regions that include the capital city are mostly large with relatively high GDP and high population densities with consequently relatively high values for *RQI* categories Education, Public Services and Recreation. Large variation within countries is found for Italy (IT), Belgium (BE) and Spain (ES). The northern regions of both these countries score better in terms of the *RQI* than their southern counterparts. Also, large variations are found in France (FR), Germany (DE) and Norway (NO). Figure 5 shows a large gap between average scores for northwestern European countries (average *RQI* >6.8) and south-eastern countries of Europe (average *RQI* <5.8).

3.3 RQI *vs GDP per capita and weighted population density*

3.3.1 Regional GDP per capita vs Regional Quality of Living

Higher GDP per capita mostly relates with a better *RQI*. Below a GDP per capita of about 18.000 euros no *RQI* scores higher than 6 were found (Figure 5). Probably there is some kind of threshold value that should be reached, after which the *RQI* score improves remarkably. An explanation could be that regions with a less developed economy primarily focus on the development of the basic needs, like infrastructure (Public services), basic Education and Health care services and after that the focus is on other categories of *RQI*

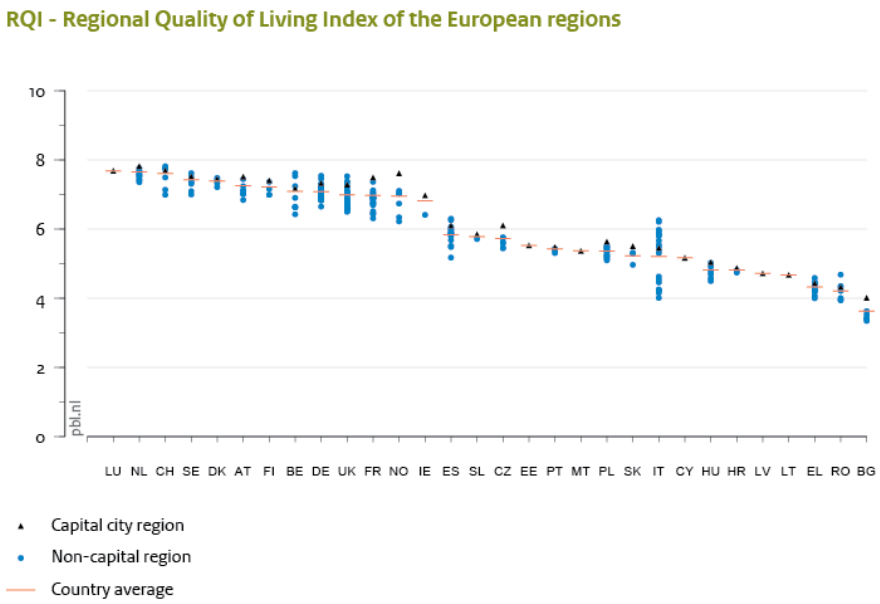


Figure 4: *RQI* values for the European NUTS2 regions, showing the average *RQI* value per country and its capital city

like Housing, Recreation, Social Environment and (higher) Education.

Between GDP and *RQI* a strong correlation of 0.78 was found. The scores for Governance, Social Environment, Education, Public Services and Recreation are strongly related to GDP (see also Table 1). However, a negative relation is found for Natural Environment.

3.3.2 Population density vs Regional Quality of Living

The influence of population density on the *RQI* score is analyzed because it is suspected to have a positive correlation with amenity-based *RQI* categories like Education and Public Services resulting in higher scores on the *RQI*. The conventional definition of population density is population/area for NUTS2 regions This definition is problematic because the ratio between the urban and rural environment shows large variations. This results in a very low population density for regions with a million-person city situated in a very large rural area. In comparison with the relevant part of a NUTS2 region, where the people live, the population density is much higher. Therefore a weighted population density (*wPD*) will be more useful to analyze the relations between densities and the *RQI*. The *wPD* was calculated as the average of two overlapping 10x10 km2 grids with grid population as a weighting factor.

A relatively weak but significant correlation of 0.10 is found between *log wPD* and *RQI*. A closer look (Figure 6) shows that a higher *wPD* indeed relates with a higher score on the *RQI* in general but that no increase is seen above *log wPD* values of 3.0 – 3.2 (1000 – 1600 Inhabitants/km2). High weighted population density may lead to better scores for Education, Public Services and Recreation but it seems that above a certain population density no further improvement will be realized.

3.3.3 Clustering regions with GDP per capita and weighted population density

To identify the peers for the European regions, a cluster analysis was conducted based on GDP per capita and *wPD*. As a result, clusters regions can be compared with other regions with comparable GDP per capita and *wPD*. Figure 7 shows the European regions with their logarithmic values of GDP per capita and *wPD* and the eleven clusters that were chosen. For both GDP per capita and *wPD* four classes were concerned: high,

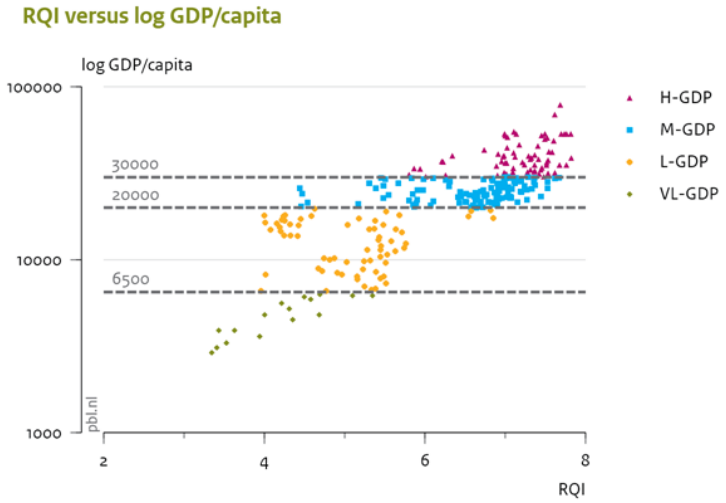


Figure 5: Average score of Regional Quality of Living Indicators vs several classes of regional GDP per capita

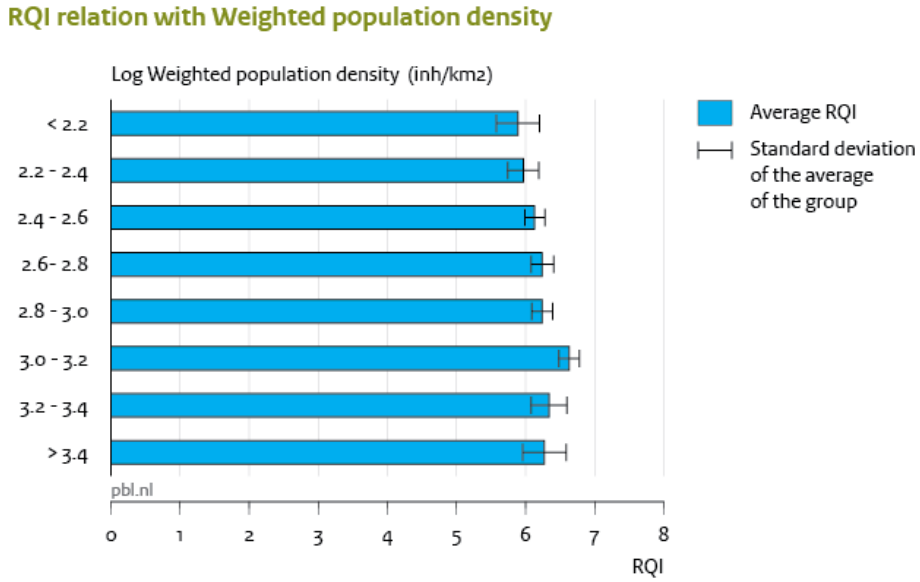


Figure 6: Average scores for Regional Quality of Living indicators for different levels of weighted population density

