MEASURING PERIPHERALITY AND ACCESSIBILITY FOR LITHUANIAN REGIONAL POLICY

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ABSTRACT

Regional policy is a very dynamic and broad concept. As we can see from Lithuanian regional policy, regions can be formed very flexibly, using different spatial areas (counties as well as municipalities). This is justified by the main purpose of regional policy – dealing with social and economic inequality. The aim of the Government is, therefore, to identify the remote territories and to divert certain assistance in time. The Government, however, uses short-handed instruments, namely economic indicators, for the revealing of problem areas in Lithuania. The article argues that this is not enough: peripherality and accessibility indicators could be calculated for Lithuanian regions. Calculations of data using the formulas presented quite clear picture and tendencies of territorial development. They proved the existence of poor development axes and good development nucleus. The trend towards institutional development of 6 potential regions in Lithuania could be envisaged.

KEYWORDS: *region, regional policy, peripherality, accessibility.*

JEL CODES: R000, R120, R150, R190

Introduction

Regional policy is a very dynamic and broad concept. Various territorial units could be used as the basis for regional formation. As we can see from Lithuanian regional policy, regions can be formed very flexibly, using different spatial areas (counties as well as municipalities). This flexibility is justified by the main purpose of regional policy – dealing with social and economic inequality. The main idea is that the spread of economic policy does not cover all the states' territory equally. Certain centers and certain peripheries appear as the result of uneven distribution of wealth. The aim of the Government is, therefore, to identify the remote territories and to divert certain assistance in time.

The problem of the research is, therefore, to present that Lithuanian regional policy is very ambivalent, as we can talk about regional policy without regions. Regions are used as analytical concepts subjected to the need of the Government. The *purpose* of the article, therefore, is to provide the more objective instruments for the identification of regions.

The main object is to present *peripherality* and *accessibility* calculations for Lithuanian regions.

The tasks of the article are:

- to present the dynamic of *regional policy* notions and perceptions;
- shortly introduce with the evolution of Lithuanian regional policy and its targets;
- to present different methods for peripherality and accessibility calculations;
- calculate peripherality and accessibility indicators for Lithuania regions and present these result in maps.

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For the achievement of the purpose and the tasks, the following methods were used: SPSS and GIS, mathematical calculations and analysis.

1. What is regional research about? Different approaches, all about the same

The notion of *region* is used very freely and very unrestrictedly in economic research. Using a broad variety of economic criteria, economists employ this term for identifying territories of very different scale: from sub-national to supra-national levels. In regional economy, however, there is a tendency towards identifying a region as a local community (Dicken, 2003: 75), as a sub-national territorial unit (Степанов, 2000: 10) the boundaries of which ought not to coincide with the boundaries of a politico-administrative unit (Armstrong & Taylor, 2004: 2). The notion of region that is employed in regional economy is usually used at micro-scale. Such an approach is widely used in the EU, in its regional policy. At mezzo- and macro-scale a more unattached concept of region is used. It enables the forming of a very new geo-economic map of the world economy (Dicken, 2003: 33). Therefore at macro-scale it is possible to find three great economic regions (it would be more properly to call them economic areas) as NAFTA, the EU, and ASEAN (or South East Asia). The UN and the World Bank, however, are following the Cold War era practice of dividing the world into the three main areas/regions according to their level of economic development. Such a division distinguishes the well-developed countries that belong to the OECD organization, the transition economy countries that belong to the CEE and CIS, and the developing countries that belong to the rest of the world. Of course, it is possible to scale these areas, especially those of the developing countries, into mezzo-regions. Nevertheless, the concept of mezzo-scale region is more commonly used for identifying the so-called 'economic corridors' that are emerging as the outcome of economic globalization.

The notion of region in political research is used also very broadly. Firstly, regions traditionally were understood as a form of a state's territorial political organization. Regions constituted a very important regional level (between national and local levels) of territorial political organization. The processes of globalization, however, are changing many elements of public policy. The regional level is changing too. As John (2001) indicates, territorial units at local level are cooperating in order to resist the pressure of global powers. They create alliances which should be called as *meso*. The term, however, did not stick. Instead of the term *meso*, the term of *mezzo-scale region* is used for identifying these new forms of cooperation. Secondly, the term *region* can be used in domestic/national policy. Here the term refers to *regional policy*. Regional policy, however, is understood as part of a state's economic policy. In such a case the notion of *region* is identical to that used in regional economy, i.e. a region is realized as a sub-national micro-scale territorial unit. Thirdly, the term *region* is broadly and very freely used in international politics where it refers to all, as B. Buzan (1997) points out, "hot and interesting for international media places of the world."

