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ANALYSIS OF SPATIAL RELATIONSHIPS BETWEEN LEVELS OF SUSTAINABLE DEVELOPMENT OF GREATER POLAND DISTRICTS

Abstract: The purpose of this paper is to rank the Greater Poland districts using 2015 data and to perform the spatial autocorrelation analysis based on the developed synthetic measures of sustainable development. Based on a selected set of diagnostic variables, a proprietary synthetic measure of sustainable development was created. The use of a synthetic measure, which describes the objects with a single aggregated value rather than with a series of variables, enabled the measurement of the multidimensional differentiation between sustainable development levels, and allowed to rank the objects. The survey covered 35 districts of the Greater Poland province. The TOPSIS method was employed, and the spatial autocorrelation analysis was based on the (local and global) Moran's *I* statistics.

Keywords: sustainable development, spatial autocorrelation.

INTRODUCTION

Since the industrial revolution, economy has been developing faster than the social and environmental spheres. Due to growing threats to human existence caused by excessive consumption and pollution of natural resources, specific reports[15] have been published since the 1960s to warn of the destructing human activities and their possible consequences, giving rise to the sustainable development concept. Sustainable development was supposed to be a way of harmonizing the progressing economic growth and the enhancements to the natural environment. Today, because of the essence of this problem, references to that principle are made in multiple strategic[16] and political documents (in that context, Polish authors often emphasize that sustainable development assumptions were found to be one of the basic principles underpinning the national political system and were addressed in may ways, including in Article 5 of the Constitution of the Republic of Poland).

It appears self-evident that sustainable development, whether considered on a micro- or macroeconomic level, is a popular topic among economists and has nowadays become a quite broadly described paradigm. However, as regards Poland, the author of this paper believes there is a shortage of empirical analyses of spatial relationships between specific local government units (e.g. districts) in terms of sustainable development levels. Therefore, this paper attempts to identify the spatial relationships between synthetic sustainable development measures at the district level. The survey covered all of the 35 districts of the Greater Poland province. As sustainable development is an umbrella term, this study used TOPSIS-based taxonomic measures which describe the items under consideration with a single, aggregated figure rather than with multiple characteristics, making the analysis easier. The next step was the analysis of spatial autocorrelation (based on the developed proprietary measures of sustainable development) in order to determine the strength of spatial relationships between the districts in terms of the subject matter of this study. The main criterion for selecting the variables was their completeness and availability for all items under

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[15] In this context, the following should be mentioned: the 1968 U Thant's report ("Man and his environment") and "The limits to growth," a report published in 1972 by the Club of Rome, discussing the future fate of humankind.

[16] The sustainable development concept was reflected in documents such as the "Poland's energy policy by 2030," "National transport policy for 2006-2025," or the "Poland's climate policy: policies for greenhouse gas emissions in Poland by 2020."

consideration in 2015. The source of data related to specific subsystems of sustainable development was the Local Data Bank of the Central Statistical Office.

THE SUSTAINABLE DEVELOPMENT CONCEPT

Scientific papers and various legal acts provide different definitions of sustainable development by placing emphasis on various aspects of this interdisciplinary category. That term was introduced during the Stockholm UN conference in 1972. A definition often referred to in the relevant literature is the one formulated for the purposes of the "Our Common Future" 1987 UN report. Accordingly, sustainable development is a development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs [United Nations, 1987]. Also, R.K. Turner and D.W. Pearce note that the concept of sustainable development is directly related to that of inter-generative justice. They believe sustainable development means that the next generation should not be "worse off" in development terms than the current one. This means leaving the next generation with a stock of capital assets that provide them with the capability to generate at least as much development as is achieved by the current generation [Turner, Pearce, 1992]. B. Poskrobko [1997, p. 7-20] defines sustainable development as running business, developing and exploiting the potential of the environment, and organizing social life in a manner that ensures dynamic development of qualitatively new production processes, sustainable use of natural resources, together with an improvement and, subsequently, maintenance of high living standards. In the Poland's Sustainable Development Strategy by 2025, this term is associated with a development that is "determined by the ecological space while being safe and advantageous to humans, to the environment and to the economy because of the assumed synergy between economic, environmental and social aspects."

Also, sustainable development may be considered as a certain set of characteristics such as balance, self-sustainability and durability. In that context [Fiedor, Kociszewski, p. 170-171]:

- balance means (in the structural aspect) maintaining adequate proportions between the socio-economic need for development and the environmental protection needs,
- self-sustainability means creating provisions and incentives for further development,
- durability means that none of the development components should attenuate during the development process.