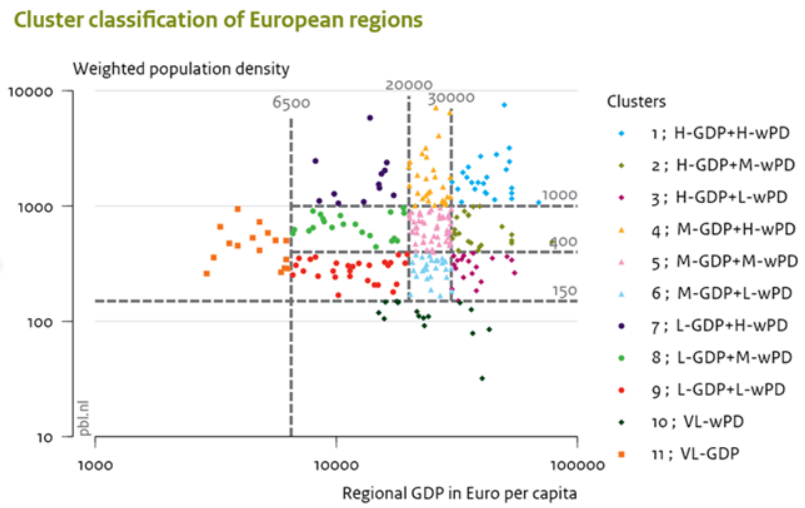


Figure 7: The 11 clusters of regions of Europe classified with their GDP per capita and population density

moderate, low and very low (See also for European maps in Appendix Figure A.1a and A.1b). The highest values for *RQI* are found for Cluster 1 High GDP per capita and high *wPD* (H-GDP+H-wPD). The highest average *RQI* values are found for the clusters with high GDP (Figure 8). The influence of *wPD* is different for different GDP per capita ranges.

3.4 Clustering of the European regions

Table 1 shows the average scores for the nine *RQI* indicators for the eleven clusters. These data make it is possible to compare a region with the average scores of all regions in the same cluster in order to identify strong and weak indicators. In Appendix A.3 the regions of the different clusters are presented with their *RQI* scores and the lowest and highest indicator scores per region.

3.4.1 Regions with high GDP per capita

The highest *RQI* scores are found for Swiss and Dutch regions in the clusters with high or moderate *wPD*. In the cluster with low *wPD* Swedish and Danish regions are scoring high.

Italian regions show the lowest scores. In all three clusters regions in the southern parts of Europe like Italy and Spain show relatively low *RQI* scores. Table A.2 shows that the differences between the three clusters with regard to *wPD* can be found in Education and Recreation and in the other direction for Natural Environment and Social Environment. The regions with the highest *wPD* (Hamburg 3200 inhabitants/ km2), Ile de France (7500 inh/ km2) and Greater London (2700 inh/ km2) have relative lower *RQI* values. These results are in line with the findings by the OECD (2006). They concluded that moderate sized cities showed higher productivity than the largest metropoles worldwide. Though most of the largest metropoles have higher economic growth, foreign investment and labour productivity than the rest of the country, they are also more polluted, crime-ridden and socially disparate (OECD 2006).

3.4.2 Regions with moderate GDP per capita

English and Dutch regions score relatively high in comparison to their peers in the clusters with moderate GDP per capita (see Table A.3). High scores are also found for several French, German and Belgian regions. The biggest cluster with moderate *wPD*

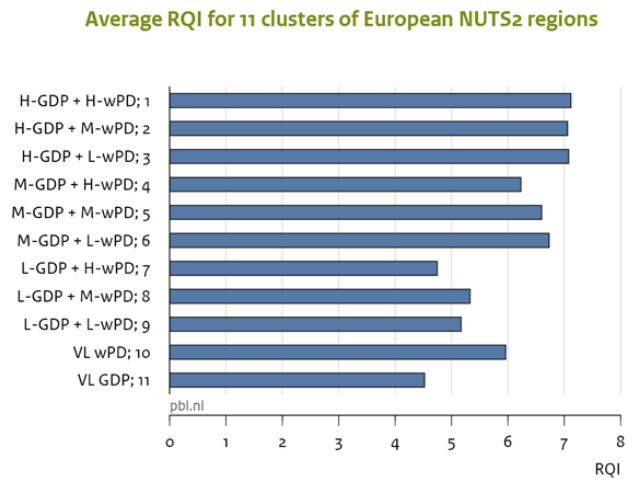


Figure 8: Average *RQI* values for the European Nuts2 regions for 11 clusters

involves several western European regions of The Netherlands, France, Germany and the United Kingdom which have scores higher than 7. In the cluster with low *wPD*, Austrian, French and English regions, have the highest scores of 6.7 to 7.5. The regions with the highest *wPD*, West Midlands (3200 inh/ km2), Merseyside, (2200 inh/ km2) and Greater Manchester (2700 inh/ km2), have relatively low *RQI* values. Table 1 shows that the differences between the three clusters with regard to *wPD* can be found in Education and in the other direction for Natural Environment and Purchasing Power and Jobs.

3.4.3 Regions with low GDP per capita

English, Czech and Polish regions have the highest rankings in the clusters with low GDP per capita (see Table A.4). Differences as a consequence from different *wPD* are significant. In the cluster with high *wPD* the Mazowieckie region has the highest score of 5.64 while in the clusters with moderate and low *wPD* the best score is 6.8. In the cluster with moderate and low *wPD* the English regions score best. Only for Health can a pattern be recognized that shows that lower population density leads to better scores.

3.4.4 Regions with very low GDP per capita or population density

The cluster with low *wPD* shows high scores for the Austrian region, Burgenland, and some Scandinavian regions. Relatively few people are living in these regions (see Table A.5).

In the cluster with very low GDP East European regions are found. From these regions Polish regions have the highest rankings (see Table A.5).

3.4.5 Regional benchmarking with peers

Figure 9 shows for the Dutch region of Utrecht a comparison with the characteristics of Cluster 1 (high-GDP per capita and high-*wPD*) and the average score of all European regions. Utrecht scores high on Education, Governance, Social Environment and Recreation, even better than the average of Cluster 1 regions, but low on Natural Environment compared to the average of all regions as well as the average of the Cluster 1 regions. In comparison to its peers the Bucaresti-Ilfov region shows high scores on Purchasing Power and Employment and Natural Environment but low on Governance, Social Environment, Health, and Recreation.