This article treats *region* as a sub-national micro-scale territorial unit that is affected by *regional policy* which aims implementing goals such as fighting economic and social inequality, uneven distribution of economic and social wealth. *Regional policy*, respectively, deals with *territoriality*. Uneven distribution of economic and social wealth is treated in *spatial dimension* – uneven distribution creates cores of development, namely, centers, and margins of development, namely, peripheries. For a long time in Europe, *peripherality* was strongly associated with geographical position of a particular territory, therefore, "until very recently most interventions addressing *peripherality* have involved attempts to ameliorate the economic disadvantage of remoteness through investment in physical infrastructure" (Copus, 2000: 2), investment in physical *accessibility*. Reality, however, shows that "certain peripheral and less accessible regions exhibit high levels of economic growth despite their disadvantaged locations… Factors other than location may be (and have been) employed to explain regional growth or, conversely, poor performance" (Copus, Skuras, 2006: 29). It leads to the new dimension of "aspatial peripherality" where economic development is understood to be fostered by essentially non-geographic processes (Copus, 2000, 2001), what means that we should start talking about the *accessibility* of social and human capital.

The article, therefore, presents the basic initial calculations of *peripherality* and *accessibility* for Lithuanian regions.

2. Lithuanian regional policy and regionalization: a short overview

The process of territorial decentralization in Lithuania started in 1995, when the new territorial-administrative reform was introduced. In accordance with the Law on Administrative Territorial Units, Lithuania was divided into two main sub-national territorial administrative tiers: 10 counties – higher administrative units, whose management is organized by the Government and 56 municipalities – lower administrative units, where self-government was preserved (since the year of 2000, there are 60 lower administrative units). By decision of a municipal council, a municipality may divide its territory into smaller units – wards. Lithuania differs from its neighbors in that it has established large municipalities in terms of territory (through amalgamation of different settlements in one municipal territory) and the population.

It appears, therefore, that regional level of governance (understanding it the way as it was mentioned in the chapter above) is/was missing in Lithuanian territorial – administrative division. Nonetheless, the Government has started regional development programmes since 1997. First of all, the Law on Regional Development was introduced in 2000 and amended in 2002. The same 2002 the Parliament accepted the General Plan of Territorial Development. Both these documents treated *region* and *regional policy* in the terms of regional economy – the main aim was to minimize territorial socio-economic differences. The means for achieving this aim, however, were not clear enough. Not clear enough, until the Government and the Parliament introduced several new documents concerning territorial development vision until 2013.[2] All these documents diverted regional policy towards socio-economic cohesion.

It appeared, firstly, that the Government and the Parliament are keener to see counties as future regions (in terms of administrative regional policy). Nonetheless, the later steps (especially those of the year 2010 when the administrations of the counties were abolished leaving counties as territorial units only) cleared out that regions will be formed according the need. They will be used as analytical units for the implementation of regional policy.

As we can see in picture 1, according the General Plan of Lithuanian Territory Development, and other documents, concerning regional policy until 2013, there are 14+1 target regions: 14 municipalities with very low socio-economic indicators and 1 special Ignalina Nuclear Plant region (covering Ignalina, Zarasų rajonas and Visaginas municipalities). The Government used various, though, namely, economic indicators for determining of such territories. The experience of the EU regional policy (especially the development of the European Spatial Development Perspective and The European Spatial Planning Observatory Network/ESPON) enables the use of multi-dimensional indicators. As a small part of this multi-dimensional variety it is possible to indicate *peripherality* and *accessibility* calculations for the identification of remote regions.

3. Different methods measuring peripherality and accessibility

Traditionally, accessibility and peripherality indicators are used to identify remote regions: "A peripherality indicator can be interpreted as an inverse function of accessibility, i.e. the higher the accessibility, the less peripheral a region is located and vice versa" (Schürmann, Talaat, 2002: 6). According to A. K. Copus (1999), all the broad variety of accessibility and peripherality indicators falls into two broad types:
- The first group utilizes *gravity* model-based methodologies to estimate "economic" or "market" potential.[3]
- The second group comprises "travel time/cost" and "daily accessibility" indicators.[4]

[2] LR Seimas. (2002). *LR Regioninės plėtros įstatymas (nauja redakcija)*. 2002 m. gruodžio 10 d. Nr. IX-1285. *Valstybės žinios*, Nr. 123-5558. LR Seimas (2002). *LR Teritorijos Bendrasis Planas*, 2002 m. spalio 29 d., Nr. IX-1154.

