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Level and determinants of sustainable rural development in the Region of Green Lungs of Poland[1]

Abstract: *The research was composed of two parts. In the first one, an attempt was made to determine spatial variations in the level of sustainable development of rural areas in the region of Green Lungs of Poland by means of taxonomic analysis. The level of sustainable development was presented as a meta-feature made up of three components: environmental, economic and social. The environmental component, which was the most difficult one to operationalise, was defined with the use of the typical pressure-state-response framework. The economic component was understood as characteristics of the agricultural and non-agricultural sectors, economic activity characteristics, and the level of affluence (budgets) of rural communes. The social component was described by demographic structure, educational characteristics, social activity and living standards. The second part of the research project was designed to identify factors determining the current picture (level) of sustainable rural development within the region of Green Lungs of Poland. The main rationale for conducting the research, in the context of objectives and methods used in its first stage, was to verify the hypotheses proposed, select partial variables, and supplement the analysis with some important content to allow a more valid interpretation of research findings.*

Keywords: *sustainable development; level of development; rural areas; the Green Lungs of Poland*

Introduction

Defining the level of sustainable development is a certain idea which lacks reliable (unambiguous, typical) reference in literature. Sustainable development still remains not measurable enough. The possibilities of addressing this

1 This research was made within the national scientific project on "Social and Economic Preconditions of the Sustainable Development of the Green Lungs of Poland Rural Areas in the NATURA2000 Network". The project was financed by the Ministry of Science and Higher Education.

idea in a measurable way are quite limited. This is why, in this study, endeavors have been made to translate 'the language of theory' into 'the language of empiricism'. Such an approach calls for the use of certain simplifications (especially in terms of interpretation). Thus, this analysis is, first and foremost, based on arbitrary decisions of the investigators, which have been supported by professional comments of a group of theoreticians as well as practicians who are unquestionable experts in the subject concerned. The innovativeness of this study manifests itself by:

1. dual methodological approach involving (1) a multi-criteria analysis of sustainable development level components and (2) factor analysis.
2. spatial scope of the analysis, which includes a homogeneous area of the Green Lungs of Poland (341 administrative units), at NUTS5 level, excluding urban areas. The selection of variables which could well describe the issue under investigation for such an area, was quite a difficult task (although not impossible!), mostly due to the fact that data to be included in the study and concerning all units, had to be collected in an identical way, i.e. using the same methodology. Comparativeness turned to be a problematic issue, even in the case of data obtained from Central Statistical Office of Poland.

Definition of sustainable development

Sustainable development involves the development of three realms ensuring fair living conditions. They include: natural capital, material and financial capital, as well as social and human capital. To pursue this type of development is to ensure a durable improvement of life quality through integrating and determining adequate proportions among the three types of capital in question. Sustainable development being defined in this way, the above mentioned fields of development have been assigned three mutually integrating domains, i.e. environmental, economic and the social one. It is necessary to highlight that we did not use the strict definition of the sustainable development. It was rather a theoretical construct that was made only for a purpose of this research.

Region of the research

In the beginning The Green Lungs of Poland were an idea that was born in 1983. It was based on the integration between environmental protection and economic development along with civilization progress in the north-eastern part of the country. The agreement concerning complex environmental protection and sustainable development of regions was signed by regional representatives in 1988. Polish parliament declared a statement in 1994, saying that the Green Lungs of Poland was the region where the sustainability idea should be consistently applied and observed.

The region of the research was an area of the Green Lungs of Poland located in the north-eastern part of the country (Figure 1), in the entire podlaskie region, in 98% of the communes total number of the warmińsko-mazurskie

region, near 37% located in the north-eastern part of mazowieckie, 24% located in eastern part of kujawsko-pomorskie and only 4% of pomorskie region communes. The Green Lungs of Poland consists of the relatively ecologically clean and unspoiled areas. Presently, their total size is nearly 61 000 square kilometres or over 19% of the whole country area, which is inhabited by almost 10% of population. The Green Lungs of Poland include the largest environmental protection areas of the country: 4 National Parks, 13 Landscape Parks and over 260 nature reserves. Around 40% of the Green Lungs of Poland area is under the legal environmental protection of different forms.