Table 1: Characteristics of the 11 clusters of European NUTS2-regions

Cluster	Gover-nance	PP&E	Social environ-ment	Health	Educa-tion	Public services	Recrea-tion	Natural environ-ment	Housing	Average of RQI
H-GDP H-wPD	7.9	6.5	8.4	7.5	7.8	7.6	7.3	5.0	6.1	7.1
H-GDP M-wPD	8.0	6.6	8.5	7.5	7.3	7.5	6.8	5.5	5.9	7.1
H-GDP L-wPD	8.7	6.6	8.9	7.8	6.3	7.2	6.7	6.0	5.7	7.1
M-GDP H-wPD	6.7	5.4	7.4	6.9	6.4	6.4	6.5	5.0	5.3	6.2
M-GDP M-wPD	7.3	5.9	8.0	7.5	6.1	6.9	6.6	5.5	5.6	6.6
M-GDP L-wPD	7.6	6.3	8.0	7.6	5.4	7.1	6.8	6.3	5.6	6.7
L-GDP H-wPD	4.4	6.4	4.6	4.5	3.5	4.9	3.7	6.3	4.3	4.7
L-GDP M-wPD	5.7	5.6	6.3	5.4	4.2	5.2	4.7	6.4	4.4	5.3
L-GDP L-wPD	5.4	5.4	5.9	5.8	3.6	5.2	4.4	6.3	4.6	5.2
VL wPD	6.9	5.7	7.5	7.3	3.9	5.6	5.2	6.4	5.2	6.0
VL GDP	4.3	6.2	5.0	3.5	2.6	4.7	3.7	7.1	3.5	4.5

Note: PP&E ... Purchasing Power and Employment

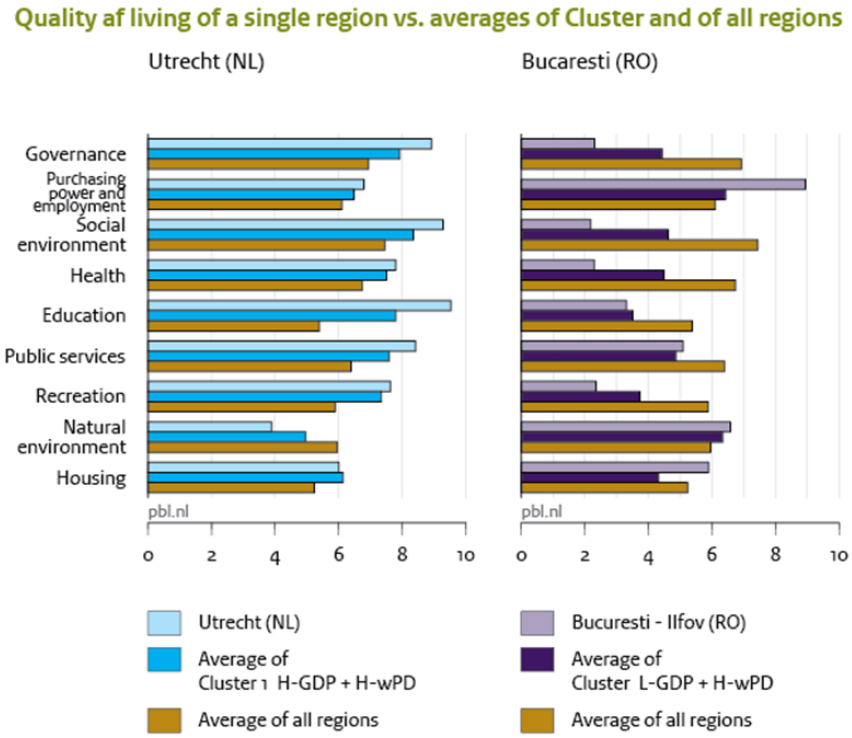


Figure 9: Examples of benchmarking European regions with their peers

4 Conclusions

The Regional Quality of Living Indicators, using non-business-related indicators, can help to improve the attractiveness of regions, thereby encouraging people and companies to settle and invest in these regions. A set of nine indicators is presented. The highest scores for *RQI* indicators are found for regions in Switzerland, Sweden, Norway and the Netherlands.

Some countries show a wide divergence between regional scores. The southern regions of Italy and Spain, for example, have significantly lower scores than those in the north. In addition, most of the capital city regions have a high *RQI* value in comparison to the rest of their country.

Results show a relation between *RQI* scores and the GDP per capita and population density. Significant correlation is found between *RQI* and GDP per capita. Between population density and *RQI* scores a relatively weak but also significant positive correlation is found. In order to benchmark a European region with its peers, a cluster analysis was conducted based on GDP per capita and weighted population density. Eleven different clusters are distinguished, which makes benchmarking between comparable regions possible to identify strong or weak *RQI* characteristics of a region.

Improving the "quality of living" can help to make the regions and their cities more attractive for local residents and businesses, but also to attract foreign knowledge workers and multinationals. It may help countries and regions in Europe to realize their ambitions to create economic growth and to achieve the objectives formulated in the Europe 2020 10-year strategy presented by the European Commission on March 2010 (European Commission 2010) for advancement of the economy of the European Union.

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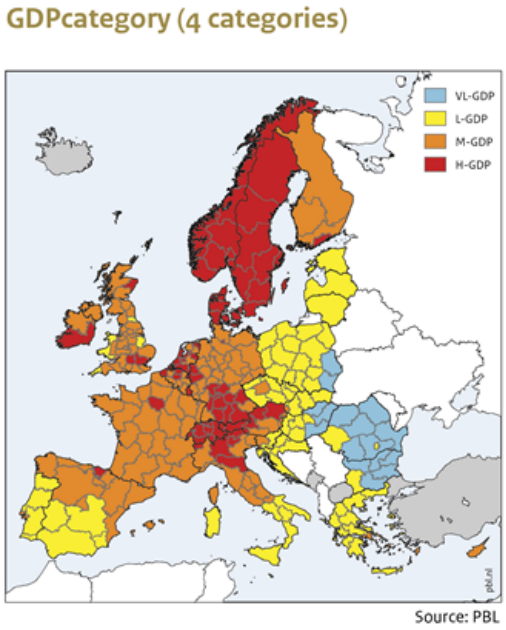
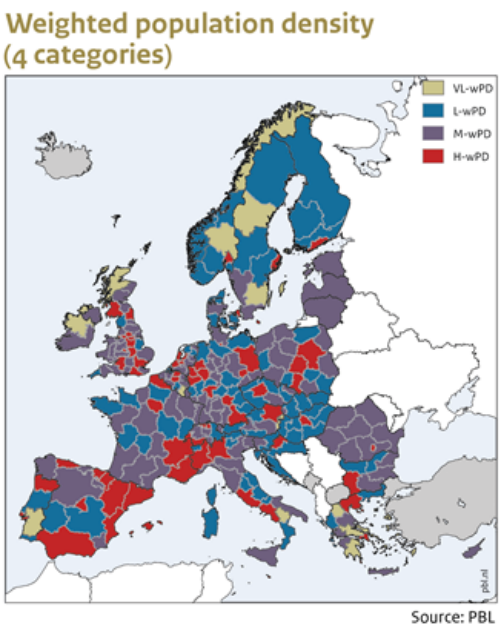
A Appendix

A.1 Maps of Europe for different clusters

Figure A.1a and A.1b shows the different classes for GDP/cap and population density. European regions are classified: high, moderate, low and very low. Figure A.2 shows the map of Europe for 11 clusters. All the 11 clusters are given with their NUTS 2 regions in different tables with regard to their GDP per capita in Table A.2 to A.5.