[3] In this case it is assumed that the potential for economic activity at any location is a function both of its proximity to other economic centers and of their economic size or "mass". The analogy with the law of gravity is explicit in that the influence of each centre on the "economic potential" of a location is assumed to be directly proportional to the volume of economic activity at the former, and inversely proportional to the distance separating them. The economic potential of the location is found by summing the influences on it of all other centers in the system (Copus, 1999: 1).

[4] Although conceptually simpler and more intuitive than the first group, these have become dominant in recent years due to ease of estimation using modern GIS software. Essential these approaches answer one of three questions: the total cost of travelling from each locality to all the major economic center; number of people that can be reached with a day trip (3–4 hours each way) from each point on the map; or the total cost of accessing a total market of n people from each location (Copus, 1999: 1).

Figure 1. Target regions (municipalities) according Lithuanian regional policy until 2013

As a milestone for the gravity model-based methodologies the works of D. Keeble and his colleagues must be mentioned. A premise is that the potential for economic activity at any location is a function of its proximity to other economic centers. The analogy with the law of gravity is explicit in that the influence of each centre on the "economic potential" of a location is assumed to be directly proportional to the volume (or "mass") of economic activity at the former, and inversely proportional to the distance separating them. The economic potential of the location is found by summing the influences of all other centers in the system. This is expressed in the formula (1):

$$P_i = \sum_{j=1}^{n} \frac{M_j}{D_{ij}} \qquad (1)$$

where:

P_i – is the index of peripherality for location i;

M_j – is an economic "mass" variable in location j;

D_{ij} – is the distance between locations i and j;

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This methodology was improved by many other scientists[5], among whom it is worth to mention the research by J. Gutiérrez and P. Urbano.[6] It focuses on the accessibility of major centers of economic activity (defined as cities of more than 300,000 people) rather than regions and presented the new modified equation (2):

$$A_i = \frac{\sum_{j=1}^{n} (I_{ij} * GDP_j)}{\sum_{j=1}^{n} GDP_j} \qquad (2)$$

where:

A_i – is the accessibility of node i;

I_{ij} – is the impedance[7] through the network between nodes i and j;

GDP_j – is the gross domestic product of the destination node j.[8]

Travel time/cost and daily accessibility models are based on the average travel time calculations using different types of transport networks, combining different routs and modes. The spread of such models was enabled by the development of GIS. Among other works it is worth to mention research by H. Lutter and his team[9], G. Chatelus and A. Ulied[10], and by K. Spiekermann ir M. Wegner[11] (Copus, 1999, 2000; Schürmann, Talaat, 2002; Spiekermann, Neubauer, 2002). The H. Lutter study developed an unweighted travel time indicator for the regions of the EU12. Average travel times were calculated between each NUTS III region and 194 major cities. These travel times are estimated on the basis of a set of simplified transport networks, not unlike that used by D. Keeble, but rather more detailed, and multi-modal, allowing the software to select the fastest route, whether by road, rail or air. G. Chatelus and A. Ulied generally take the economic development benefits of improved accessibility as given, although, interestingly, they point out that improved transport infrastructure, although necessary, is not sufficient. K. Spiekermann and M. Wegener use a sophisticated Daily Accessibility methodology to assess the effect of the TENS on core-periphery differences in Europe. A 10 kilometer grid raster data file provides population data, which is combined with a simplified rail network. They acknowledge the importance of service quality, reliability and speed, the low

5   Linneker, B. J., Spence, N. A. (1992). An accessibility analysis of the impact of the M25 London Orbital Motorway on Britain. *Regional studies*, No. 26, p. 31–47; Frost, M. E., Spence, N. A. (1995). The rediscovery of accessibility and economic potential: the critical issue of self potential. *Environment and Planning A*, Nr. 27, p. 1833–1848; Smith, D. M., Gibb, R. (1993). The regional impact of the Channel Tunnel: a return to potential analysis. *Geoforum*, Vol. 24 (2), p. 183–192; Bruinsma, F., Rietveld, P. (1993). Urban agglomerations in European infrastructure networks. *Urban Studies*, Vol. 30 (6), p. 919–934.

6   Gutiérrez, J., Urbano, P. (1996). Accessibility in the European Union: the impact of the Trans-European road network. *Journal of Transport Geography*, Vol. 4, p. 15–25.

