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ENVIRONMENTAL COMPETITIVENESS OF REGIONS

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ABSTRACT: The quality of the environment plays a significant role in supporting regional development. Whenever a region is viewed as the space it occupies, a clean environment is one of the fundamental conditions of the region's competitiveness, including its environmental advantage. The environmental competitiveness can be analysed in terms of the natural conditions occurring in a given region as well as their skillful transformation into social and economic effects, which will contribute to a more rapid development of this region.

The main purpose of this study has been to identify the level of competitiveness and environmental competitiveness of regions (Polish provinces) by calculating values of the Perkal index, and to determine the correlation coefficients for the competitiveness and environmental competitiveness between the regions. The provinces in Poland distinguished by a positive and high value of the Perkal index are: mazowieckie, śląskie, wielkopolskie, followed subsequently by małopolskie, dolnośląskie and pomorskie. The regions which possess the highest environmental competitive advantage are: lubuskie, pomorskie, zachodniopomorskie and warmińsko-mazurskie. Negative correlation was determined between the indicators of competitiveness and environmental competitiveness achieved in our study. However, it is a weak correlation. Thus, there is no ground to worry that the economic development will lead to some considerable deterioration of the natural environment. On the contrary, positive effects of the growth in economy on the natural surroundings should not be neglected.

KEY WORD: competitiveness, environmental competitiveness of regions

Introduction

Competitiveness is defined as the ability to achieve success, to gain competitive advantage over others, to attain a higher level of wealth and to sustain permanent growth. Such effects can be obtained through the use and conversion of resources, including natural and environmental ones. The condition of the natural environment is increasingly often treated as an element of regional competitiveness, and even as a factor that guarantees life, survival and development. However, as the economy grows, the state of the environment deteriorates, and a growing number of business enterprises contributes to an increased exploitation of the natural resources and to the destruction of landscape, climatic or cultural assets. The quality of the environment plays an important role in supporting the regional development. When viewing a region as the space it occupies, possessing a clean environment is one of the principal conditions for the region to be competitive, also in terms of having environmental advantages. The environmental competitiveness of regions can be seen as a set of environmental conditions present in a given region as well as the ability to transform them into social and economic effects which will contribute to a more rapid development of this region.

The term 'region' has many meanings. Legally speaking, a region is defined as an area delineated by a unit of the highest level of administrative division, it is usually granted much autonomy and the actual scope of its competences depends on the degree of decentralisation of the state (Tomaszewski 2007, p. 13).

The main aim of this study has been to determine the level of competitiveness and environmental competitiveness of regions understood in the legal sense, i.e. provinces in Poland. To this aim, several auxiliary aims have been pursued, including:

- the choice of indicators measuring competitiveness and environmental competitiveness of provinces;
- an attempt to assess the competitiveness and environmental competitiveness of provinces by calculating values of the Perkal index as of the years 2011 and 2014;
- calculation of the coefficients of correlation in the competitiveness and environmental competitiveness between Polish provinces.

Region and its competitiveness

The term 'region' is derived from the Latin word *regio*, which denotes movement in a specific direction, or a locality, land or district. According to Pietrzyk (2000, p. 213), the notion of a region bears many meanings. It can designate some territory distinguished by its cultural or historic characteristics, or it can refer to an area delineated as a result of the administrative division. Domański (2007, p. 23) defines a region as an area which constitutes a homogenous and coherent unity that arises from the character of its constituent parts and relationships, and is distinguished from a larger area by one or several criteria, or as a structure distinguished from a domain of human activity in a given area. A region is therefore defined through the human activity conducted within it. Classification of regions relies on the specific nature of economy, e.g. an industrial, mining, agricultural region, and on the basis of an analysis of economic relationships which stem from the human activity carried out in a given region.