(a) Overview of categories with respect to GDP per capita in the European region. (euro/inhabitant); 1=High >30000; 2=Moderate (20000-30000); 3=Low (6500-20000); 4=very low (<6500)



(b) Overview of categories with respect to weighted population density (inh/km^2)in the European regions 1=High >1000; 2=Moderate (400-1000); 3=Low (150-400); 4=very low (<150)

Figure A.1: Categories of regions

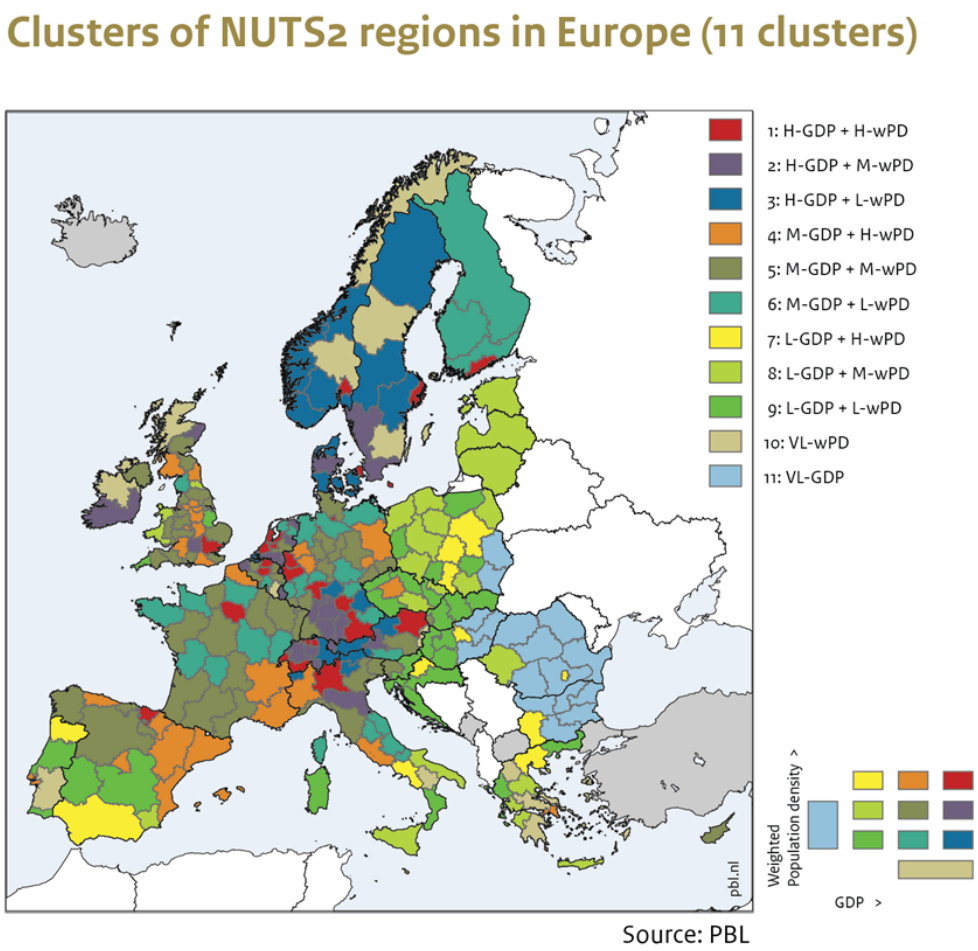


Figure A.2: Overview of the 11 different clusters in Europe

A.2 Description of the indicators and sub-indicators for Regional Quality of Living

Indicators and sub-indicators were chosen which are important for people, individually or with their families, related to foreign companies that want to settle in a specific region, either for some time or permanently. After concerning several indicators applied in the Quality of Living Index (Mercer 2010), Liveability Index (EIU 2012) and OECD Better Life index data we selected for 25 sub-indicators aggregated to 9 indicators representing the Quality of Living.

***RQI* 1. Governance** Governance is an important factor for people when deciding to settle in a region. This was taken into account in all "quality of living" indices. The indicator Governance was calculated with the sub-indicators *RQI* 1.1 Government Effectiveness, *RQI* 1.2 Political Stability and Terror and *RQI* 1.3 Banks. Governance data were derived from the World Governance Indicators (Worldbank 2012), a recent study on regional variation in quality of government within the EU (Charron et al. 2012). Data on corruption were also taken into account, as well as EU regional statistics and perception data from the EU Urban Audit, Perception Survey (Eurostat 2015a). Data from the Global Peace Index were used (VoH 2012) for Political Stability and Terror. The scores for Banks resulted from a benchmark using OECD data on the soundness of banks taken from Sustainable Governance Indicators (OECD 2011) and the Standard and Poor's credit rating per country.

***RQI* 2. Purchasing Power and Employment** The indicator *RQI* 2 Purchasing Power and Employment is the result of the average of three sub-indicators: *RQI* 2.1 Housing Affordability, *RQI* 2.2 Employment and *RQI* 2.3 Cost of Living. For the *RQI* 2.2 Employment data for unemployment of people aged from 15 to 24, and 20 to 65, were derived from Eurostat's regional labour market statistics. Price level indices with a correction for income per capita were used for the *RQI* 2.3 Cost of Living. The sub-indicator 2.1 Housing Affordability refers to the property price per square meter, divided by income per capita.

***RQI* 3. Social Environment** When people decide whether or not they intend to settle in a certain region, Freedom, Safety in the personal environment and Social Cohesion are important factors, representing the Social Environment. *RQI* 3.1 Safety was calculated with the indicators *RQI* 3.1 Safety, *RQI* 3.2 Personal Freedom and *RQI* 3.3 Social Cohesion. Data for Safety were obtained from DG Regional Policy research (Charron et al. 2012) and the EU perception survey. The sub-indicator 3.2 Personal Freedom was constructed with country data from Sustainable Governance Indicators with a regional correction. Regional data on Voice and Accountability were derived from a recent study on regional variation in the quality of government in EU member states (DG Regional Policy 2010). The data for Social Cohesion were derived from the European Social Survey (ESS 2014) and Eurofound (2014).

***RQI* 4. Health** The indicator Health was calculated with four sub-indicators. *RQI* 4.1 Healthcare represents the average of 7 datasets representing qualitative and quantitative aspects of healthcare. *RQI* 4.3 Life Expectancy includes life expectancy at birth and at the age of 65, and healthy years at the age of 50. *RQI* 4.4 Environmental Quality was focussed on health effects as a consequence of environmental pollution. Objective data on air quality (particulate matter and ozone) and noise, as well as perception data were used for calculation of the score for Environmental Quality. Most of these data were derived from the Urban Audit data 'Key Cities', a database of 416 cities, and the European Environmental Agency. *RQI* 4.2 Food Quality and Safety is a country sub-indicator and was derived from the Global Food Security Index (EIU 2012).

***RQI* 5. Education** Education is an important settlement factor for both companies and potential residents. The qualitative aspects (*RQI* 5.1) as well as the quantitative aspects (*RQI* 5.2) were considered. Quality standards and education opportunities (including higher education) are among the factors that people take into account when choosing to settle in a specific region. The data used for the sub-indicator 5.1

Education Quality were derived from PISA (2012), university rankings and the EU Urban Audit (perception surveys). The 'Distance decay method' was applied for the sub-indicator 5.2 Education Quantity. Regions near to those with universities benefit from this.

***RQI* 6. Public Services** Public Services are important to potential residents when deciding where to settle. This indicator includes information from the sub-indicators 6.1 Energy Security, *RQI* 6.2 Internet and *RQI* 6.3 Connectivity. Data for Energy Security were derived from the World Economic Forum where the use of renewable energy sources produces high scores. The data used for the *RQI* 6.2 Internet (availability and quality) were derived from the EU Urban Audit. The sub-indicator 6.3 Connectivity refers to potential accessibility of the region by road, rail, and air. In terms of connectivity inside the region, only data from the EU perception surveys were available.