7   "Impedences" were travel times calculated for the route between each pair of nodes, using a detailed digital road/ferry network, each class of road having a difference average speed, and changes of mode (road-ferry) and crossing city centres incurring time penalties.

8   This was estimated by applying the GDP per capita for the surrounding region to the population of the city.

9   Lutter, H., Pütz, T., Spangenberg, M. (1992). Accessibility and peripherality of Community regions: the role of road, long-distance railways and airport networks. *Report to the European Commission*, DG XVI, Bonn, Bundesforschungsanstalt fur Landeskunde und Raumordnung.

10 Chatelus, G., Ulied, A. (1995). Union territorial strategies linked to the Trans-European Transportation Network. *Final report to DG VII*. Paris/Barcelona, INRETS-DEST/MCRIT.

11 Spiekermann, K., Wegner, M. (1996). Trans-European Networks and unequal accessibility in Europe. *European Journal of Regional Development (EUREG)*, No. 4, p. 35–42.

proportion of production costs accounted for by transport in many modern industries, the various impacts of information and communications technology, and the increasing role of other factors (quality of life, access to information and specialist business services and so on) in industrial location decision making. They stress the fact that infrastructural improvements often work to the disadvantage of peripheral areas, especially if they link central cities together, or even if they link the core with the periphery.

In general terms, then, accessibility 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 (Schürmann, Talaat, 2002: 6) and can be expressed in formula (3):

$$A_i = \sum_j g\,(W_j)\,f\,(c_{ij}) \qquad\qquad (3)$$

where:
A_i – is the accessibility of region;
W_j – is the activity W to be reached in region j;
C_{ij} – is the generalized cost of reaching region j from region i.

The functions $g(W_j)$ and $f(c_{ij})$ are called *activity functions* and *impedence functions*, respectively (Schürmann, Talaat, 2002: 6). The formula (3) can be modified according to the different functions used.

4. Peripherality and accessibility of Lithuanian regions (municipalities)

As Lithuania is not a very big country in terms of territory size, travel time/cost or daily accessibility calculations are not so meaningful for the regional potential analysis. More actual become *activity* and *network impedance* functions. For the purpose of comparative calculations, in this article the gravity-based formula (1) and the following modifications of formula (3) are used:

$$A_i = \sum_j P_j\,d_{ij} \,/\, \sum_j P_j \qquad\qquad (4)$$

where:
A_i – area i accessibility;
P_j – population size in area j;
d_{ij} – Euclidean distance between area i and j.

$$A_i = \sum_j \frac{c_{ij}}{d_{ij}}\,W_j \,/\, \sum_j W_j \qquad\qquad (5)$$

where:
A_i – area i accessibility;
c_{ij} – network impedance;
d_{ij} – Euclidean distance between area i and j;
W_j – is the mass W to be reached in region j.

For the calculations using the gravity-based formula, as an *economic mass variable in location j* (M_j) an average gross monthly earnings indicator for the year 2008 is used. For the calculations of D_{ij} variable, distance among municipalities' centers is calculated. In the article, data presented by Lithuanian Road Administration under the Ministry of Transport and Communications is used. The bigger the value, the more peripheral a territory is.

The results are presented in the 2nd picture.