The concept of a region can be defined in different ways, depending on the domain of science involved. In economy, a region is the central place of economic activity, where an individual is engaged in production and manufacturing processes (Tomaszewski 2007, p. 14). For geographers, a region is part of the Earth's geographical surface that possesses certain characteristic features originating from the location, soil quality, climate or the history of development (Radwan-Roehrenscheff 1998, p. 65). In political sciences, a region is a space described by social relationships and political distinctiveness within a certain administrative and territorial division. In sociology, a region is an area the inhabitants of which share the feeling of territorial identity as well as ethnic, cultural, linguistic or historic distinctiveness (Pastuszka 2012, p. 15-16).

Competitiveness of a region is perceived as an ability to compete with others, both nationally and internationally, and to achieve some success in this competition (Mączka, Kudełko 2005, p. 42). According to Winiarski (1999, p. 9), competitiveness is the adaptability of regions to changeable conditions in economy, in the sense of a region being able to secure or improve its position in the mutual competition. It encompasses a set of characteristics that identify the appeal of a given region as a place for locating investment capital or for living. It can be an expression of technological advantage or lower prices of products and services generated in one region compared to others.

Competition between regions should be understood first as indirect competition, that is the presence or formation of such an environment for businesses in a region that allows them to gain a competitive advantage in the

elements which are beyond their active control. Higher competitiveness of local companies makes an indirect contribution to the growing competitiveness of the whole region. Direct competition, in turn, needs to be understood as the competition between administrative units, endowed with some independence, which strive to achieve high quality of life, to assure social and economic development, and to acquire domestic and foreign investment capital as well as the EU funds in the form of subsidies or aid schemes (Bojer 2001, p. 12).

The environmental competitiveness of a region

The regional environmental competitiveness is ascribed to regions with a relatively clean environment, which are distinguished by having a competitive advantage over other regions gained from the existing environmental potential and their ability to incorporate the quality of nature in processes of the social and economic growth and development. Regions should strive towards building a development strategy which will encompass such domains of economic activity that take advantage of the resources and values of the environment.

The environmental competitiveness of regions can be viewed in two ways. On the one hand, it can pertain to the environmental conditions and assets in a given region. On the other hand, it deals with the region's capability of transforming such values into socio-economic effects, which contribute to a relatively more rapid development of this region. Less developed regions are often endowed with a valuable asset, i.e. the natural environment. Regulations governing the natural environment and actions undertaken to protect it are perceived by economists as a factor undermining the competitive position of business companies, but at the same time they strengthen the environmental competitiveness (Gray 1987, p. 45). When the natural environment is improved owing to more stringent law, the competitiveness of economies of regions, and consequently of the whole country, may suffer. Among the negative consequences of stricter environmental regulations are (Jaffe et al. 1995, p. 34):

- a worse trade balance;
- a lesser importance of the sector subject to regulations;
- higher unemployment;
- the need to deviate from economy sectors heavily reliant on environmental resources.

Although actions undertaken to conserve and protect the nature may have a negative impact on the competitiveness of a given region in terms of the generated GDP, they favour the 'green' specialisation of regions, which

has a positive influence on competitiveness on the national and even international level. Being able to face competition on open market is increasingly often associated with the ambient conditions in which business enterprises operate or will operate, and therefore protection of the environment should be one of the fundamental elements in progress. Environmental conditions comprise all particular components of the natural environment, and together underlie the region's development.

Should we look at a region as the space where human activity is located, we can conclude that the region's social and economic attractiveness depends on this space. Clean nature is one of the major conditions for being competitive. This is one of the arguments why this aspects of the economy-environment-society relationship should be involved in the processes of regional development. It is important to undertake actions which promote the actual and potential environmental factors adding to the region's competitive advantage, such as ecological marketing, which is an element of territorial marketing (Kasztelan 2010, p. 77-86). In the context of associating regional policy with ecological policy, ecological marketing becomes an important tool in raising the competitiveness of a region (Baumgartner 2008, p. 15-19). A large contribution to the building of this type of competitiveness is made by local government, which should promote the ecological image of the region and encourage potential investors to pursue undertakings which employ the environmental resources and values. Sustainable social and economic development can be achieved only in integrated and rationally organised systems. The ability of entities to submit themselves to vertical and horizontal integration is a significant feature of building regional competitive advantages. In this type of cooperation and with such inter-relationships, territorial economies of scale appear, and the integrated approach can largely enhance the region's ability to gain sustainable advantages from its natural heritage (Słodowa-Hełpa 2009, p. 250-253).