***RQI* 7. Recreation** The presence of restaurants or cultural possibilities and recreational opportunities are factors that also determine the quality of the living environment. This indicator was calculated with data from the sub-indicators *RQI* 7.1 Culture and Restaurants and *RQI* 7.2 Recreation Possibilities. Regions near those with high ranking restaurants (e.g. with Michelin stars) benefit from this factor based on the Distance decay method. *RQI* 7.2 Recreation Possibilities was calculated with data from Urban Audit – Key cities, LUCAS and the Perception survey.

***RQI* 8. Natural Environment** Although the Natural Environment and in particular climate cannot directly be influenced by policy measures, it is a factor that is taken into account when people choose to settle in a certain region. Three sub-indicators were used for this: *RQI* 8.1 Climate, *RQI* 8.2 Natural Hazards and *RQI* 8.3 Nature. Climate data on temperature and precipitation were taken from the EU Urban Audit. Regions with medium temperatures and precipitation levels generally scored best, as high and low levels are not comfortable to most people. The sub-indicator *RQI* 8.2 Natural Hazards refers to the aggregated exposure potential for 11 natural hazards, including floods, forest fires, droughts, earthquakes and tropical storms. The regions' integrated sensitivity and response capacity (ESPON 2013) were also taken into account for this indicator. *RQI* 8.3 included land use and biodiversity data.

***RQI* 9. Housing** Housing covers *RQI* 9.1 Housing Quality which refers to the quality of both privately owned and rented housing and *RQI* 9.2 Housing Environment which is made up of several datasets, including the amount of green space and green/blue urban areas, as well as data from the EU perception survey with respect to satisfaction with the housing environment, such as public spaces and green.

Table A.1: Additional information with respect to the data applied for the calculation of the Regional Quality of Life Index

Indicator/ Sub-indicators/datasets of Regional Quality of Living	Geographical level	Source	Reference year
RQI 1 Governance			
RQI 1.1 Governance Effectiveness (regional correction for national data applied)			
Government Effectiveness	Country	Worldbank 2012	2011
Regulatory Quality	Country	Worldbank 2012	2011
Rule of Law:	NUTS2/NUTS1	Charron et al. 2012	2009
Control of Corruption	NUTS2/NUTS1	Charron et al. 2012	2009
Corruption	Country	TI 2012	2012
RQI 1.2 Political Stability and terror			
Political Terror Scale	Country Country	VoH 2012	2011
Political Stability and Absence of Violence/Terrorism	Country	Worldbank 2012	2011
Physical Integrity Rights Index	Country	VoH 2012	2011
Political stability	Country	CIRI 2012	2011
RQI 1.3 Banks (Country indicator)			
Standard & Poor Country ratings	Country	S&P 2014	2013
Soundness of banks	Country	OECD 2011	2011
RQI 2 Purchasing power and jobs			
RQI 2.1 Housing Affordability			
Price owner-occupied housing (relative to Disposable income)	NUTS2 (both)	Eurostat 2015a Eurostat 2015a	2009
Price rented housing (relative to Disposable income)	NUTS2 (both)	Eurostat 2015a Eurostat 2015a	2009
RQI 2.2 Employment			
Unemployment (15–24 year age group)	NUTS2	Eurostat 2015a	2012
Unemployment (20–65 year age group)	NUTS2	Eurostat 2015a	2012
RQI 2.3 Cost of living			
Price goods (relative to Disposable income)	Country (Goods) NUTS2 (income)	Eurostat 2015a Eurostat 2015a	2010
Price fuel/alcohol (relative to Disposable income)	Country (Goods) NUTS2 (income)	Eurostat 2015a Eurostat 2015a	2010
RQI 3 Social environment			
RQI 3.1 Safety (regional correction for national data applied)			
Feel safe in this city?	Cities	Eurostat 2015a	2009
Most people can be trusted?	Cities	Eurostat 2015a	2009
Feel safe in this neighbourhood?	Cities	Eurostat 2015a	2009
Business costs of crime and violence (Country data)	Country	Eurostat 2015a	2011
Reliability of police services (Country data)	Country	Eurostat 2015a	2011
Organised crime (Country data)	Country	Eurostat 2015a	2011
RQI 3.2 Freedom (Country Indicator)			
Civil Rights	Country	OECD 2011	2011
Access to Information	Country	OECD 2011	2011
Voice and accountability	Country	Worldbank 2012	2011
RQI 3.3 Social cohesion (Country indicator)			
Most of the time: people helpful or mostly looking out for themselves	NUTS2	ESS 2014	2011
Important to help people and care for others well-being	NUTS2	ESS 2014	2011
Important to be loyal to friends and devote to people close	NUTS2	ESS 2014	2011

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Indicator/ Sub-indicators/datasets of Regional Quality of Living	Geographical level	Source	Reference year
Participating in social activities of a club, society or association	NUTS2	Eurofound 2014	2011
How often did you do unpaid voluntary work in the last 12 months?	NUTS2	Eurofound 2014	2011
RQI 4 Health			
RQI 4.1 Healthcare			
Infant mortality rate	Country	Eurostat 2015a	2009
Satisfied with hospitals?	Cities	Eurostat 2015a	2009
Cancer death rate	NUTS2	Eurostat 2015a	2010
Per capita government expenditure on health	Country	WHO 2011	2011
Satisfied with healthcare?	Cities	Eurostat 2015a	2009
Satisfied with doctors?	Cities	Eurostat 2015a	2009
Heart disease death rate	NUTS2	Eurostat 2015a	2010
Per capita total expenditure on health at average exchange rate (USD)	Country	WHO 2011	2011
RQI 4.2 Food quality and safety			
Food quality and safety	Country	EIU 2012	2012
RQI 4.3 Life expectancy			
(double weight of NUTS2 data)			
Life expectancy at given exact age	NUTS2	Eurostat 2015a	2010
Life expectancy at birth	Country	OECD 2012b	2012
Life expectancy, Females at age 65	Country	OECD 2012b	2012
Life expectancy, Males at age 65	Country	OECD 2012b	2012
Number of years of healthy life expected	NUTS2	Eurostat 2015a	2010
RQI 4.4 Environmental quality			
Air pollution is a big problem here?	Cities	Eurostat 2015a	2009
Noise is a big problem here?	Cities	Eurostat 2015a	2009
This is a clean city?	Cities	Eurostat 2015a	2009
Number of days ozone concentration exceeds 120 $\mu g/m^3$	NUTS2	Eurostat 2015a	2011
Number of days particulate matter conc. (PM_10) exceeds 50 $\mu g/m^3$	NUTS2	Eurostat 2015a	2011
Accumulated ozone concentration in excess 70 $\mu g/m^3$	NUTS2	Eurostat 2015a	2011
Annual average concentration of PM_10	NUTS2	Eurostat 2015a	2011
RQI 5 Education			
RQI 5.1 Education quality			
(double weight of PISA)			
Satisfied with schools?	Cities	Eurostat 2015a	2009
Quality of University – best 20% in world = 5 etc.	Cities	QS 2013	2012
PISA score	Country	NCIS 2012	2012
Aged 15 to 64 qualified at tertiary level (ISCED 5–6)	NUTS2	Eurostat 2015a	2008 2008
Number of foreign languages	Country	Eurostat 2015a	2009
RQI 5.2 Education Availability			
(3x weight Universities)			
Number of universities per region (Distance decay calculation)	Cities	QS 2013	2012
N-international schools per region (Distance decay calculation)	Cities	Wikipedia 2014	2014
RQI 6 Public services			
RQI 6.1 Energy security			
Energy security and access	Country	WEF 2013	2012
RQI 6.2 Internet			
Satisfied with public internet access?	Cities	Eurostat 2015a	2012
Households with access to the Internet	NUTS2	Eurostat 2015a	2012
Households with broadband access	NUTS2	Eurostat 2015a	2012
Individuals who ordered goods or services over the Internet	NUTS2	Eurostat 2015a	2012