Figure 1. Area of the Green Lungs of Poland and the regional division of the country
Source: own study

Spatial diversity of sustainable development level

This analysis presents the issue of spatial diversity in the level of sustainable development . The main goal of the analysis was to define a synthetic index for the evaluation of sustainable development components. Basic issues under analysis have been streamlined to the following questions:

- What is the spatial distribution of synthetic evaluation of sustainable development components?
- Is there a statistical relationship between sustainable development components?

The study was conducted in rural areas of the Green Lungs of Poland, i.e. in 341 rural communes (excluding urban areas). This analysis is exhaustive and static. In this research we used data mostly from year 2006, but some of them originated from previous years, even from 2002, for example Census. This situation was due to a limited access to certain data for 2006 for the NTS5 level, for example regarding inhabitants income sources, economic activity and agricultural issues.

Assumptions

Empirical approach to the issue calls for extremely precise translation of the term 'sustainable development level' into the language of empirical indexes, by means of which an evaluation of the level shall be made in spatial dimension. Since definitions are not unequivocal it was decided that a term 'synthetic evaluation index of sustainable development level components' shall be used as a synonym for the level of sustainable development. It was presented as a meta-characteristic constituting three components: environmental, economic and social (Figure 1). Environmental component, i.e. the most difficult one to be measured, has been defined using Pressure-State-Response model. It was defined by means of variables describing pressure on natural environment, the level of environmental attractiveness, as well as environmental protection. Economic component was understood as characteristics of agricultural and non-agricultural sectors, characteristics of economic activity (i.e. job market attractiveness) and the amount of commune resources (i.e. management of funds by a territorial unit). Social component was defined by demographic structure, characteristics of education system, social viability (involving also local government animation) as well as living conditions (where infrastructure has been taken account of).

Each of the above mentioned aggregates was defined by several empirical indicators. The selection of variables was deliberate as it took account of multi-aspect and complex character of sustainable development along with the access (often quite restricted) to adequate statistics (especially in the case of the first component). Time-consuming and multi-stage selection conducted by a number of experts resulted in the choice of 49 basic variables for the purposes of the main analysis (Table 1). These basic variables were grouped into eleven subcomponents such as Economic activity, Budget of communes, Agriculture, Non-agricultural activities, Demography, Education, Social activity, Living Conditions, Pressure on environment, Natural attractiveness, Environmental protection. These subcomponents in effect, made up three components: economic, social and environmental (Figure 2).

The result of such an analysis always depends on the type of indicators used and the way of using these indicators. In any case, the selection of indicators is the resultant of data availability and arbitrary decisions of investigators.

Table 1. List of 49 basic variables concerning the sustainable development

Nº	Name of Variable
	Component: ECONOMY
	Subcomponent: Economic activity
1.1	Registered unemployment per 100 persons at working age
1.2	Persons employed only or mainly in agriculture
1.3	Non-agricultural employment ratio (employees in non-agricultural activities vs. employees in agriculture
1.4	Employment rate (share of employees in the total population at working age)
	Subcomponent: Agriculture
2.1	Share of private farms (more than 1 ha) producing mainly for the market
2.2	Share of private farms managed by persons with secondary, post secondary and higher agricultural education
2.3	Average size of the private farm
2.4	Share of private farms with non-agricultural economic activity
2.5	Number of supported farms financed from the RDP (Activities II, III and IX) from years 2004-2006 per 100 farms
	Subcomponent: Non-agricultural activities
3.1	Share of persons employed in services (tertialization of the local economy)
3.2	Share of households without any holder of private farm + plots
3.3	Register private firms per 1000 persons at working age
3.4	Ratio of private firms and public entities from the public services' sector
	Subcomponent: Budget o communes (local self-government entities)
4.1	Own revenue of local self-government entities per capita
4.2	Revenue of the local self-government entities from personal income tax and corporation tax per capita
4.3	Funds for additional financing of commune tasks from non-budgetary sources
4.4	Share of investment expenditures in the total expenditures of the local self-government entities
	Component: SOCIETY
	Subcomponent: Demography
5.1	Share of population at working age
5.2	Demographic dependency ratio
5.3	Feminization ratio (females at reproductive age per 1000 males)
5.4	Internal migration attractiveness ratio
5.5	Natural increase per 1000 inhabitants
	Subcomponent: Education
6.1	Gross education ratio for people between 18 and 24 years
6.2	Share of population with secondary, post-secondary and tertiary level of education
6.3	Average score at the final exam of primary school
	Subcomponent: Social activity
7.1	Attendance in parliamentary elections in 2006
7.2	Share of communes' councilors with secondary, post-secondary and tertiary level of education
7.3	Number of NGOs per 1000 inhabitants
7.4	Number of cultural events per 1000 inhabitants
7.5	Expenditures for culture and national heritage by local self-government entities per capita
7.6	Value of donation from the SAPARD Program Activity III from year 2002 per capita
	Subcomponent: Living conditions
8.1	Share of new built dwellings (years 1989-2002) in total inhabited dwellings
8.2	Expenditures for social welfare by local self-government entities per capita
8.3	Share of population maintained from non-earned sources of income in total population
8.4	Average usable floor space of dwellings per capita (m2)
8.5	Share of dwellings fitted with water-line system in total inhabited dwellings

