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ASSESSMENT OF SOCIAL DEVELOPMENT OF POLISH VOIVODESHIPS BETWEEN 2005 AND 2013 IN THE CONTEXT OF IMPLEMENTING THE CONCEPT OF SUSTAINABLE DEVELOPMENT WITH THE USE OF THE TOPSIS METHOD

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OCENA ROZWOJU SPOŁECZNEGO WOJEWÓDZTW POLSKI W LATACH 2005–2013 W KONTEKSCIE REALIZACJI KONCEPCJI ZRÓWNOWAŻONEGO ROZWOJU Z WYKORZYSTANIEM METODY TOPSIS

STRESZCZENIE: Celem badań była ocena zróżnicowania rozwoju społecznego województw Polski w latach 2005–2013 w kontekście realizacji koncepcji zrównoważonego rozwoju. Oceny zróżnicowania poziomu rozwoju społecznego regionów z podziałem na obszary tematyczne oraz zmian trendów w ujęciu przestrzennym i czasowym dokonano z wykorzystaniem miary syntetycznej TOPSIS ze wspólnym wzorcem rozwoju. W badaniach wykorzystano dane BDL GUS.

SŁOWA KLUCZOWE: zrównoważony rozwój, rozwój społeczny, zrównoważona produkcja i konsumpcja, włączenie społeczne, zmiany demograficzne, zdrowie publiczne, bezpieczeństwo publiczne, TOPSIS

Introduction

Implementing the concept of sustainable development in a region is the result of multiple processes and socio-economic phenomena. The analysis regarding the level of sustainable development of Polish voivodeships[1] and specific issues related to social development of the regions were the subject of many studies and quantitative analyses. They concerned sustainable production and consumption[2], transport[3], energy[4], social inclusion[5], employment[6], demographic changes[7], public health[8], public safety[9], the quality of life[10], and income convergence[11].

[1]   E. Roszkowska, E. Misiewicz, R. Karwowska, *Analiza poziomu zrównoważonego rozwoju województw Polski w 2010 roku*, „Ekonomia i Środowisko" 2014 No. 2(49), pp. 168–190; D. Perło, E. Roszkowska, *Zastosowanie wybranych metod klasyfikacji do analizy zrównoważonego rozwoju*, „Zeszyty Naukowe 176, Wzrost Gospodarczy. Teoria. Rzeczywistość" 2011, pp. 372–399.

[2]   A. Borowska, *Społeczeństwo konsumpcyjne – charakterystyka,* „Zeszyty Naukowe Politechniki Białostockiej" 2009 No. 14, pp. 7–18; B. Kryk, *Zrównoważona jakość życia a zrównoważona konsumpcja i zachowania ekologiczne polskich konsumentów*, „Handel Wewnętrzny" 2013, November–December (A), Vol. 2; E. Lorek, A. Lorek, *Rozwój rynku dóbr i usług ekologicznych jako podstawa wdrażania zrównoważonej konsumpcji i produkcji*, „Optimum. Studia Ekonomiczne" 2014 No. 4(70).

[3]   A. Przybyłowski, *Pomiar zrównoważonego rozwoju transportu w polskich województwach*, „Optimum. Studia Ekonomiczne" 2014 No. 3(69).

[4]   A. Pultowicz, *Przesłanki rozwoju rynku odnawialnych źródeł energii w Polsce w świetle idei zrównoważonego rozwoju*, PAN. Komitet Człowiek i Środowisko 2009 No. 24(1).

[5]   B. Bal-Domańska, J. Wilk, B. Bartniczak, *Ocena realizacji koncepcji zrównoważonego rozwoju w województwach w zakresie włączenia społecznego,*"Econometrics" 2013 No. 2(40), p. 48–61.