W. Florczak specifies the following common features provided for in numerous definitions of sustainable development: rejecting the zero-growth concept in order to reconcile the environmental and socio-economic issues; interactions between development economic, environmental, demographic and social aspects of development; emphasizing the need for the involvement of the entire society in the implementation process of sustainable development principles; the need to analyze the impact of today's decisions on the well-being of future generations; the distributive justice principle; emphasizing the role of intangible aspects of the quality of human life [Florczak 2011, p. 287-288].

It could be assumed with no major reservations that the definitions of the contemplated concept, as clearly outlined in the literature, mainly focus on three aspects. Because the authors often emphasize the environmental aspects, the natural approach may be identified. Also, an economic approach is adopted which lays emphasis on the need to run environmentally-friendly businesses. When defining this term, authors also address the need to improve the population's quality of life and to create a new social life system. Therefore, the social approach to the definition of sustainable development may be identified, too. According to the sustainable development concept, a certain balance between the aforesaid aspects (dimensions) should be sought.

ORDERING AND GROUPING GREATER POLAND DISTRICTS BY LEVELS OF SUSTAINABLE DEVELOPMENT

Due to multiple aspects involved in the sustainable growth concept, it seems reasonable to use taxonomic methods based on a synthetic development measure. The use of a synthetic measure, which describes the objects with a single aggregated value rather than with a series of variables, enabled the measurement of the multidimensional differentiation between sustainable development levels in specific districts, and allowed to rank the objects.

The relevant literature fails to provide a universal list of sub-indicators used to quantify the level of sustainable development of specific geographies. With no major reservations, the following three dimensions may be covered by the analysis of sustainable development: the economic dimension (including the economic and social infrastructure, and the employment structure); the social dimension (including demographic issues, health and culture); the environmental dimension (including forest resources, water and air quality) [cf. Borys T., 2011, p. 75-81; Central Statistical Office, 2011].

As a result of a relevant and formal analysis of variables, 35 sub-indicators were proposed which reflect the levels of sustainable development split into 3 dimensions:

- the environmental dimension: OS1: municipal and industrial wastewater treated vs. total volume of wastewater; OS2: share of population served by treatment plants in the total population; OS3: afforestation rate; OS4: particulate matter emissions by particularly noxious plants per 1 sq. km; OS5: emission of gaseous pollutants by particularly noxious plants per 1 sq. km; OS6: area of walking and leisure parks per 1 sq. km; OS7: share of green areas in the total area; OS8: water consumption per person;
- the social dimension: S1: population density; S2: population growth rate per 1,000 population; S3: infant deaths per 1,000 live births; S4: graduates of junior high schools per 1,000 population; S5: share of apartments equipped with central heating; S6: share of apartments served by gas networks; S7 number of books per 1,000 population; S8: library members per 1,000 population; S9: population per library; S10: population per cinema seat; S11: doctors per 10,000 population; S12: hospital beds per 1,000 population; S13: number of apartments per 1,000 population; S14: number of kindergarten pupils per 1,000 children aged 3 to 5; S15: number of passenger cars per 1,000 population; S16: traffic accidents per 100,000 population;
- the economic dimension: G1: employees per 1,000 population; G2: share of employees in the working-age population; G3: hard-surfaced municipal roads in the district per sq. km; G4: sewage network length per sq. km; G5: water supply network length per sq. km; G6: share of commercial enterprises in the total number of operators registered in the REGON system; G7: permanent marketplaces per 1,000 population; G8: hotel beds per 1,000 population; G9: social foundations, organizations and associations per 1,000 population; G10: output sold per person[17]; G11: CAPEX in enterprises per person.

All sub-variables covered are indicators (rather than absolute values). This is supposed to somehow restrict the distortions resulting from the fact that some objects (districts) demonstrate certain characteristic features (e.g. a significantly larger population or area than other ones). In the second phase, the initial list of variables was subject to verification including the discriminatory capacity and volume of variables (degree of correlation with other variables[18]). Such analyses require that specific observations demonstrate adequate variation because a non-diversified variable is of limited analytical value. The classic coefficient of variation was used to measure the diversification of specific diagnostic variables.

[17] The data relates to enterprises and operators with more than 9 employees.
[18] As two highly correlated variables deliver similar information, it is recommended to eliminate one of them.