As we can see from the picture 2, the gravity model-based calculation of *peripherality index* did not give us much information needed for the formation of regional policy. Even the use of *economic mass variable* (average gross monthly earnings) did not present any interesting difference that regional policy could aim to. Distance among municipalities dominated and, though with some exceptions, the same picture of Lithuania territory evolved.
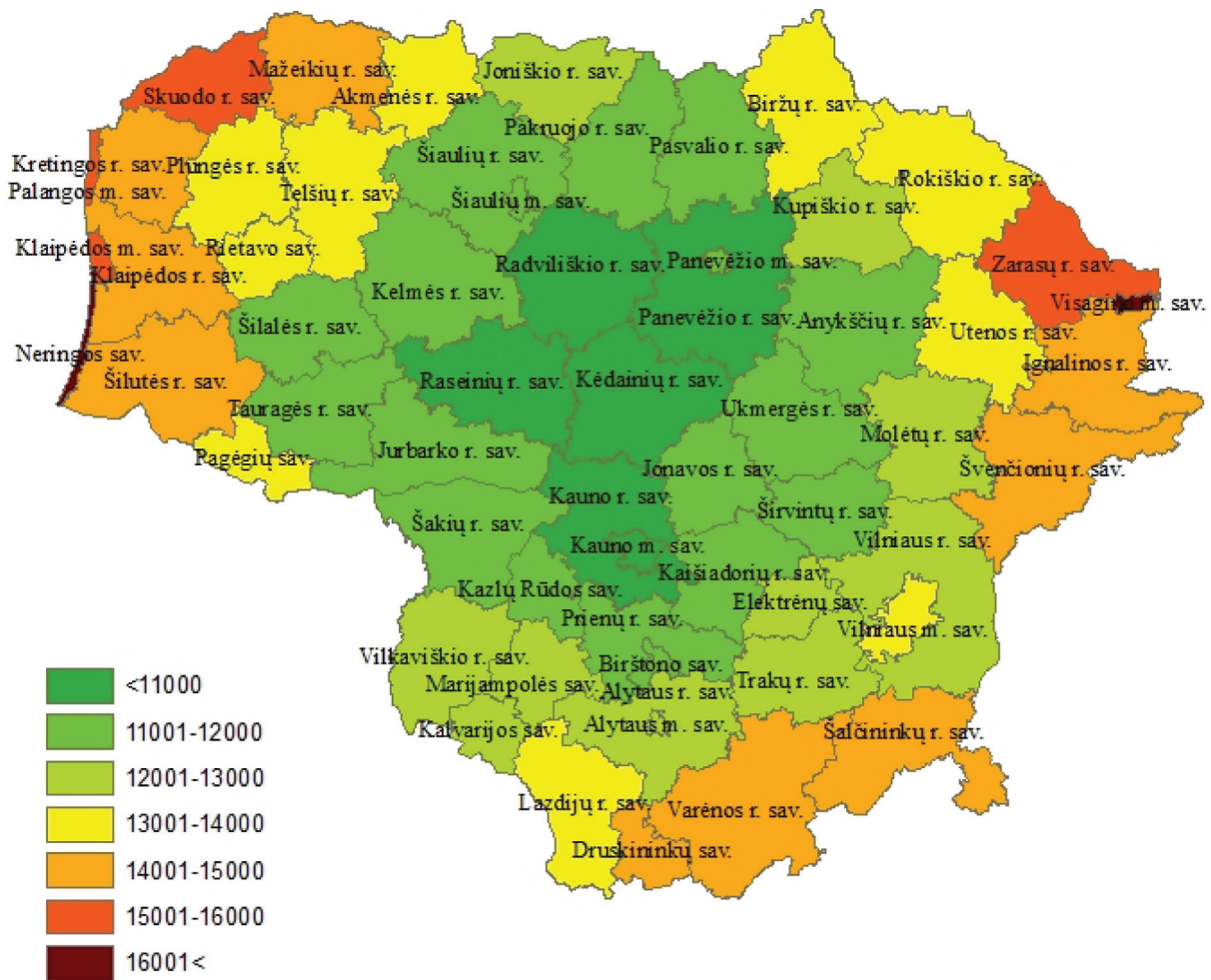

Figure 2. Peripherality index of Lithuanian municipalities

It is worth to try the *accessibility indicators* instead.

For the calculations of *accessibility* using the formula (4), population size of certain municipality is used and the Euclidean distance among municipalities is calculated. For the calculations of accessibility using the formula (5), an average gross monthly earnings indicator for the year 2008 is used as mass W variable (W_j). And an additional variable of impedance (c_{ij}) is introduced. I used the distance to the regional centers and the capital as the main impedance function. The Euclidean distance among municipalities is calculated as well. For the calculations of d_{ij} variable in both formulas, distance data presented by Lithuanian Road Administration under the Ministry of Transport and Communications is used. The real distance values in kilometers

are transformed into the proximity matrix of distances using SPSS 11.0 (measured using Squared Euclidean distance interval, standardized by Z scores).