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Indicator/ Sub-indicators/datasets of Regional Quality of Living	Geographical level	Source	Reference year
RQI 6.3 Connectivity			
Satisfied with public transport?	Cities	Eurostat 2015a	2009
Rail accessibility	NUTS3	ESPON 2011	2011
Road accessibility	NUTS3	ESPON 2011	2011
Air accessibility	NUTS3	ESPON 2011	2011
RQI 7 Recreation			
RQI 7.1 Culture and Restaurants			
Michelin star restaurants (Distance decay calculation)	Cities	Michelin 2013	2012
Satisfied with cultural facilities?	Cities	Eurostat 2015a	2009
Satisfied with cinemas?	Cities	Eurostat 2015a	2009
RQI 7.2 Recreation possibilities			
Satisfied with sports facilities?	Cities	Eurostat 2015a	2009
Area for recreational sports and leisure use	Cities	Eurostat 2015a	2011
Land area for recreational sports and leisure (use/cap)	Cities	Eurostat 2015a	2011
Length of bicycle network	Cities	Eurostat 2015a	2011
Satisfied with outdoor recreation?	Cities	Eurostat 2015a	2009
Recreation, leisure and sport	NUTS2	Eurostat 2015a	2009
RQI 8 Natural environment			
RQI 8.1 Climate			
Number of days of rain per year	NUTS2	Eurostat 2015a	2011
Average number of hours of sunshine per day	NUTS2	Eurostat 2015a	2011
Average temperature of warmest month	NUTS2	Eurostat 2015a	2011
Average temperature of coldest month	NUTS2	Eurostat 2015a	2011
Rainfall	NUTS2	Eurostat 2015a	2011
RQI 8.2 Natural hazards			
Aggregated hazard exposure potential	NUTS2	ESPON 2013	2010
Sensitivity and response	NUTS2	ESPON 2013	2010
RQI 8.3 Nature			
Recreation, leisure and sport	NUTS2	Eurostat 2015a	2009
Nature reserves	NUTS2	Eurostat 2015a	2009
Forestry	NUTS2	Eurostat 2015a	2009
Landscape Shannon Evenness Index	Country	Eurostat 2015b	2009
RQI 9 Housing			
RQI 9.1 Housing quality			
Average price per m^2 – apartment	NUTS2	Eurostat 2015a	2009
Average price per m^2 – house	NUTS2	Eurostat 2015a	2009
Rooms per person	Country	OECD 2012b	2009
Dwellings with basic facilities	Country	OECD 2012b	2009
RQI 9.2 Housing environment			
Satisfied with green space?	Cities	Eurostat 2015a	2009
Satisfied to live in this city?	Cities	Eurostat 2015a	2009
In 5 years, it will be more pleasant to live here?	Cities	Eurostat 2015a	2009
Satisfied with public spaces?	Cities	Eurostat 2015a	2009
Green space (in m^2) to which the public has access, per capita	Cities	Eurostat 2015a	2009
Proportion of the area in green space	Cities	Eurostat 2015a	2009

Note: Indicator scores were calculated from average of sub-indicators unless otherwise mentioned. Sub-indicators were calculated from average of underlyingdata unless otherwise mentioned.

A.3 Tables with RQI *values of the European regions divided in 11 clusters*

Table A.2: Regions with High GDP per capita

Cluster 1 H-GDP + H-wPD			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
CH04	Zürich	7.82	5,6 - 9,7
NL00	Amsterdam Great	7.82	5,0 - 9,6
CH03	Nordwestschweiz	7.76	5,9 - 9,6
CH01	Région lémanique	7.74	5,0 - 9,9
NL33	Zuid-Holland	7.68	4,7 - 9,7
NO01	Oslo og Akershus	7.62	5,8 - 9,9
NL31	Utrecht	7.58	3,8 - 9,5
DE21	Oberbayern	7.54	5,2 - 8,9
BE21	Prov. Antwerpen	7.53	4,0 - 9,4
SE11	Stockholm	7.52	5,8 - 9,6
AT00	Wien Great	7.52	6,3 - 8,8
FR10	Île de France	7.49	5,5 - 9,8
DK01	Hovedstaden	7.45	5,3 - 9,5
FI1B	Helsinki-Uusimaa	7.41	5,4 - 9,6
DE25	Mittelfranken	7.31	5,5 - 8,9
UK00	London Great	7.29	4,4 - 8,7
BE00	Bruxelles great	7.17	4,8 - 9,1
DE71	Darmstadt	7.10	4,8 - 8,7
DE60	Hamburg	7.00	4,0 - 8,7
DEA2	Köln	6.99	4,4 - 8,6
DE50	Bremen	6.91	3,9 - 8,6
DEA1	Dusseldorf	6.89	3,6 - 8,6
ES21	País Vasco	6.01	4,0 - 8,3
ITC4	Lombardia	5.94	4,5 - 7,1

Cluster 2 H-GDP + M-wPD			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
NL41	Noord-Brabant	7.76	5,1 - 9,5
CH02	Espace Mittelland	7.70	5,9 - 9,4
LU00	Luxembourg	7.68	5,0 - 9,5
NL11	Groningen	7.60	4,5 - 9,7
NL42	Limburg (NL)	7.53	4,9 - 9,1
SE23	Västsverige	7.51	5,2 - 9,5
CH06	Zentralschweiz	7.49	5,2 - 9,4
DE12	Karlsruhe	7.46	5,4 - 8,7
NL21	Overijssel	7.42	4,9 - 9,4
UKJ1	Berkshire, Buckingh	7.37	4,7 - 9,3
SE22	Sydsverige	7.36	4,9 - 9,5
DK04	Midtjylland	7.33	5,3 - 9,7
DE14	Tübingen	7.28	5,6 - 8,6
AT32	Salzburg	7.12	4,9 - 9,0
DE27	Schwaben	7.09	5,3 - 8,9
AT34	Vorarlberg	7.02	4,7 - 8,6
CH07	Ticino	6.99	4,8 - 9,4
UKM5	North Eastern Scotl	6.98	5,8 - 8,5
IE02	Southern and Easter	6.97	4,8 - 9,0
DE11	Stuttgart	6.95	5,1 - 8,6
BE25	Prov. West-Vlaande	6.90	5,2 - 8,1
ITH5	Emilia-RomagNA	5.80	4,7 - 7,1