For the purposes of this paper, it was assumed that the set of potential variables reflecting the sustainable development level would exclude the characteristics which demonstrate a coefficient of variation below a critical threshold arbitrarily set at 10% (such characteristics are considered to be *quasi-fixed*). Beside variation, an important criterion for the selection of variables is their correlation. To assess the information value, the inverse correlation matrix (a method for the discrimination of features depending on the correlation matrix entries) was used. The inverse correlation matrix was calculated for each thematic sub-group. As the next step, where necessary, the variable with the highest diagonal entry, above the threshold set arbitrarily (r*=15[19]), was eliminated. Afterwards, the inverse correlation matrix was recalculated (for a reduced correlation matrix), and the diagonal entries were checked to see if they exceed the fixed threshold value. That procedure was continued until all diagonal entries were below or equal to that threshold. The above initial set of diagnostic characteristics was reduced due to low differentiation of variables by eliminating OS1, S5, S14, S15. In turn, based on the inverse matrix entries, the following variables were eliminated from the set of potential decision variables: OS5, S1, S9, S10 and G3. Having considered all criteria for the selection of variables, 26 variables were qualified to the ultimate diagnostic set. The nature of each of them was specified (stimulating effect / inhibiting effect / neutral effect). The stimulating variables (from the perspective of the aspect under consideration, high values are desired) included: OS2, OS3, OS6, OS7, OS9, S2, S4, S6-S8, S11-S13, G1, G2, G4-G11. Other ones were classified as inhibiting variables. None of the variables was neutral.

Table 1. Synthetic measure of sustainable development (SMSD) for Greater Poland districts (as at 2015)

District	SMSD	Rank	Group	District	SMSD	Rank	Group
chodzieski	0,4395	7	II	pilski	0,4217	19	III
czarn.-trzcian.	0,4011	25	III	pleszewski	0,4129	22	III
gnieźnieński	0,3933	26	III	poznański	0,4568	4	II
gostyński	0,4415	5	II	rawicki	0,4275	13	II
grodziski	0,4374	8	II	słupecki	0,3715	33	III
jarociński	0,4223	17	III	szamotulski	0,4307	12	II
kaliski	0,3630	34	IV	średzki	0,4220	18	III
kępiński	0,4251	16	III	śremski	0,4110	23	III
kolski	0,3428	35	IV	turecki	0,3885	28	III
koniński	0,3723	32	III	wągrowiecki	0,3845	29	III
kościański	0,3832	30	III	wolsztyński	0,4179	20	III
krotoszyński	0,4323	11	II	wrzesiński	0,4412	6	II
leszczyński	0,3923	27	III	złotowski	0,4034	24	III
m.Kalisz	0,5100	3	I	DIFFERENTIATION			
m.Konin	0,4374	9	II	Minimum	0,3428		
m.Leszno	0,5357	2	I	Maximum	0,6972		
m.Poznań	0,6972	1	I	Average	0,4259		
międzychodzki	0,4263	15	II	Median	0,4220		
nowotomyski	0,4369	10	II	Standard deviation	0,0600		
obornicki	0,4265	14	II	Coeff. of variation	14,08%		
ostrowski	0,4165	21	III	1st quartile	0,3428		
ostrzeszowski	0,3828	31	III	3rd quartile	0,6972		

Source: own study based on the Local Data Bank of the Central Statistical Office.

[19] Diagonal entries of matrix R^{-1} fall into the interval $[1, \infty)$.

One of the main requirements imposed by taxonomic methods on final diagnostic variables is their comparability (the addition postulate). With a view to ensure the comparability of characteristics, a standardization-based normalization process was performed.

To arrange the districts by sustainable development levels, the classic TOPSIS (*Technique for Order Preference by Similarity to an Ideal Solution*) was used. Unlike in the Hellwig's development pattern (commonly used by scientists), the synthetic measure is created based on Euclidean distance both from the pattern and from the anti-pattern. The smaller is the distance from the pattern (and the greater is the distance from the anti-pattern), the higher is the value of the synthetic variable (for a broader description, see Hwang, Yoon, 1981).

The calculated synthetic development measures reflect the districts' standing in 2015 compared to other areas. Based on the synthetic development measures, the districts were ranked by sustainable development level. As shown by the calculations, Greater Poland districts demonstrate quite moderate differentiation in terms of sustainable development levels (which is reflected by several factors, including low values of the coefficient of variation (14.08%) and of standard deviation (0.06)). Note also the narrow interquartile range which also confirms the relative low differentiation of districts in terms of the subject matter of this analysis. As regards 75% of districts, the synthetic measure of sustainable development was not above 0.4357 with a maximum and minimum at 0.6972 and 0.3428, respectively. Also, the synthetic measure demonstrated right-side asymmetry (the coefficient of skewness was 2.96). This means the values equal to or below the SMSD arithmetic mean were dominating. The maximum-to-minimum ratio for the synthetic measure was slightly above 2.03.