	Component: NATURAL ENVIRONMENT
	Subcomponent: Pressing on environment
9.1	Not segregated municipal waste collected per 100 inhabitants (in tons)
9.2	Livestock in terms of large heads per 100 ha of agricultural area
9.3	Percentage of population serviced by municipal waste water treatment plants
9.4	Percentage of dwellings fitted with central heating system of total inhabited dwellings
	Subcomponent: Natural attractiveness
10.1	Share of forest lands in total area
10.2	Share of meadows and pastures in total agricultural land area
10.3	Tourists attractiveness of the terrain's relief
10.4	Tourists accommodated per 1000 inhabitants
	Subcomponent: Environmental protection
11.1	Number of decisions given out for donation (Activity IV of the RDP for Poland) from years 2004-2006 per 100 farms
11.2	Share of protection areas in total area
11.3	Investments outlays for environmental protection by the local self-government entities per capita
11.4	Expenditures for environmental protection by local self-government entities per capita
11.5	Share of the NATURA2000 area in total area

Source: own elaboration

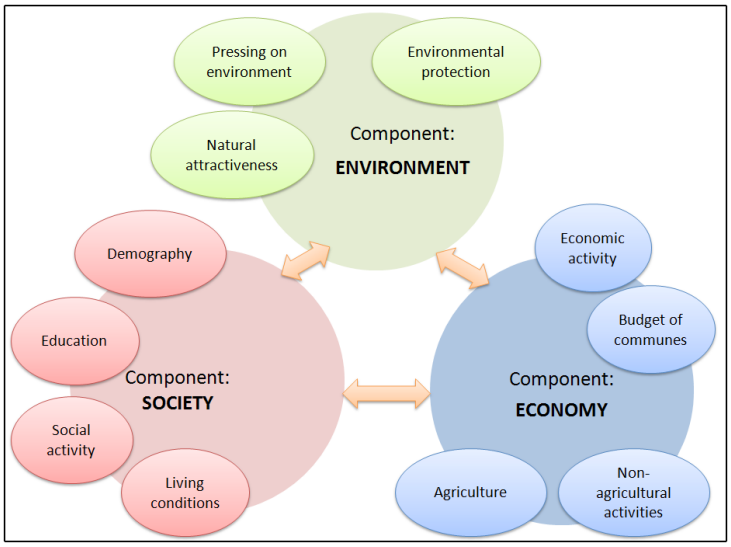

Figure 2. Structure of sustainable development analysis which was applied in the study
Source: own studies

Method of analysis

Analysis of components of sustainable development level features a very wide cognitive spectrum, including conditions governing in particular domains. For this reason the use of multi-criteria taxonomy is well justified. The proposed procedure of analysis includes conducting a separate taxonomic analysis and defining particular values of a composite measure for each criterion (subcomponent) separately. Based on this, a general evaluation of the phenomenon under investigation may follow. Figure 3 shows subsequent

phases of generalization of results. Due to limited editorial capacity the authors shall present only the results of statistical analysis which contributed to the definition of spatial diversity of the level of sustainable rural development of the region known as the Green Lungs of Poland, i.e. the highest level of generalization.