[6]   Raport monitorujący z 2011 r. w sprawie strategii zrównoważonego rozwoju UE, www.epp.eurostat.ec.europa.eu [02/12/2013]; R.B. Dylkiewicz, *Czynniki ekonomiczne determinujące rynek pracy w ujęciu teoretycznym i empirycznym,* „Optimum. Studia Ekonomiczne" 2014 No. 2(68).

[7]   J. Wilk, T. Bartłomowicz, *Wielowymiarowa analiza zmian demograficznych w Polsce w świetle koncepcji zrównoważonego rozwoju,* „Studia demograficzne" 2012 No. 2(162), pp. 57–86.

[8]   B. Bal-Domańska, J. Wilk, B. Bartniczak, *Pomiar postępów województw w kierunku zrównoważonego rozwoju w zakresie zdrowia publicznego,* „Econometrics" 2012 No. 3(37), pp. 83–92.

[9]   J. Kudełko, *Poziom rozwoju społeczno-gospodarczego województw Polski,* „Zeszyty Naukowe Akademii Ekonomicznej w Krakowie" 2004 No. 651, pp. 75–90.

[10] B. Kryk, *Środowiskowe uwarunkowania jakości życia w województwie zachodniopomorskim na tle Polski*, „Ekonomia i Środowisko" 2015 No. 3(54).

[11] J. Batóg, *Analiza krańcowej pionowej konwergencji dochodowej typu β w krajach Unii Europejskiej w latach 1993–2010*, „Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania" 2013 No. 31, pp. 29–48.

The study presents a multi-dimensional assessment of the differentiation of social development of Polish voivodeships in the years 2005–2013. The analysis of the progress of the regions in implementing the concept of sustainable development in the context of social order was based on the rankings of voivodeships within the subject areas indicating the level of social development, the level of territorial cohesion, and the direction and pace of changes in 2013 compared to 2005. Synthetic measures determined by the TOPSIS method with the common pattern of development, through the overall analysis of the partial indicators, made it possible to assess the overall level of development of the regions. In addition, they made it possible to sort and group the studied regions due to the considered subject areas of social development.

Research methodology

In order to compare the changes and evaluate the progress of individual regions towards sustainable development in 2013 in comparison with 2005, the TOPSIS procedure was used with the common pattern and anti-pattern of development[12]. The stages of this procedure are as follows:

1) Selection of indicators based on substantive and statistical premises. Construction of a data matrix:

$$X = [x_{ikt}],$$

where x_{ikt} is the k-th value of indicator of sustainable development (k = 1,2,…,m) for the i-th voivodeship (i = 1,2,…,16) in the t-th year (t = 2005; 2013).

2) Normalization of the values of the indicators in order to achieve their comparability:

– for stimulants:
$$z_{ikt} = \frac{x_{ikt} - \min_{i}\{x_{ikt}\}}{\max_{i}\{x_{ikt}\} - \min_{i}\{x_{ikt}\}},$$

– for distimulants:
$$z_{ikt} = \frac{\max_{i}\{x_{ikt}\} - x_{ikt}}{\max_{i}\{x_{ikt}\} - \min_{i}\{x_{ikt}\}},$$

where: i – is the number of the voivodeships (i = 1,2,…, n = 16), k is the indicator number of sustainable development (simple feature) (k = 1,2,…,m) , and t is the year (t = 2005; 2013).

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[12]   C.L. Hwang, K. Yoon, *Multiple Attribute Decision Making: Methods and Applications*, New York 1981.

$\max\limits_{i}\{x_{ikt}\}-$ is the maximum value of the k-th indicator of sustainable development in 2005 and 2013;

$\min\limits_{i}\{x_{ikt}\}-$ is the minimum value of the k-th indicator of sustainable development in 2005 and 2013.