Cluster 3 H-GDP + L- wPD			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
SE12	Östra Mellansverige	7.62	5,1 - 9,6
DK02	Sjælland	7.48	5,0 - 9,6
NL34	Zeeland	7.44	5,0 - 9,2
DK03	Syddanmark	7.41	5,8 - 9,6
SE33	Övre Norrland	7.31	5,3 - 9,4
DE26	Unterfranken	7.26	5,6 - 8,9
AT33	Tirol	7.24	5,4 - 8,7
DK05	Nordjylland	7.21	5,7 - 9,5
CH05	Ostschweiz	7.14	4,9 - 9,4
NO04	Agder og Rogaland	7.11	4,8 - 9,9
AT31	Oberösterreich	7.10	5,7 - 8,6
SE31	Norra Mellansverige	7.09	3,8 - 9,4
NO05	Vestlandet	7.03	3,8 - 9,9
NO06	Trøndelag	7.02	4,3 - 9,9
DE23	Oberpfalz	7.01	5,2 - 8,9
NO03	Sør-Østlandet	6.34	1,9 - 9,9
ITH2	Provincia Autonoma	6.26	5,0 - 7,5
ITH1	Provincia Autonoma	6.21	4,9 - 7,3
ITC2	Valle d'Aosta/Vallée	5.86	5,0 - 6,8

Table A.3: Regions with Moderate GDP

Cluster 4 M-GDP + H-wPD			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
UKJ2	Surrey, East and We	7.53	5,9 - 9,1
FR71	Rhône-Alpes	7.37	5,3 - 9,0
DE00	Berlin Great	7.33	6,0 - 8,6
UKK1	Gloucestershire, Wil	7.11	4,6 - 8,5
UKF2	Leicestershire, Rutla	7.08	4,5 - 8,6
UKF1	Derbyshire and Nott	7.07	4,5 - 8,6
DEA3	Münster	6.99	4,6 - 8,6
DEA5	Arnsberg	6.90	4,5 - 8,6
UKM3	South Western Scotl	6.87	4,8 - 8,5
UKD3	Greater Manchester	6.74	3,4 - 8,2
UKC2	Northumberland and	6.70	4,8 - 8,3
DED5	Chemnitz	6.65	4,8 - 8,7
UKG3	West Midlands	6.65	3,9 - 8,3
UKD7	Merseyside (NUTS 2	6.64	4,5 - 8,2
UKE3	South Yorkshire	6.57	3,8 - 8,2
UKE4	West Yorkshire	6.55	2,2 - 8,2
FR30	Nord - Pas-de-Calais	6.51	4,8 - 7,9
FR82	Provence-Alpes-Côte	6.31	4,7 - 7,5
ES51	Cataluña	6.30	4,3 - 8,5
ES22	Comunidad Foral de	6.26	4,1 - 7,9
CZ00	Praha Great	6.10	5,0 - 7,3
ES30	Comunidad de Madr	6.10	4,2 - 7,5
ES24	Aragón	5.91	4,1 - 7,7
ES12	Principado de Asturi	5.89	4,1 - 8,3
ES52	Comunidad Valencia	5.87	3,4 - 7,4
ES53	Illes Balears	5.85	3,7 - 7,4
ITC1	Piemonte	5.67	4,8 - 6,7
PT17	Lisboa	5.48	3,8 - 7,0
ITI4	Lazio	5.45	4,4 - 6,8
EL30	Attiki	4.44	3,3 - 6,4

Cluster 5 M-GDP + M-wPD			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
NL22	Gelderland	7.67	4,8 - 9,4
BE23	Prov. Oost-Vlaander	7.62	5,3 - 8,8
UKJ3	Hampshire and Isle	7.37	5,8 - 8,7
DE92	Hannover	7.29	5,8 - 8,7
UKJ4	Kent	7.27	5,8 - 8,7
DEF0	Schleswig-Holstein	7.27	6,2 - 8,8
BE22	Prov. Limburg (BE)	7.24	5,2 - 8,2
DE13	Freiburg	7.20	5,2 - 8,6
UKH1	East Anglia	7.19	5,4 - 8,6
DEA4	Detmold	7.13	5,5 - 8,6
FR42	Alsace	7.12	5,5 - 8,0
DE91	Braunschweig	7.07	5,5 - 8,7
UKG1	Herefordshire, Worc	7.07	5,1 - 8,8
UKL2	East Wales	7.03	4,7 - 8,4
FR61	Aquitaine	7.03	5,1 - 8,4
UKE2	North Yorkshire	7.02	5,1 - 8,2
AT22	Steiermark	7.01	5,8 - 8,4
FR62	Midi-Pyrénées	6.99	5,4 - 8,5
DEB3	Rheinhessen-Pfalz	6.98	5,0 - 8,8
UKK2	Dorset and Somerse	6.96	5,0 - 8,1
UKM2	Eastern Scotland	6.94	4,9 - 8,5
FR24	Centre (FR)	6.92	5,1 - 8,0
DED2	Dresden	6.92	5,9 - 8,7
FR51	Pays de la Loire	6.91	4,6 - 8,5
FR41	Lorraine	6.89	5,6 - 8,0
DED4	Leipzig	6.89	4,4 - 8,7
DECo	Saarland	6.84	4,6 - 8,6
DEE0	Sachsen-Anhalt	6.83	4,4 - 8,5
DE73	Kassel	6.83	4,7 - 8,7
FR23	Haute-Normandie	6.82	5,2 - 8,2
FR72	Auvergne	6.77	4,8 - 8,0
UKD6	Cheshire	6.73	3,7 - 8,2
FR21	Champagne-Ardenn	6.73	4,9 - 7,9
UKG2	Shropshire and Staff	6.72	4,1 - 8,3
UKE1	East Yorkshire and N	6.66	5,3 - 8,2
BE33	Prov. Liège	6.63	5,3 - 7,6
UKD4	Lancashire	6.60	3,6 - 8,2
UKN0	Northern Ireland (UI	6.52	5,1 - 8,0
UKK4	Devon	6.50	5,0 - 8,1
FR81	Languedoc-Roussillc	6.45	5,1 - 7,6
BE32	Prov. HaiNAut	6.43	4,9 - 7,6
ES11	Galicia	6.07	4,4 - 8,4
ITH4	Friuli-Venezia Giulia	5.98	5,0 - 7,4
ES23	La Rioja	5.98	3,9 - 7,8
ES13	Cantabria	5.90	4,1 - 8,6
SL02	ZahodNA Slovenija	5.85	3,7 - 6,9
ITH3	Veneto	5.83	4,7 - 7,2
ES41	Castilla y León	5.80	3,9 - 7,8
SK01	Bratislavský kraj	5.51	3,4 - 7,4
ITC3	Liguria	5.48	3,8 - 7,3
ITI1	ToscaNA	5.31	3,4 - 6,8
CY00	Kypros	5.17	2,1 - 7,2

Cluster 6 M-GDP + L- wPD			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
NL13	Drenthe	7.53	5,3 - 9,7
NL12	Friesland (NL)	7.36	4,8 - 9,7
DEB2	Trier	7.20	5,2 - 8,8
DE24	Oberfranken	7.20	5,5 - 8,9
FI1C	Etala Suomi	7.16	4,3 - 9,6
DE93	Lüneburg	7.15	5,0 - 8,7
FR22	Picardie	7.06	5,5 - 8,1
DEB1	Koblenz	7.04	4,9 - 8,8
DE22	Niederbayern	7.03	5,1 - 8,9
FI1D	Pohjois-JA Ita	6.99	4,6 - 9,6
FI19	Länsi-Suomi	6.99	4,5 - 9,6
DE72	Gießen	6.97	5,0 - 8,7
DE94	Weser-Ems	6.93	4,9 - 8,7
FR63	Limousin	6.92	4,6 - 8,4
FR43	Franche-Comté	6.90	5,4 - 8,1
DEG0	Thüringen	6.90	4,7 - 8,8
FR53	Poitou-Charentes	6.90	4,4 - 8,5
FR52	Bretagne	6.88	4,7 - 8,4
DE80	Mecklenburg-Vorpon	6.87	4,1 - 8,8
AT21	Kärnten	6.84	4,5 - 8,7
FR25	Basse-Normandie	6.75	4,7 - 8,2
FR26	Bourgogne	6.70	4,7 - 8,0
BE35	Prov. NAmur	6.65	5,1 - 7,6
UKD1	Cumbria	6.62	4,8 - 8,2
FR83	Corse	6.44	4,1 - 7,7
ITI2	Umbria	5.55	3,7 - 7,1
ITI3	Marche	5.39	3,6 - 7,1
ITF1	Abruzzo	4.54	2,2 - 6,3
ITF2	Molise	4.46	2,2 - 6,5