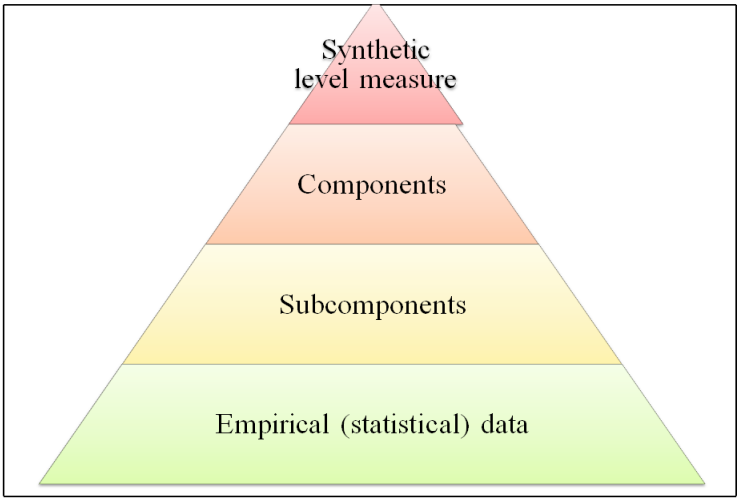

Figure 3. Measure generalization stages
Source: own studies

For the purpose of assessing the level of development a nonstandard method was applied, i.e. Perkal's index (Chojnicki, Czyż 1991). This method features simplicity as well as little loss of information during aggregation, and involves a construction of a synthetic index which is a sum of standardized values of partial indicators. In our analysis the index has been constructed on the assumption that all factors (characteristics) are equivalent. Similarly, the same weighs have been used for groups of variables of higher levels of aggregation (components and synthetic indicator) which were taken account of in the calculation. The synthetic Perkal's index is calculated based on the following formula:

$$s_i = \frac{1}{n}\sum_{j=1}^{m} m_i z'_{ijn}$$

where z'_{ij} - standardized value of jth characteristics in ith object, following the exchange of destimulants for stimulants, n - number of objects, m_i - weight coefficient of i-numbered characteristic, and:

$$\sum_{i=1}^{I} m_i = 1$$

The analysis of the development level of particular sustainable development domains was the starting point for its synthetic characterization. Sustainable development level, or strictly speaking – synthetic evaluation index of sustainable rural development level of communes referred to as the Green Lungs of Poland was treated as a resultant of three components: environmental characterization, economic characterization and social characterization. Each of these components is an aggregate of characteristics which describe factors influencing rural development. One can thus assume that particular development fields and their characterizations (sets of empirical features) are interrelated, however, they are of independent character in general (Majewski 2008, *Zróżnicowanie poziomu …* 2007, *Wskaźniki zrównoważonego …* 2005, Bołtromiuk 2003).

The resulting multi-criteria classification enables general evaluation of the phenomenon subject to analysis. For graphic evaluation of spatial distribution of the synthetic measure for the evaluation of components of sustainable development of rural communes located in the Green Lungs of Poland groups were formed using quintile algorithm, i.e. by dividing a set of communes into five equal classes (á 20% units each, i.e. approx. 68 communes). The groups feature very low (quintile 1), low (2), average (3), high (4) and very high (5) development level.

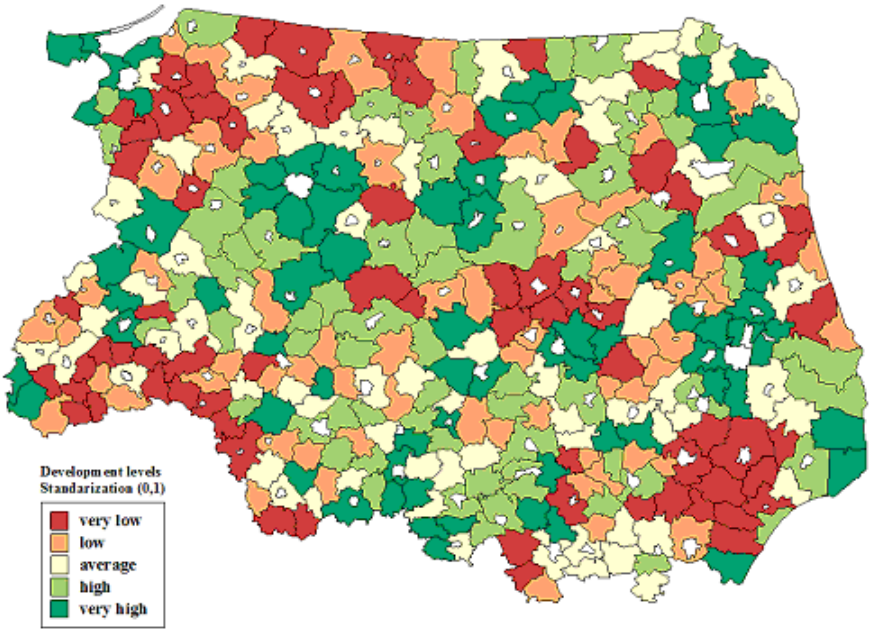

Figure 4. Classes of measure assessing sustainable development components
Source: own studies