3) Calculation of the Euclidean distance between the voivodeships from the pattern (z^{+}_{kt}) and anti-pattern (z^{-}_{kt}) according to the formulas:

$$d^{+}_{it} = \sqrt{\sum_{k=1}^{m}\left(z_{ikt} - z^{+}_{kt}\right)^{2}} \quad d^{-}_{it} = \sqrt{\sum_{k=1}^{m}\left(z_{ikt} - z^{-}_{kt}\right)^{2}},$$

where: z^{+}_{kt} = (1,1,...,1), z^{-}_{kt} = (0,0,...,0)   for (i = 1,2,..., n = 16), (t = 2005, 2013).

4) Determining the value of the synthetic measure of the i-th voivodeship, and t-th year:

$$q_{it} = \frac{d^{-}_{it}}{d^{-}_{it} + d^{+}_{it}},$$

where: (i = 1,2,..., n = 16), (t = 2005, 2013). $0 \leq q_{it} \leq 1$ occurs at this.

Higher values of the measure q_{it} indicate a higher position in the ranking of the i-th voivodeship.

5) Establishing the voivodeships ranking due to the value of the synthetic measure of sustainable development.

Evaluation of the situation of voivodeships due to the value of the synthetic measure of development[13]: $0 < q_{it} \leq 0.2$ represents a very unfavourable situation, $0.2 < q_{it} \leq 0.4$ an unfavourable situation, $0.4 < q_{it} \leq 0.6$ a moderate situation, $0.6 < q_{it} \leq 0.8$ a favourable situation, and $0.8 < q_{it} \leq 1.0$ a very favourable situation. On the basis of the measure, one determines the **predominance** of the voivodeship for which the value of the synthetic measure is greater than or equal to 0.6 and the **limitation** of the voivodeship for which the value of the synthetic measure is less than 0.4. In order to evaluate the progress of voivodeships in the direction of sustainable development, we adopted a difference of no less than 0.2 in the case of **clear progress** and

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[13]   B. Bal-Domańska, J. Wilk, *Gospodarcze aspekty zrównoważonego rozwoju województw – wielowymiarowa analiza porównawcza,* „Przegląd Statystyczny" 2011 No. LVIII (3/4), pp. 304.

a difference of less than or equal to –0.1 in the case of a **threat** to the voivodeship[14].

The analysis was performed in each subject area in terms of time and space. We carried out an evaluation of the differentiation of voivodeships due to the indicators describing particular areas in the years 2005–2013. In terms of the time approach, we assessed the progress of voivodeships towards sustainable development with regard to the social level in 2013 compared with 2005.

Selection of diagnostic variables to assess the level of social development within the subject areas in the context of sustainable development

According to the available data, we suggested a set of 37 potential diagnostic variables of social development. The features can be divided into five subject areas: sustainable production and consumption, social inclusion, demographic changes, public health, and public safety[15]. Selected individual indicators were the most significant in terms of the conducted research according to the formal and substantive criteria. They complied with the relevant statistical properties, such as universality (universally recognized importance and relevance of the indicator), comparability (presented in the form of intensity indicators), weak correlation of variables with each other (eliminating duplication of information), and adequate diversification (a coefficient of variation higher than 7%)[16]. The choice of variables was also dependent on the availability, completeness, and continuity of the occurrence of statistical data from the regional perspective in 2005 and 2013. The initial set of 37 diagnostic variables was reduced to 25 indicators divided into subject areas. In addition, a set of accepted variables was divided into two subsets: stimulants and distimulants. High values of the stimulant (S) are desirable from the point of view of the synthetic measure. In the case of distimulants (D), high values of the variables are undesirable and cause a decrease in the value of the synthetic measure:

I.   **Sustainable production and consumption**
Z1:   Electricity consumption [kWh] (D)
Z2:   Gas consumption [m^3] (D)

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14   Ibidem.