The following are identified as determinants of the environmental competitiveness of regions (Kasztelan 2010, p. 83):

- 1) natural conditions (including the diversity of landscape, mean monthly air temperatures, mean monthly atmospheric precipitation, wind velocity, insolation, cloudiness, presence of major mineral resources);
- 2) geodesic and soil conditions (including the share of agricultural land and forests in the total surface area of a region, structure of soils according to the soil valuation system, risk related to wind and water erosion, share of fallow and degraded land, consumption of fertilisers, structure of soil reaction);
- 3) the condition and degree of pollution of water resources (including the resources and quality of surface water, e.g. the purity of water in lakes

- and rivers, available resources of groundwater and its quality, industrial and municipal effluents discharged to waters and soil);
- 4) the quality and pollution of air (including concentrations of basic air pollutants, UV-B radiation, total emission of air pollutants, number of noxious industrial plants, captured pollutants);
 - 5) amounts and structure of generated waste;
 - 6) objects and areas of special natural quality, and the ratio of forest cover and land afforestation;
 - 7) the level of industrial and traffic noise;
 - 8) the infrastructure of environmental protection and water management (the supply of piped water and wastewater facilities, the population using wastewater treatment plants, the ratio of legal landfills to the so-called wild dumping sites).

Due to limited data in the public statistics for making an assessment of the environmental competitiveness of regions, 16 parameters available in the Local Data Bank have been chosen. These are:

- share of forests in the total area of a region [%];
- share of agricultural land in the total area of a region [%];
- share of the area occupied by organic farms to the total area of agricultural land [%], (Local Data Bank, Category: Agriculture, Forestry and Hunting);
- industrial wastewater discharged annually [dam^3];
- emission of gas and dust pollutants [t/y];
- emission of air pollutants from particularly noxious plants [t/y];
- waste generated per 1km^2 [t];
- ratio of waste disposed of on landfills to waste generated in a year [%];
- municipal waste collected in a year [t];
- available resources of groundwater [hm^3];
- monuments of nature [indiv.];
- share of protected nature areas as a percentage [%] of the total area of a region;
- fees paid to and income of the Environmental Protection and Water Management Fund [thousand of PLN];
- inputs into durable assets serving environmental conservation and protection per capita [PLN];
- length of sewers collecting and discharging wastewater and sewage [km], (Local Data Bank, Category: Condition and Protection of the Environment).

In order to verify the competitiveness of particular regions analysed, the Perkal index was calculated. The process of estimating the value of this synthetic index proceeds through two stages (Karmowska 2011, p. 87):

- 1) normalisation of all measures selected for the analysis, which makes the measures comparable and summable;
- 2) calculation of synthetic indices (W_i) of the regional level, from the formula:

$$W_i = \frac{\sum_{j=1}^n t_{ij}}{m}$$

where:

t_{ij} – standardised value of the observation of i^{th} case and j^{th} variable,

m – number of characteristics included in the analysis.

Standardisation was carried out according to the following formula:

$$t_{ij} = \frac{x_{ij} - x_{j\text{śr}}}{S_j} \text{ for } i = 1, 2, \dots, n; j = 1, 2, \dots, m$$

where:

x_{ij} – the original value of i^{th} case of j^{th} variable.

$x_{j\text{śr}}, S_j$ – values of the arithmetic mean and standard variation of j^{th} variable.