The use of Perkal's method (Figure 4) resulted in a strongly diversified picture of spatial distribution of communes with different development levels. This picture refers, at least to a certain degree, to some evaluations concerning regional development analyses (Węcławowicz 2002, Dutkowski 2001). The best developed communes are concentrated mostly within quasi-metropolitan areas around main urban centers of the Green Lungs of Poland: Olsztyn and Białystok. Also, the influence of Elbląg, Suwałki, Toruń and Warszawa becomes noticeable. High indexes were also noted in communes having specific, structured economies, mainly based on tourism. This group comprises communes which feature many tourist attractions, such as: Mikołajki, Ruciane Nida, Giżycko. This group also comprises the so called 'transformation success' communes which successfully managed to achieve multi-functional development. These communes are located around a dozen small towns and localities.

The system of the best developed rural areas extends spatially onto the zones demonstrating a high degree of development (communes grouped in quintile 4). Generally speaking, they are usually communes neighboring the best developed communes. Some of them are also located along traditional transportation routes: Warsaw – Olsztyn, Warsaw – Białystok.

On the other hand, relatively worst developed communes (classified in quintile 1) present a considerable contrast to the system of very well developed communes, described above. These least developed units are located in the vast peripheral zones of the Green Lungs of Poland. These include peripheral communes located on the very border of provinces as well as those located near the borderline. Special attention should be paid to complexes of communes featuring poor and very poor development level. They are mostly mono-functional peripheral units (in terms of regional and national peripheries) located in distant areas which are difficult to reach by a public transport, and have been suffering from different problems (Bański, Stola 2004, Stola 1991). The map of the least developed communes overlaps with the map of mono-functional agricultural regions featuring low level of agricultural management, demographic problems (depopulation, migration), social problems (prevalence of elderly persons and women) and low level of investment.

In order to investigate a relationship between the components of sustainable development the chi-square test for independence was used. The chi-square test tests whether variables, according to which statistical population was divided, are independent. This is a chi-square distribution statistics with d-p-1 degrees of freedom. Zero hypothesis, which is verified by us in this case, provides that: N-element random sample originates from such a general population, in which variables feature stochastic independence. Zero hypothesis is rejected if the so called theoretical statistics value chi-square is smaller than chi-square empirical value of statistics established by means of a relevant formula

(Kędelski, Roeske-Słomka 1995). Theoretical value of chi-square statistics can be read in the table of critical values distribution for this test.
Empirical value of this test for the classification of communes by social component and economic component equaled 93.7 (theoretical value = 26.3). This allowed for rejecting the hypothesis on independence at the level of significance equaling 0.05, which confirms statistically significant relationship between the variables according by which communes were divided. The conclusion, thus, is that (at 95% degree of trust) there is a proof of relationship between the spatial distribution of the synthetic measure of economic component and the analogous social component. This relationship is quite strong, which can be demonstrated by the value of the adjusted contingence index: 0.68.

The hypothesis concerned has also been verified as for the relationship of the environmental component with economic component for the development level, and later, with social component. This time the chi-square test did not confirm the relationship between environmental and economic components, or between environmental and social components. Empirical value of this test in the case of environment-economy relationship equaled 20.1, and the environment-society relationship – 15.9 and did not exceed a critical value at the significance level 0.05, which equals 26.2. Thus, we cannot prove current relationship between the variables analyzed.

Summary

The most important generalizations resulting from the above analysis:

- There is no statistical relationship between the level of environmental development and the levels of economic or social development.
- A high level of economic development is statistically strongly related with the high level of social development.
- The highest level of economic and social development is the feature of rural areas located near urban centers.

However, the relationships presented above should not be treated as universal, especially in terms of their degree of influence; they should be treated as true with respect to the analyzed set of communes.