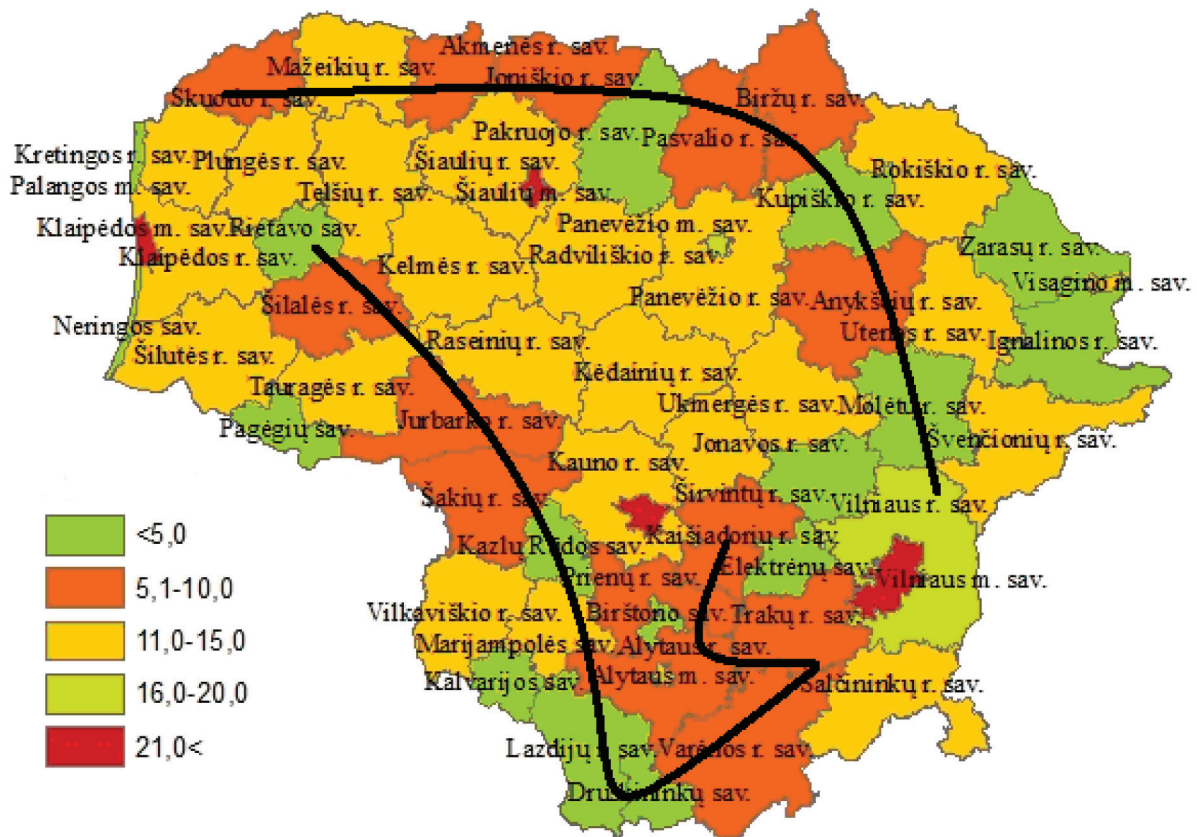The results are presented in the 3rd and the 4th pictures.

Figure 3. Accessibility index of Lithuanian municipalities according formula (4)