15   Lokal Data Bank, www.stat.gov.pl [24/06/2015].

16   A. Młodak, *Analiza taksonomiczna w statystyce regionalnej*, Warszawa 2006.

Z3:   Water consumption [m³] (D)
Z4:   Passenger cars per 1000 population (D)
Z5:   Average monthly consumption of meat per capita (D)
Z6:   Average monthly consumption of vegetables per capita (S)

II.   **Social inclusion**
Z8:   Average monthly available income per capita in private households (S)
Z9:   Unemployment rate (BAEL – Eng. LFS) [%] (D)
Z10:   The employment rate of disabled people [%] (S)
Z11:   The share of people out of work aged 18–59 living in households
       in the total number of household members [%] (D)
Z13:   Children covered by pre-school education in percentage of the total
       number of children at the age 3-5 (in rural areas) [%] (S)
Z17:   Life-long learning of persons aged 25-64 [%] (S)

III.   **Demographic changes**
Z19:   Natural increase per 1000 population (S)
Z22:   Demographic dependency ratio: post-working age population
       per 100 persons of pre-working age [persons] (D)
Z23:   Ratio of balance of permanent migration person at working age
       (international migration) (S)
Z24:   Ratio of balance of permanent migration person at working age
       (intervoivodship migration) (S)
Z25:   Average monthly gross retirement pensions from non-agricultural
       social security system in relation to average monthly gross wages
       and salary (S)

IV.   **Public health**
Z28:   Deaths by selected causes of death in percentage of total (diseases of
       the circulatory system) [%] (D)
Z31:   Deaths by selected causes of death in percentage of total (diseases
       of the respiratory system) [%], (D)
Z32:   Suicide rate for 10 thous. population (D)
Z33:   Entitled to practise doctors per 10 thous. population (S)
Z34:   Persons injured in accidents at work per 1000 employed persons (D)

V.   **Public Safety**
Z35:   Ascertained crimes in completed preparatory proceedings per 1000
       population (D)
Z36:   Rate of detectability of the delinquents of ascertained crimes [%] (S)
Z37:   Fatal victims of road accidents per 100 thous. registered motor (D)

The values of the synthetic measure for the voivodeships determined by the TOPSIS method in the particular areas in 2005 and 2013 are presented in Table 1.

Assessing the differentiation of the level of social development of Polish voivodeships in the years 2005–2013

Area: sustainable production and consumption

The synthetic indicator *sustainable consumption and production* takes values from the range [0.419; 0.742] for the year 2005 and from the range [0.272; 0.600] for the year 2013. In 2013, for each voivodeship, we observed an unfavourable situation of decline in the value of this measure compared to 2005 (Table 1). The best positions were occupied by Podkarpackie (position 1), Świętokrzyskie (position 3 in 2005, position 2 in 2013), and Lubelskie (position 2 in 2005, position 3 in 2013) in the rankings of voivodeships created for the years 2005 and 2013. Apart from Podkarpackie, the same positions were maintained by the following voivodeships: Warmińsko-Mazurskie (4), Wielkopolskie (15), and Mazowieckie (16). The biggest change of position in the rankings occurred for Lubuskie (change from position 7 in 2005 to 14 in 2013). For other regions, there was a change in position from 1 to 4 in the ranking in 2013 compared with 2005 (Table 2).

In 2005 and 2013, a *favourable situation* in the area of *sustainable consumption and production* was recorded for Podkarpackie; *moderate situations* was found for: Kujawsko-Pomorskie, Łódzkie, Małopolskie, Pomorskie, and Śląskie. For the other regions, we observed deterioration of the situation from *favourable* to *moderate* for Lubelskie, Opolskie, Podlaskie, Świętokrzyskie, and Warmińsko-Mazurskie and from *moderate* to *unfavourable* for Dolnośląskie, Lubuskie, Mazowieckie, Wielkopolskie, and Zachodniopomorskie. For all regions, the change in the value of the synthetic indicator took a value of less than −0.1. This indicates a threat to the development of the region in this area. The biggest threat occurred in Lubuskie (change = −0.254).