Determinants of sustainable development of rural areas located in the Green Lungs of Poland

The second stage of the analysis focused entirely on two goals concerning:

1. Identification of factors which are key determinants of general level of sustainable development (sustainable development determinants) – this was the main goal of this analysis.
2. Definition of the character of the selected factors, i.e. giving the names to those factors, which complements the main goal and which was inseparable and crucial procedure of factor analysis – the basic method used in this analysis.

Methodology

Economic, social and environmental development, and most of all – sustainable development called (due to its specificity, i.e. diverse and complex phenomena and processes of its description) for the selection of the most effective ways possible to establish their real effect on contemporary rural areas. Factor analysis – one of fundamental methods of multidimensional analysis, was acknowledged as the one which fulfils these conditions to a great degree.

The starting point for factor analysis was an identical set of partial variables selected for the analysis of sustainable development level analyzed at the first stage. A high complexity of the sustainable development, but mainly environmental component, revealed itself in the significant number of often poorly correlated variables. This situation made us to look for a proper method of factors' selection. Principal component method - the one which is most often used for this purpose - proved useless, because its results were difficult to interpret. Thus, it was necessary to use an alternative method, which is called as of the most reliable factors - factors having the highest explanatory value. In addition, each of the factors was subjected to rotation, in order to end up with the so called simple factor structure. It means the structure of factor loadings, which is relatively uncomplicated to interpret (Czyż 1971). The number of factors selected for further analysis depended chiefly on the percentage of variance brought in by these factors. In other words, these factors could explain the relatively greatest degree of variance. Thus, they could be called decisive determinants.

Results

Varimax rotation served to choose four main factors. They were a subject to further, detailed analysis and interpretation. The total variance explained by the 4 factors was in this case close to 43% (forty three). It proved that the structure of the factor loadings was relatively set in order. Moreover, it was a sign that we dealt with a diversified level of the three components.

Factor 1 (F_1) – accounting for over 18% of the differentiation of the whole population – has been called Income Sources Factor, because it exhibited a strongly positive correlation with employment rate (0.83), people employed only or mainly in agriculture (0.79) and the share of new built dwellings (-0.72), and a strongly negative relationship with the share of population maintained from non-earned sources of income (-0.90), expenditures for social welfare by local self-government entities per capita (-0.67), registered unemployment rate (-0.65), average size of the private farm (-0.65) and non-agricultural households and plots of agricultural land (of the areas smaller than 1 ha) (-0.66).

Thus, Factor 1 has been affected by two opposite groups of demographic and economic phenomena and processes. On the one hand, we have a considerable workforce resources used in agriculture, which – to some extent - make up

a hidden unemployment. In fact, it significantly increases the level of employment. In the second group we can find the elements of the share of population maintained from non-earned sources of income, this is: the registered unemployment, which defines the amount of social needs, and the expenditures for social welfare by local self-government entities, which indicate the amount of aid. The employment rate, as it was mentioned before, also depends on the average size of farm (that is the workforces' needs) and the household character (related to agriculture or not).

The spatial distribution of values for Factor 1 revealed a clear division of the research region into two types of areas from the income sources point of view. The first type we can find in mazowieckie region and mostly in podlaskie region, where employment (mainly in agriculture, in family farms) was the main source of income. In effect, it was reflected in a high level of the total employment. The second type was represented by communes of warmińsko-mazurskie region, with a prevalence of non-earned sources of income this is social welfare in this case and in south-eastern part of podlaskie region, with a high rate of the elderly - maintained from pensions in this case.

The Factor 2 explained as much as 11% of the variance. Moreover, it revealed a strong positive correlation with the non-agricultural employment ratio (0.84), share of people employed in services (0.85), income of the local self-government entities from personal income and corporation tax per capita (0.72), as well as the internal migration attractiveness ratio (0.64) and the share of population with secondary and the higher levels of education (0.60). This is why Factor 2 was called the Entrepreneurship Factor, I mean non-agricultural entrepreneurship. Significant number and concentration of non-agricultural businesses leads to a high level of non-agricultural employment, for example in high specialized services, which are characteristic for urban economy. An important contribution to this trend is that some part of rural population is employed in industry and services in the towns and cities nearby.