As we can see from the both pictures, a very different view (in comparison with the gravity model-based calculations) appears. The lower the value of A_i the less accessible is the certain area. From picture 3 we can identify more than 14 remote areas that need state's assistance in development. These remote areas create very clear axes of low development (as presented by bold lines in the picture 3). According to calculations, with the exclusion of Vilnius city and Vilnius rajonas municipalities, almost all south-eastern part of Lithuania, south-western border region, and northern border territories are deeply remote. It partly could be explained by the size of population: usually border regions are less populated. As this accessibility index uses population size as the main variable, it does not seem very suitable for the identification of really remote areas in terms of socio-economic development.
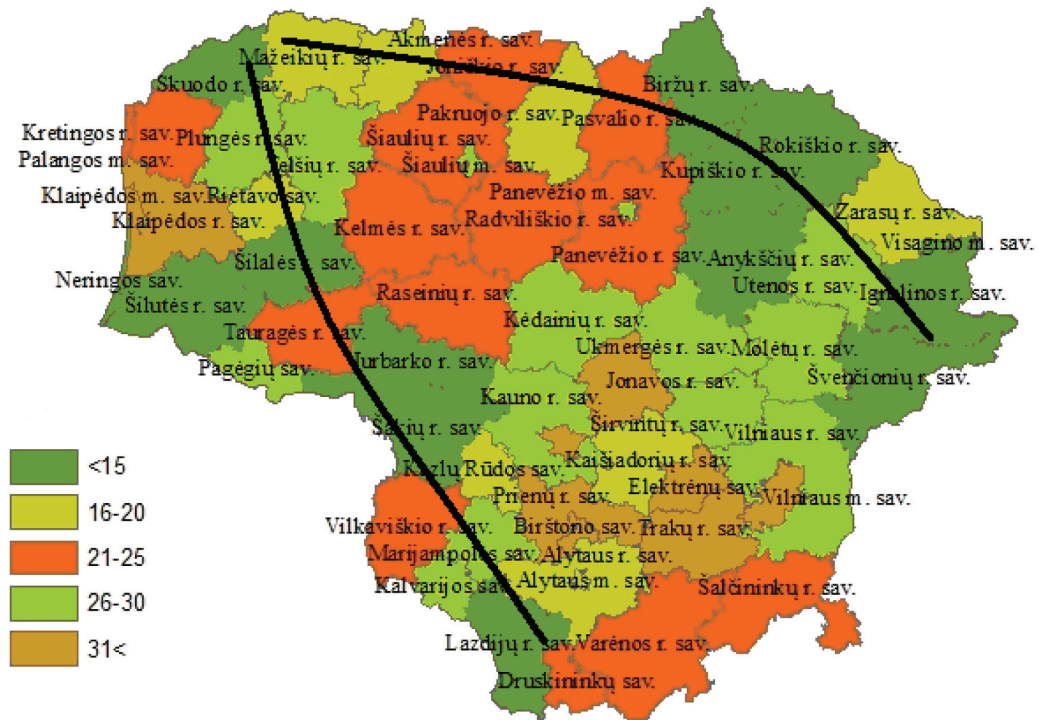
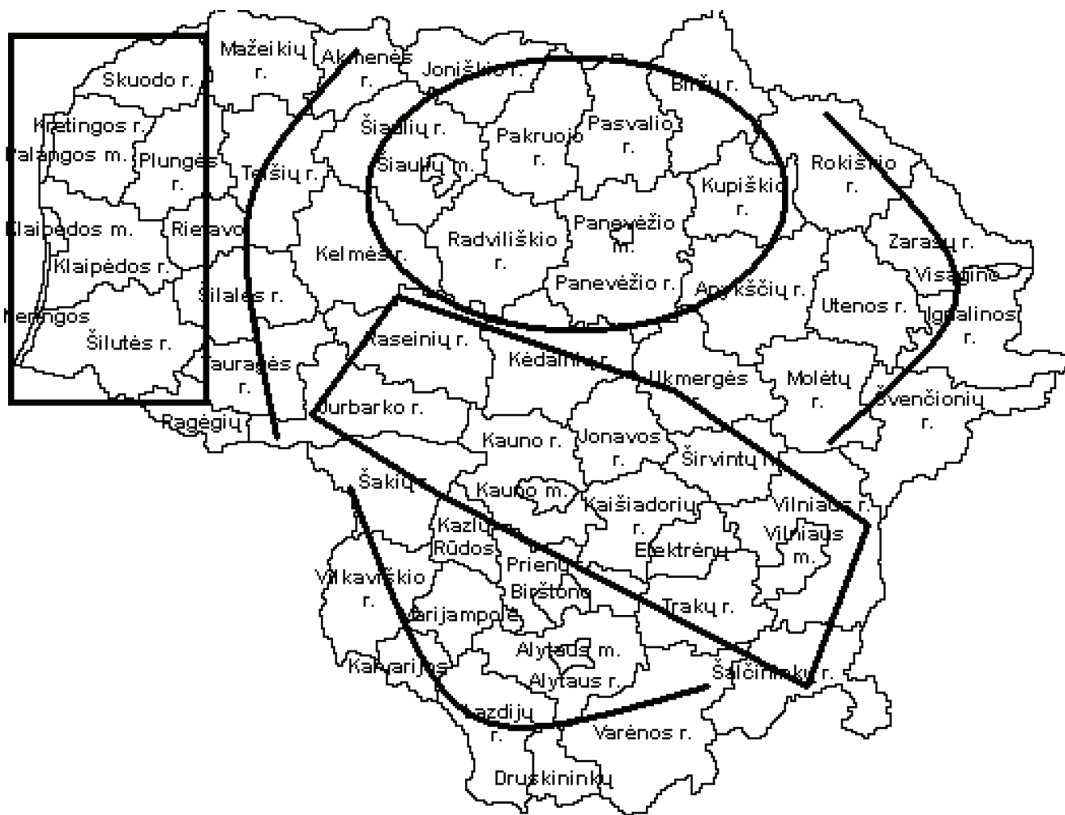*Figure 4.* Accessibility index of Lithuanian municipalities according formula (5)

Figure 5. The potential regions for Lithuanian regional policy

Inclusion of economic activity variable and impedance function provides us a new, a much better, view of spatial development (picture 4). It shows quite clear nucleus of good development, i.e. Vilnius-Kaunas axis (what proves that talks about Vilnius-Kaunas dipolis is not cheap at all) and Klaipėda region. However, almost the same (with some more or less exceptions) axes of low development territories (bold lines in picture 4) appear.