Area: social inclusion

The synthetic measure of *social inclusion* takes values from the range [0.163; 0.465] for the year 2005 and from the range [0.436; 0.734] for the year 2013. In 2013, we observed a favourable situation of increase in the value of the measure for each region compared to 2005 (see Table 1).

In the rankings of voivodeships, the best positions were occupied by Lubelskie (position 1) and Podlaskie (position 2) in 2005 and by Mazowieckie

Table 1.　The value of TOPSIS for voivodeships by subject areas in 2005 and 2013

Voivodship	Sustainable production and consumption			Social inclusion			Demographic changes			Public health			Public safety		
	2005	2013	change	2005	2013	change	2005	2013	change	2005	2013	change	2005	2013	change
Dolnośląskie	0.576	0.378	-0.198	0.312	0.586	0.275	0.559	0.458	-0.101	0.430	0.450	0.020	0.418	0.598	0.181
Kujawsko-pomorskie	0.581	0.444	-0.137	0.290	0.606	0.315	0.661	0.552	-0.108	0.444	0.473	0.029	0.374	0.772	0.398
Lubelskie	0.737	0.553	-0.184	0.465	0.667	0.202	0.543	0.438	-0.106	0.527	0.600	0.073	0.579	0.845	0.266
Lubuskie	0.594	0.341	-0.254	0.269	0.600	0.331	0.677	0.552	-0.125	0.377	0.364	-0.013	0.466	0.644	0.178
Łódzkie	0.563	0.408	-0.154	0.354	0.628	0.274	0.486	0.399	-0.087	0.543	0.583	0.040	0.282	0.680	0.398
Małopolskie	0.576	0.437	-0.139	0.424	0.673	0.249	0.784	0.690	-0.095	0.590	0.735	0.145	0.423	0.715	0.292
Mazowieckie	0.419	0.272	-0.147	0.445	0.734	0.289	0.576	0.579	0.004	0.610	0.623	0.013	0.267	0.632	0.364
Opolskie	0.619	0.451	-0.167	0.436	0.591	0.155	0.444	0.359	-0.085	0.518	0.566	0.048	0.556	0.747	0.191
Podkarpackie	0.742	0.600	-0.142	0.399	0.547	0.147	0.635	0.561	-0.074	0.491	0.591	0.099	0.682	0.919	0.237
Podlaskie	0.615	0.478	-0.137	0.457	0.604	0.147	0.553	0.465	-0.088	0.531	0.587	0.057	0.554	0.829	0.275
Pomorskie	0.522	0.409	-0.112	0.304	0.733	0.429	0.720	0.669	-0.050	0.519	0.483	-0.036	0.341	0.669	0.329
Śląskie	0.552	0.408	-0.144	0.338	0.655	0.317	0.524	0.434	-0.090	0.463	0.700	0.237	0.368	0.657	0.289
Świętokrzyskie	0.712	0.556	-0.156	0.220	0.586	0.365	0.539	0.437	-0.102	0.543	0.581	0.038	0.515	0.848	0.332
Warmińsko-mazurskie	0.651	0.502	-0.149	0.163	0.436	0.274	0.631	0.527	-0.104	0.196	0.464	0.268	0.429	0.771	0.342
Wielkopolskie	0.464	0.336	-0.128	0.396	0.660	0.265	0.784	0.681	-0.103	0.502	0.499	-0.003	0.530	0.795	0.264
Zachodniopomorskie	0.515	0.367	-0.148	0.192	0.507	0.315	0.661	0.553	-0.108	0.431	0.524	0.093	0.278	0.711	0.433

The values of the synthetic measure were highlighted using different shades of grey, indicating an advantage or a threat to the region in the given area.

Source: The author's own study on the basis of GUS (Central Statistical Office of Poland) data.