The concentration of diversified economic non-agricultural activities results in a relatively high incomes of the local self-government entities from personal income and corporation tax. This is typical of suburban zones of the larger cities (Białystok and Olsztyn, this is capitals of regions), subregional centres (Elbląg, Łomża, Ostrołęka and Suwałki, I mean capitals of former voivodship, before the administrative reform), as well as communes located within the peri-urban zone of Warsaw and areas with the highest tourist attractiveness (Great Lakes of Masuria, Białowieska and Augustowska Primeval Forrest, Nadbużański Landscape Park and others). In other words, a high intensity of entrepreneurship prevails in areas where the possibilities of using the advantage of the location rent are the greatest - I mean - within the influence of the largest cities, most important communication routes, border crossings or regions famous for tourist attractions.

Table 2. Part of the factorial loadings table for sustainable development (the strongest correlations)

N°	Name of variable	F1 „Income Source Factor"	F2 „Entrepreneurship Factor"	F3 „Demographic Potential Factor"	F4 „Green Area Factor"
	Component: ENVIRONMENT				
1.1	Share of forests and forest lands	-0.06694	0.242629	-0.104389	**0.781113**
1.2	Share of meadows and pastures	0.068524	-0.117837	-0.074311	0.573202
2.4	Share of inhabitated dwellings by heating system	-0.026805	0.354258	0.629662	-0.333286
3.5	Share of area under the NATURA 2000 network	-0.071648	0.114698	-0.030892	0.62404
	Component: ECONOMY				
4.1	Register unemployment rate	-0.651403	0.017974	0.460965	0.113904
4.2	Employed only or mainly in agriculture (at working age)	0.787954	-0.233752	-0.111301	-0.076429
4.3	Employed in non-agricultural activities rate	-0.167429	**0.837973**	0.280426	0.037316
4.4	Employment ratio (at working age)	**0.831373**	-0.273462	-0.398759	-0.12782
5.1	Share of private farms producing mainly for the market	0.254924	-0.645459	0.119009	-0.537054
5.3	Average size of private farm	-0.653871	-0.297988	0.342849	-0.274354
6.1	Share of employed in services	-0.180617	**0.854266**	0.275093	0.101362
6.2	Share of households without any holder of private agricultural farm (holding) + plots	-0.6598	0.527158	0.433148	-0.063341
7.2	Own revenue of communes (personal ioncome tax, corporation tax) per capita	0.057706	0.719648	-0.023505	0.094481
	Component: SOCIETY				
8.1	Share of population at working age	-0.292746	0.488886	0.716182	-0.049603
8.2	Demographic dependency ratio	-0.014611	-0.089915	**-0.955514**	0.015276
8.4	Migration attractiveness ratio	0.185394	0.634522	0.15113	0.115485
8.5	Natural increase per 1000 population	-0.120294	0.10179	0.890285	-0.019905
9.2	Share of population with the high and medium level of education	0.101181	0.602942	0.013223	0.024938
11.1	Share of new built dwellings (years 1989 - 2002)	0.71635	0.349268	0.093816	0.059375
11.2	Expenditures of communes for social welfare per capita	-0.666414	0.040515	0.246676	0.052468
11.3	Population maintained from non-earned sources of income	**-0.900276**	0.066313	-0.265103	0.119844
11.4	Average usable floor space of dwellings per capita (m²)	0.304379	0.18678	-0.722445	0.086474
	Share of factors in explaining the variance	**18.21619**	**10.82582**	**9.70853**	**4.1525**

Source: own studies

What is more, intensive suburbanization processes have been taking place in the closest zones of the larger cities for the recent dozen years. One of their symptoms is the immigration of urban population. It has changed demographic structures, including education structure and of course the average wealth level. This is why factorial values of the Factor 2 are so high in this type of areas located in the Green Lungs of Poland.

Factor 3 explained almost 10% of variance and was called as a Demographic Potential Factor. Its structure has been determined mostly by strong relationship with the demographic dependency ratio (-0.96), natural increase per 1000 inhabitants (0.89), and the share of population at working age (0.72). There was also a strong correlation with the average usable floor space of dwellings per capita (-0.72), but we should suppose that in this case the high values in podlaskie region were mostly affected by low population density, resulted from the intensive depopulation processes.