The highest levels of sustainable development were identified in urban districts (Poznań, Leszno, Kalisz). A distinctive feature of urban districts is the large disproportion between the synthetic measure of sustainable development in the city of Poznań (0,6972) and the city of Leszno, ranked second, where the SMSD based on 2015 data was lower by more than 30% (0.5357). Another observation are the very low ranks of districts located in the immediate vicinity of urban districts: the Konin district (32nd in the SMSD ranking), the Kalisz district (ranked 34th) and Leszno district (ranked 27th)[20]. It seems that this pattern could be related to the phenomenon referred to as the "big city shadow." Municipal districts are the focal points for a large part of specific components of the entire region's socio-economic potential (including economic operators, significantly better quantitative and qualitative features of the social and economic infrastructure), contributing to lowering the sub-indicators of sustainable development in the corresponding land districts. The lowest levels of the synthetic measure of sustainable development were recorded in districts located mainly at the eastern border of the province which form a large continuous area. Starting from north-east, these are: Wągrowiec district (ranked 29th), Gniezno district (26th), Słupca district (33rd), Konin district (32nd), Koło district (35th), Turek district (28th), Kalisz (34th) and Ostrzeszów district (31st).

Based on synthetic measures obtained with the use of TOPSIS, the districts covered were grouped into four classes by the level of sustainable development, using the threshold method: I: $m_i \geq \overline{m} + c \cdot s_m$; II: high values of the development measure, with $\overline{m} \leq m_i \leq \overline{m} + c \cdot s_m$; III: low values of the development measure, with $\overline{m} - c \cdot s_m \leq m_i \leq \overline{m}$; IV: very low values of the development measure, with $m_i < \overline{m} - c \cdot s_m$; s_m means the standard deviation of the development measure; c is a constant greater than or equal to 1.

Three urban districts, Poznań, Leszno and Kalisz, were classed into the highest sustainable development group. Compared to other ones, that group demonstrates much more advantageous

[20] Except for the Poznań district, ranked 4th.

values of sub-indicators. This primarily includes variables referring to the saturation of specific districts with the social infrastructure (doctors and hospital beds per inhabitant) and economic infrastructure (length of the sewage and water supply networks per sq. km). The second group are districts where the sub-indicators of sustainable development, in most cases, go beyond the average levels, however to a lesser extent than in the first group. This group includes twelve districts which, except for the city of Konin, form two continuous, quite large areas. The first (and the smaller) area is composed of three districts: Krotoszyn district, Rawicz district and Gostyń district. In turn, the second one covers eight districts located (mostly) in the western and central part of the province, namely: Chodzież district, Grodzisk district, Międzychód district, Nowy Tomyśl district, Oborniki district, Poznań district, Szamotuły district and Września district. The third and the largest group (18 districts) is composed of districts with sub-indicators that are usually close to or below the average. The lowest group includes two districts: Kalisz and Koło. It demonstrates particularly low indicators as regards the share of apartments served by gas networks, the density of the sewage network or the number of doctors per 10,000 population (this is especially true for the Kalisz district where that very indicator was 0.86 in 2015, compared to the province average level of 2.91).

SPATIAL AUTOCORRELATION ANALYSIS

Relationships with a both socio-economic and environmental nature very often exist between neighboring local government units. In this analysis, sub-variables related to the sustainable development level often go beyond the conventional administrative borders of the areas under consideration, for reasons which include mobility of the population, linear nature of many infrastructural facilities, and migration of (gaseous or other) pollutants. As a consequence, correlation may exist between neighboring territories. Therefore, spatial autocorrelation should be covered by the analysis of spatial differentiation of sustainable development levels. What is especially important in this context, is the presence of some of kind of sustainable development clusters: large continuous areas which demonstrate high levels of sustainable development. The analysis of spatial relationships allows to determine the strength of relations between spatial units regarding sustainable development levels. Also, it enables the identification of groups of districts with similar levels of the feature concerned.