Table A.4: Regions with Low GDP

Cluster 7 L-GDP + H-wPD			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
PL12	Mazowieckie	5.64	4,0 - 7,4
PT11	Norte	5.42	3,6 - 7,3
PL11	Lódzkie	5.39	3,3 - 7,0
MT00	Malta	5.37	2,7 - 7,6
PL22	Slaskie	5.24	3,3 - 7,2
ES61	Andalucía	5.18	2,7 - 6,9
HU10	Közép-Magyarország	5.04	3,4 - 6,5
HR01	SjeverozapadNA Hrv	4.87	3,4 - 7,4
RO32	Bucuresti - Ilfov	4.33	2,1 - 8,9
EL12	Kentriki Makedonia	4.19	2,2 - 6,4
ITF3	Campania	4.16	2,0 - 6,2
BG41	Yugozapaden	4.01	1,9 - 7,1

Cluster 8 L-GDP + M-wPD			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
UKL1	West Wales and The	6.85	5,0 - 8,3
UKC1	Tees Valley and Durl	6.58	4,1 - 8,3
CZ06	Jihovýchod	5.58	4,3 - 7,0
EE00	Eesti	5.53	2,9 - 7,0
ES62	Región de Murcia	5.52	3,6 - 7,9
PL41	Wielkopolskie	5.51	3,9 - 7,3
PL42	Zachodniopomorski	5.49	3,8 - 7,2
CZ08	Moravskoslezsko	5.45	4,0 - 7,1
PL51	Dolnoslaskie	5.44	3,4 - 7,3
PL34	Podlaskie	5.33	3,2 - 7,5
PL63	Pomorskie	5.23	3,1 - 7,0
PL61	Kujawsko-Pomorski	5.16	3,0 - 6,9
PL21	Malopolskie	5.16	3,8 - 6,1
LV00	Latvija	4.72	3,3 - 7,6
LT00	Lithuania	4.67	2,7 - 6,9
EL43	Kriti	4.59	3,4 - 6,8
ITG1	Sicilia	4.25	2,1 - 6,4
EL23	Dytiki Ellada	4.25	1,9 - 6,5
ITF4	Puglia	4.22	1,7 - 6,6
EL14	Thessalia	4.20	2,1 - 6,4
RO42	Vest	3.96	2,0 - 7,1

Cluster 9 L-GDP + L- wPD			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
UKF3	Lincolnshire	6.82	4,7 - 8,6
UKK3	Cornwall and Isles of	6.54	4,6 - 8,1
CZ03	Jihozápad	5.76	4,2 - 7,2
CZ05	Severovýchod	5.74	4,3 - 7,1
SL01	VzhodNA Slovenija	5.71	3,5 - 6,9
ES42	Castilla-la Mancha	5.68	3,7 - 7,7
CZ04	Severozápad	5.63	4,0 - 7,2
PL52	Opolskie	5.52	3,1 - 7,2
ES43	Extremadura	5.48	3,3 - 7,9
CZ07	Strední Morava	5.45	3,8 - 7,0
PL43	Lubuskie	5.45	3,5 - 7,6
PT16	Centro (PT)	5.43	3,8 - 7,0
PL62	Warminsko-Mazurski	5.38	2,9 - 7,6
PT15	Algarve	5.38	3,7 - 6,9
SK03	Stredné Slovensko	5.32	3,3 - 6,7
SK02	Západné Slovensko	5.28	3,3 - 6,5
PL33	Swietokrzyskie	5.25	3,3 - 7,5
HU22	Nyugat-Dunántúl	5.02	3,3 - 7,2
SK04	Východné Slovensko	4.97	3,4 - 6,7
HU21	Közép-Dunántúl	4.91	2,9 - 6,6
HR03	Jadranska Hrvatska	4.81	2,6 - 7,6
HU23	Dél-Dunántúl	4.77	2,7 - 7,0
HR02	Sredisnja i IstocNA (P	4.74	2,5 - 7,2
ITG2	SardegNA	4.63	2,2 - 7,0
EL22	Ionia Nisia	4.45	1,7 - 6,9
EL21	Ipeiros	4.41	2,0 - 6,9
EL11	ANAtoliki Makedonia	4.08	1,9 - 6,2
ITF6	Calabria	4.01	1,9 - 6,3

Table A.5: Regions with very low GDP or Population density

Cluster 10 VL-wPD			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
AT11	Burgenland (AT)	7.45	5,4 - 9,2
SE21	Småland med öarNA	7.37	5,1 - 9,5
FI20	Åland	7.37	4,6 - 9,6
SE32	Mellersta Norrland	7.00	3,6 - 9,4
UKM6	Highlands and Island	6.79	4,7 - 8,5
NO07	Nord-Norge	6.74	3,4 - 9,9
BE34	Prov. Luxembourg (E	6.63	5,0 - 7,6
IE01	Border, Midland and	6.41	4,4 - 9,0
NO02	Hedmark og Opplan	6.23	1,6 - 9,9
PT18	Alentejo	5.31	2,8 - 7,8
EL42	Notio Aigaio	4.47	2,2 - 6,9
EL41	Voreio Aigaio	4.43	2,3 - 6,9
EL25	Peloponnisos	4.32	2,0 - 6,6
EL24	Sterea Ellada	4.26	2,0 - 6,5
ITF5	Basilicata	4.24	1,8 - 6,4
EL13	Dytiki Makedonia	4.00	1,8 - 6,5

Cluster 11 VL-GDP			
NUTS2 code	NUTS2 name	RQI score	RQI Indicator range
PL32	Podkarpackie	5.35	3,0 - 7,8
PL31	Lubelskie	5.10	3,1 - 7,3
HU33	Dél-Alföld	4.69	2,8 - 7,3
RO22	Sud-Est	4.68	2,0 - 8,3
HU31	Észak-Magyarország	4.58	2,7 - 6,9
HU32	Észak-Alföld	4.50	2,6 - 6,7
RO41	Sud-Vest Oltenia	4.35	1,9 - 7,9
RO11	Nord-Vest	4.31	2,1 - 7,1
RO12	Centru	4.21	2,1 - 6,8
RO31	Sud - Muntenia	4.00	2,0 - 7,4
RO21	Nord-Est	3.94	1,7 - 7,2
BG33	Severoiztochen	3.63	1,8 - 7,3
BG42	Yuzhen tsentralen	3.53	1,5 - 6,7
BG34	Yugoiztochen	3.43	1,8 - 6,2
BG32	Severen tsentralen	3.41	1,4 - 7,2
BG31	Severozapaden	3.34	1,3 - 7,0