Though calculations provide different results, certain tendencies are possible to evolve. These tendencies are:

- firstly, the possible ways of accessibility calculations provides certain nucleus of development, namely Vilnius-Kaunas region and Klaipėda region;
- Šiauliai-Panevėžys form the second nucleus of development;
- the rest territories could be named as the remote ones.

The presented tendencies enable to talk about the need for the Government to concentrate its regional policy towards 6 potential regions as presented in the 5th picture. This could lead towards the institutionalization of regional policy and the introduction of possible new tier of territorial-administrative governance.

Conclusions

As we can see from the conducted research, it is very difficult to talk about effective regional policy without having a complex instrumental base for the identification of regions (if we understand regional policy in terms of regional economy, *i.e.* as dealing with socio-economic territorial differences). A very broad complex analysis is needed.

The EU regional policy has established a certain institutions for this, namely the European Spatial Development Perspective and The European Spatial Planning Observatory Network/ESPON. Scientist, gathered under the ESPON, elaborate multi-layer calculations for the reveal of problem territories in the EU.

Lithuanian regional policy is deeply oriented towards the EU regional policy. The Government, however, uses short-handed instruments, namely economic indicators, for the revealing of problem areas in Lithuania. The article argues that this is not enough. A more complex analysis is needed. As a part of such complex analysis, peripherality and accessibility indicators could be calculated for Lithuanian regions.

The calculations provided in the article proved that the gravity model-based formulas are not enough. A more complex analysis is needed. Accessibility indicators, especially using economic variables and impedance functions, prove to be more adequate. Calculations of data using the accessibility formulas presented quite clear picture and tendencies of territorial development. They proved the existence of poor development axes and good development nucleus. Despite the fact, that a more complex analysis should be done, and that peripherality and accessibility calculations are only a very small part of complex spatial research, the trend towards institutional development of 6 potential regions in Lithuania could be envisaged.

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REGIONŲ PERIFERIŠKUMO IR PASIEKIAMUMO MATAVIMAI KURIANT LIETUVOS REGIONINĘ POLITIKĄ

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Santrauka

Regiono samprata labai plačiai paplitusi. Vis dėlto nepaisant didelių šio termino vartojimo apimčių, sąvokos turinys ir esmė nėra vienareikšmiai ir neginčijami. Lietuvos regioninės politikos raida atskleidžia, kad regionai gali būti ne tik skirtingai suprantami, bet ir labai lanksčiai formuojami, naudojant skirtingus teritorinius arealus (pvz., apskritis, savivaldybes ar jų junginius). Toks labilumas pateisinamas dėl vienos pagrindinės priežasties – siekiama išvengti netolygios socialinės ir ekonominės erdvinės plėtros. Valdžiai tenka svarbus uždavinys – laiku nustatyti atsiliekančias (socialiniu-ekonominiu požiūriu) teritorijas, kad galėtų suteikti joms pagalbą ir paramą. Vis dėlto, kaip galima pastebėti iš Lietuvos regioninės politikos, tokioms teritorijoms nustatyti naudojami gana riboti instrumentai (iš esmės tik ekonominiai rodikliai).

Europos Sąjungos mastu išplėtota kompleksinė įvertinimo sistema. Pavienių teritorijų periferiškumo ir pasiekiamumo matavimai yra šios kompleksinės įvertinimo sistemos dalis. Straipsnyje, taikant skirtingus matematinius skaičiavimus, pateikiami periferiškumo ir pasiekiamumo rodikliai Lietuvos savivaldybėms. Nepaisant kai kurių esminių skirtumų, skaičiavimai atskleidžia, kad Lietuvoje formuojasi du sėkmingos raidos branduoliai (Vilniaus-Kauno bipolis ir Klaipėdos regionas), atskiras vidutinės raidos branduolys (Šiauliai-Panevėžys) bei trys silpnos raidos ašys. Tokios tendencijos leidžia daryti prielaidas apie galimybę Lietuvoje institucionalizuoti šešis potencialius regionus.

PAGRINDINIAI ŽODŽIAI: *regionas, regioninė politika, periferiškumas, pasiekiamumas*.