The synthetic index developed by Perkal can assume values from -3 to 3. Regions with a high level of competitiveness (development) score above 0, while regions which are less developed fall below 0. Regions with a moderate level of competitiveness score around 0. Table 1 shows values of the Perkal index for all analysed regions in 2011 and 2014.

Based on the calculated values of the Perkal index, it appears that the regions with the highest environmental competitiveness in Poland are the following provinces (*województwo*): lubuskie, pomorskie, zachodniopomorskie and warmińsko-mazurskie, while the lowest environmental competitiveness was attributed to the provinces: śląskie, dolnośląskie, lubelskie and opolskie. No clear-cut tendency was observed for three provinces, such as małopolskie, podkarpackie and kujawsko-pomorskie.

Table 1. The Perkal index illustrating the level of environmental competitiveness

Territorial unit	2011	2014
Łódzkie	-0.044	-0.07552
Mazowieckie	-0.07378	-0.03318
Małopolskie	0.012608	-0.07481
Śląskie	-0.40505	-0.24027
Lubelskie	-0.20185	-0.22009
Podkarpackie	0.117172	-0.05449
Podlaskie	-0.17659	-0.12848
Świętokrzyskie	-0.15827	-0.12187
Lubuskie	0.185258	0.355543
Wielkopolskie	-0.04331	-0.04791
Zachodniopomorskie	0.288753	0.11485
Dolnośląskie	-0.28899	-0.20688
Opolskie	-0.34992	-0.15288
Kujawsko-pomorskie	0.053695	-0.07697
Pomorskie	0.255554	0.289926
Warmińsko-mazurskie	0.21189	0.097198

Source: the authors, based on data from the Local Data Bank.

The same formula was applied to calculate the level of economic competitiveness of the Polish provinces, based on the following variables:

- value of the GDP in total [million PLN], (Local Data Bank, Category: Regional accounts);
- unemployment rate [%], (Local Data Bank, Category: Labour market);
- number of population in pre-working age;
- number of population in working age
- number of population in post-working age, (Local Data Bank, Category: Population);
- level of remunerations [PLN], (Local Data Bank, Category: Remunerations and social benefits);
- number of business entities registered in the REGON system per 10,000 residents, (Local Data Bank, category: Business entities and ownership transformations).

The results are as follows (table 2).

Table 2. The Perkal index illustrating the level of competitiveness

Territorial unit	2011	2014
Łódzkie	-0.07349	-0.08071
Mazowieckie	1.450601	1.460253
Małopolskie	0.448384	0.454784
Śląskie	1.030381	0.94865
Lubelskie	-0.32802	-0.35947
Podkarpackie	-0.44544	-0.44826
Podlaskie	-0.56271	-0.55413
Świętokrzyskie	-0.49089	-0.52966
Lubuskie	-0.44877	-0.38393
Wielkopolskie	0.468828	0.483806
Zachodniopomorskie	-0.19429	-0.20865
Dolnośląskie	0.361941	0.417798
Opolskie	-0.31414	-0.31019
Kujawsko-pomorskie	-0.37636	-0.38565
Pomorskie	0.238365	0.269849
Warmińsko-mazurskie	-0.76439	-0.77448

Source: the authors, based on data from the Local Data Bank.

The three provinces distinguished by a positive and high value of the Perkal index are mazowieckie, śląskie and wielkopolskie. They are followed in this regard by małopolskie, dolnośląskie and pomorskie. Unlike the environmental competitiveness, the values of these economic indices create unambiguous tendencies.

In order to determine the relationships between the environmental competitiveness of regions and economic competitiveness, correlation coefficients were calculated for the years 2011 and 2014. They equalled -0.28194 and -0.15129, respectively. Based on these correlation coefficients, it is possible to state firmly that there is a negative correlation between the two types of competitiveness (an increase in one of type is accompanied by a decrease in the mean values of the other). Thus, the more economically competitive a region is, the lower its environmental competitiveness. However, this dependence is weak. Hence, a fear that the economic growth will invariably weaken the condition of the natural environment is groundless. Moreover, positive effects of the economic development on nature should be borne in mind.