We can find relatively high values of Factor 3 in communes located in warmińsko-mazurskie region, this is in the areas commonly regarded as demographically 'young'. Thus, the demographic dependency level wasn't there so high. Additionally, majority of inhabitants living in the northern

part of the research region had a wider access to the basic infrastructure networks, central heating for example, than in podlaskie and mazowieckie region. On the other hand, communes with low factorial values were concentrated in podlaskie and eastern part of mazowieckie region. But there, the percentage of 'old' population is the highest not only within the Green Lungs of Poland, but also in the country. We firmly believe that the deformation of population age structure was mostly the result of increased migration of the 'young' to the urban areas and due to evident decrease in birth rate. We can highlight that the intensive depopulation process is a large-scale problem in the eastern part of Poland.

The Factor 4 explained only 4.2% of the whole variance. It was called the Green Area Factor, due to a strong correlation with the share of forest lands (0.78) and the share of the NATURA 2000 area in total area of communes (0.62). The analysis also revealed relations (but, to a smaller extent) with the share of meadows and pastures (0.57). The highest factorial values in this case were found mostly in areas covered with great, primeval forests (Augustowska, Biała, Białowieska, Knyszyńska and Piska) and with concentration of grassland and meadows (in the western part of Kurpiowska and Romincka Forest).

Multi-factor analysis that takes into account factorial values for each of the four factors using the Perkal's index enables us to identify the general level of sustainable development. A significant concentration of communes with a high level of the phenomenon was revealed in suburban zones of larger cities that is Białystok, Olsztyn and Warsaw and the regions touristically attractive. It can be a confirmation of a strong influence of variables of economic and social components. As it was mentioned before, two factors accounted for nearly 30% of the whole variance. The influence of environmental component variables appears more clearly in the last factor selected, which accounts for less than 5%.

Relatively low values appeared mostly in peripheral areas of warmińsko-mazurskie region (in the communes with former state farms), as well as in peripheral areas of podlaskie region (due to the intensive depopulation process). General characteristic of these areas was determined by the high level of social needs of local population, with numerous inhabitants maintained from non-earned sources of income, low internal migration attractiveness rate and low population growth.

Summary

This study enabled us to identify the key determinants of sustainable rural development within the area of the Green Lungs of Poland. The analysis revealed the greatest influence of the factors concerning income sources, entrepreneurship, demographic potential and "green areas", but with a significant prevalence of social and economic domains. The influence of environmental component was stronger only in the last, fourth factor, which explained less than 5% of vari-

ance. This meant that sustainable rural development of the Green Lungs of Poland was mostly determined by social and economic phenomena and processes. It was affected directly not only by the relatively uncomplicated structure of economic and social components' variables, but also by the complex structure of environmental component, resulting chiefly from a relatively poor correlation between its basic indicators. In addition, the so-called high complexity of the environmental component was affected by the highest dispersion and asymmetry of values among three components, the situation when the phenomenon or process didn't exist (magnitude zero) and relatively low number of environmental variables. Moreover, disparities between environmental and socio-economic issues, concerning the general statistics quality and availability, were probably of a negative influence. At the NUTS5 level we can find much more categories concerning social, demographic and economic phenomena and processes, than those connected with environmental domain.

Furthermore, we can point out other specific difficulties resulting from the contextual character of natural environment. It's necessary to underline that the social and economic issues are much more uncomplicated to be evaluated as positive or negative ones, than the issues concerning natural environment. We can point out two types of equivocal indicators. The non-segregated municipal waste collected per 100 inhabitants can be the example of the first type. It can't be stated definitely that the relatively high value is positive or negative in this case. In reality it depends on what is important for evaluators. The fact that waste was collected could be a positive action, while the fact that it wasn't segregated - negative. The second type of indicators may for example concern the livestock per 100 ha of agricultural area, and in this situation the evaluation depends on the point of view. The high indicator value could be recognized as positive by farmers, but not necessarily by tourists or ecologists, because of the livestock strong pressure on the natural environment.

Finally, there exists a strong necessity to obtain much more detailed statistical data regarding environmental issues. Moreover, it can be difficult to make a research on sustainable development without finding a statistical method, which will enable us to recognize a real character of environmental phenomena. Furthermore, in the future, quantitative research concerning sustainable development, it should be considered weighting of each variable and, consequently, of each component in order to minimize the prevalence of socio-economic domains over environmental ones, which results from the different access to statistical data.

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