In such analyses, the basic step is to specify the neighborhood structures with spatial weights reflecting the scope of geospatial interactions between the measures of specific objects (e.g. based on the distance criterion or the common boundary criterion). A properly defined weight matrix should enable an objective representation of similarity between the location and identified attribute values with respect to neighboring objects within the boundaries of the area concerned [cf. Felcenloben, 2011, p. 142-143]. This paper uses the common boundary between districts as the proximity criterion.

The spatial autocorrelation analysis relies on two measure types: global and local measures. Global measures are a single-digit indicator of spatial autocorrelation or general similarity of areas. In turn, local statistics determined for each area allow for answering the question whether a district is surrounded by areas demonstrating high or low levels, or whether it is similar to or different than the neighboring districts [Kopczewska, 2007].

To verify the dependencies between the values of synthetic measures of sustainable development in specific districts and the corresponding values recorded in neighboring districts, the Moran's *I* statistics (both global and local) were calculated. To calculate the strength and nature of correlation throughout the area under consideration, the global Moran's *I* statistic was used, as it may be considered to be the basic statistic used in such analyses. It takes the following form [Suchecki, 2010]:

$$I = \frac{1}{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}} \cdot \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2}, \text{ with:}$$

x_i, x_j: values observed in locations i and j $(i, j = 1, 2, \ldots, n)$, $\bar{x}$: average value in all areas under consideration, w_{ij} : entries of the spatial weight matrix.

The global Moran's *I* statistic calculated for the synthetic measure of sustainable development was positive (0.1253) and, most importantly, statistically significant[21]. Positive autocorrelation means the existence of clusters with similar (low or high) values. For a more in-depth analysis, a dot plot of the global Moran's *I* statistic was produced. The slope of the regression line plotted on the graph is equivalent to the value of the global Moran's *I* statistic.

The next step of this study was to analyze the spatial distribution of variables throughout the territory under consideration, which is enabled by the local autocorrelation coefficients. The local Moran's I_i statistic, one of the Local Indicators of Spatial Association (LISA), was used to discover the share of the global autocorrelation for each location in the area covered by the analysis. For non-standardized variable values and for a weight matrix standardized by rows, the local Moran's I_i statistic is as follows [Suchecki, 2010]:

$$I_{i(w)} = \frac{(x_i - \bar{x})\sum_{j=1}^{n} w_{ij}^{*}(x_j - \bar{x})}{\sum_{i=1}^{n}(x_i - \bar{x})^2}, \; gdzie:$$

w_{ij}: entries of the spatial weight matrix of rank 1 standardized by rows, x_i, x_j: values observed in locations i and j $(i, j = 1, 2, \ldots, n)$; $\bar{x}$: average value in all areas under consideration.

Table 2. Values of the local Moran's I_i statistics

District	I_i	District	I_i	District	I_i	District	I_i
chodzieski	-0,06	koniński	0,85**	nowotomyski	0,03	szamotulski	0,01
czarn.-trzcian.	-0,03	kościański	-0,01	obornicki	0,00	średzki	-0,01
gnieźnieński	0,10	krotoszyński	0,00	ostrowski	0,01	śremski	0,00
gostyński	-0,06	leszczyński	-0,14	ostrzeszowski	0,27	turecki	0,74**
grodziski	0,00	m.Kalisz	-0,63	pilski	0,02	wągrowiecki	-0,03
jarociński	0,00	m.Konin	-0,27*	pleszewski	0,04	wolsztyński	0,02
kaliski	0,27	m.Leszno	-0,98	poznański	0,15	wrzesiński	-0,05
kępiński	0,00	m.Poznań	2,33	rawicki	0,00	złotowski	0,02
kolski	1,30**	międzychodzki	0,00	słupecki	0,39		

Symbols: * statistically significant at $p < 0.05$; ** statistically significant at $p < 0.01$.

Source: own study

As shown by the values of local Moran's I_i statistics calculated for the synthetic measure of sustainable development, the values are statistically significant only in four districts: city of Konin, Koło district, Konin district and Turek district (the value of the local statistic is positive for the city of Konin, and is negative for other districts listed above). Thus, it may be concluded that the city of Konin is adjacent to an area with significantly different values of the synthetic measure of sustainable development, whereas the Koło, Konin and Turek districts are adjacent to areas with

[21] The global statistic significance test was based on the analysis of histograms of the randomized permutation test. The hypothesis was verified based on the pseudo-significance level. The number of permutations was 999.

similar values of the synthetic measure of sustainable development. As regards other districts, values of the local Moran's I_i statistics for the variable under consideration were mostly negative. However, as they were not statistically significant, no particular attention should be paid to these results.