Conclusions

The term competitiveness is most often considered with regard to business companies. Competitiveness of regions is difficult to measure as it is a function composed of many variables, and the same applies to the environmental competitiveness. There are no unambiguous indicators developed thus far that could help to identify whether a given region is more or less competitive owing to its natural environment. This article is an attempt at making estimates of the levels of competitiveness and environmental competitiveness based on available data. The determinants of an influx of investors and, consequently, the development of industries in a given region comprise: well-developed infrastructure, qualified workforce resources and useful environmental assets. A growing number of business enterprises which contribute to the development in a region is a factor responsible for deteriorating natural conditions. On the other hand, owing to the economic growth, higher inputs are invested into the measures which prevent further degradation of nature, for example facilities and installations to reduce atmospheric pollution and investments into other durable forms of nature protection. This observation can be supported by the calculated coefficients of correlation between the competitiveness of a region and its environmental competitiveness, which implicated a negative but weak correlation. The uneven distribution of natural resources and assets across the country can give rise to a region's environmental competitive advantage, as well as a source of additional benefits derived by business entities, which determine the economic growth of a given region.

The contribution of the authors

Agnieszka Napiórkowska-Baryła – 60%

Karolina Rozenek – 30%

Małgorzata Grzywińska-Rapca – 10%

Literature

Local Data Bank, www.bdl.stat.gov.pl [20-11-2016]

Baumgartner J. (2008), *From Sustainable Development to Management of Sustainable Ecosocial Systems*, "Problemy Ekorozwoju. Problems of Sustainable Development" Vol. 3, No. 2, p. 15-19

Bojer E. (2001), *Bezpośrednie inwestycje zagraniczne w obszarach słabo rozwiniętych*, Warszawa

Gray W.B. (1987), *The cost of regulation: OSHA, EPA and the productivity showdown*, "American Economic Review" Vol. 77, No. 5

- Jaffe A.B., Peterson S.R., Portney P.R., Stavins R.N. (1995), *Environmental regulation and the competitiveness of U.S. manufacturing: What does the evidence tell us?*, "Journal of Economic Literature"
- Karmowska G. (2011), *Badanie i pomiar rozwoju regionalnego na przykładzie województwa zachodniopomorskiego*, www.wne.sggw.pl [12-11-2016]
- Kasztelan A. (2010), *Środowiskowa konkurencyjność regionów – próba konceptualizacji*, "Problemy ekorozwoju. Problems of Sustainable Development" Vol. 5, No. 2, p. 77-86
- Mączka L., Kudełko J. (2005), *Polityka regionalna Polski w aspekcie integracji z Unią Europejską*, Kraków
- Pastuszka S. (2012), *Polityka regionalna w Unii Europejskiej – cele, narzędzia, efekty*, Warszawa
- Pietrzyk I. (2000), *Polityka regionalna Unii Europejskiej i regiony w państwach członkowskich*, Warszawa
- Radwan-Roehrenscheff M. (1998), *Polityka Regionalna Wspólnot Europejskich – definicje*, Warszawa
- Słodowa-Helpa M. (2009), *Zrównoważony rozwój a konkurencyjność. Wyzwania oraz dylematy*, in: Kielczewski D. (ed.), *Od koncepcji ekorozwoju do ekonomii zrównoważonego rozwoju*, Białystok 2009
- Tomaszewski K. (2007), *Regiony w procesie integracji europejskiej*, Kraków
- Winiarski B. (1999). *Konkurencyjność regionów a cele polityki i kierunki strategii rozwoju regionalnego*, in: Korenik S. (ed.), *Przekroje regionalne w polityce ekonomicznej*, Wrocław