SUMMARY

Recently, an increase of the number of comprehensive measures of sustainable development, employed at various levels of spatial aggregation, has been observed. Despite these efforts, no widely accepted set of sub-variables was established for sustainable development at local level. Neither a method of selecting adequate weights for variables nor a methodology for developing such aggregated measures was created. Due to the multidimensional nature of this analysis, TOPSIS (a taxonomic method) was used to measure the sustainable development levels of Greater Poland districts. The analyses enabled the identification of quite moderate differences in the development levels of the territories under consideration. Based on the defined synthetic measures of sustainable development, the threshold method was used to group the districts demonstrating similar levels of the feature covered by this analysis. The highest levels of sustainable development were reported by three urban districts (Poznań, Leszno, Kalisz) while the lowest ones were recorded in the eastern part of the province. Extremely low values of the synthetic measure of sustainable development were discovered in districts located in the immediate vicinity of urban districts (including Kalisz district, ranked 34th, and Konin district, ranked 32nd). This could be related to the phenomenon referred to as "big city shadow." Urban districts are focal points for a large part of the entire region's socio-economic potential, contributing to lowering many sub-indicators of sustainable development in adjacent areas. To verify the dependencies between the values of synthetic measures of sustainable development in specific districts and the corresponding values recorded in neighboring districts, the Moran's I statistics were calculated. The value of the global Moran's I statistic calculated for the synthetic measure of sustainable development, based on 2015 data, was positive (0.1253) and statistically significant. When analyzing the values of local Moran's I_i statistics calculated for the synthetic measure of sustainable development, statistically significant values of the local Moran's I_i statistic were identified in four districts (city of Konin, Koło district, Konin district, Turek district). Only in the case of the city of Konin, the results of this study confirmed the existence of a negative, statistically significant spatial autocorrelation between the municipal district and the corresponding land district.

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EVALUATION METHOD OF REVITALIZATION WORKS IMPACT ON THE LEVEL OF LIFE IN SETTLEMENT UNITS

Abstract: The rural space is constantly undergoing change, created predominately by factors of anthropogenic character. The basic tool for improving the living conditions of the population living in rural areas, since 2015, is revitalization, defined by the provisions of the Act on revitalization from 9th October 2015. The main purpose of this paper is to present an innovative evaluation method of revitalization works impact on the level of life in settlement units, with particular regard to social, environmental, spatial-functional and technical conditions.

Key words: spatial order, sustainable development, revitalization

INTRODUCTION

Changes occurring in rural areas are the resultant of economic, social, political and cultural processes [Czapiewska 2014]. The large number of difficult-to-maintain indicators that generate rural development is the reason for the continually visible differences in the social, economic and technical activity of our rural areas. This state also deepens the fact that rural area possesses some of the original attributes and properties produced in the regular course of events, extremely difficult to transform [Liżewska, Knercer 2003].

The Act on Revitalization, introduced on 18 November 2015, provides the possibility of conducting spatial transformations by self-government units regardless of their size, scale of problems affecting the local community or sources of funding. The provisions of the Act from 9 October 2015 provide a number of practical tools supporting the preparation and normalization of the process of revitalization, requiring also the use of parameters describing the intensification of negative phenomena: social, environmental, spatial-functional and technical. The authors of this paper point out the need to include at the stage of revitalization programming process spatial principles of spatial order and sustainable management, since only that approach to the problem of revitalization can result in the minimization of social, spatial and ecological conflicts, thus improvement of the living conditions of the population living in rural areas. The main aim of the study is to present an innovative evaluation method of revitalization works impact on the level of life in settlement units, with particular regard to social, environmental, spatial-functional and technical conditions.

SUSTAINABLE DEVELOPMENT AND SPATIAL ORDER IN TERMS OF REVITALIZATION WORKS

Hans Carl von Carlowitz, who at the beginning of the nineteenth century limited the concept of sustainable development to the forest sphere, developed the fundamental principle of forest management in such a way that the annual increment of the stand was equivalent of the wood harvested from that forest. This principle, propagated by all German Forest Schools, has become a model for other modern and developing countries of Europe at that time. At present, the concept of sustainable development encompasses much broader spheres of life and according to the provisions of the Act on Environmental Protection Law is a socio-economic development in which the process of integrating political, economic and social activities takes place, preserving the natural balance and the sustainability of basic natural processes, to guarantee the ability to meet the basic needs of

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