Table 2. The positions of the voivodeships by area determined by the TOPSIS method in 2005 and 2013

Voivodship	Sustainable production and consumption			Social inclusion			Demographic changes			Public health			Public safety		
	2005	2013	Change	2005	2013	Change	2005	2013	Change	2005	2013	Change	2005	2013	Change
Dolnośląskie	9	12	−3	10	12	2	10	11	−1	14	15	−1	10	16	−6
Kujawsko-pomorskie	8	7	1	12	8	4	6	7	−1	12	13	−1	11	6	5
Lubelskie	2	3	−1	1	4	−3	12	12	0	6	4	2	2	3	−1
Lubuskie	7	14	−7	13	10	3	4	8	−4	15	16	−1	7	14	−7
Łódzkie	11	10	−1	8	7	1	15	15	0	3	7	−4	14	11	3
Małopolskie	10	8	2	5	3	2	1	1	0	2	1	1	9	9	0
Mazowieckie	16	16	0	3	1	2	9	4	5	1	3	−2	16	15	1
Opolskie	5	6	−1	4	11	−7	16	16	0	8	9	−1	3	8	−5
Podkarpackie	1	1	0	6	14	−8	7	5	2	10	5	5	1	1	0
Podlaskie	6	5	1	2	9	−7	11	10	1	5	6	−1	4	4	0
Pomorskie	13	9	4	11	2	9	3	3	0	7	12	−5	13	12	1
Śląskie	12	11	1	9	6	3	14	14	0	11	2	9	12	13	−1
Świętokrzyskie	3	2	1	14	13	1	13	13	0	4	8	−4	6	2	4
Warmińsko-mazurskie	4	4	0	16	16	0	8	9	−1	16	14	2	8	7	1
Wielkopolskie	15	15	0	7	5	2	2	2	0	9	11	−2	5	5	0
Zachodniopomorskie	14	13	1	15	15	0	5	6	−1	13	10	3	15	10	5

Source: The author's own study on the basis of GUS (Central Statistical Office of Poland) data.

(position 1) and Pomorskie (position 2) in 2013. Two voivodeships maintained the same positions: Zachodniopomorskie (15) and Warmińsko-Mazurskie (16). The biggest changes in the positions in the years 2005 and 2013 were observed for Pomorskie (from position 11 to 2) and Podkarpackie (from position 6 to 14). Other regions were characterized by a change in the position from 1 to 7 in the ranking in 2013 compared with 2005 (Table 2).

In 2005 in the area of *social inclusion* there was no voivodeship for which the situation could be described as *very favourable* or *favourable*. A *moderate* situation was reported for Opolskie. In other voivodeships there were improvements of the situation: from *moderate* to *favourable* for Lubelskie, Małopolskie, Mazowieckie, and Podlaskie; from *unfavourable* to *favourable* for Kujawsko-Pomorskie, Łódzkie, Pomorskie, Śląskie, and Wielkopolskie, from *unfavourable* to *moderate* for Dolnośląskie, Lubuskie, Podkarpackie, and Świętokrzyskie; and from *very unfavourable* to *moderate* for Warmińsko-Mazurskie and Zachodniopomorskie. Pomorskie made significant progress in the development of the social level in the area of *social inclusion*, where the change in the value of the synthetic measure amounted to 0.429.

Area: demographic changes

The synthetic measure for the area of *demographic changes* takes values from the range [0.444; 0.784] for 2005 and from the range [0.359; 0.690] for 2013. Only in Mazowieckie was there a slight increase (0.004) in the value of the synthetic measure in the year 2013 compared to 2005. Other regions experienced an unfavourable situation of a decline in its value (Table 1).

In the rankings of voivodeships, the best positions in 2005 and 2013 were occupied by the voivodeships of Małopolskie (position 1), Wielkopolskie (position 2), and Pomorskie (position 3). The same positions were also maintained by Lubelskie (12), Świętokrzyskie (13), Śląskie (14), Łódzkie (15), and Opolskie (16). Mazowieckie (change of position from 9 to 4) and Lubuskie (change of position from 4 to 8) displayed the biggest changes of positions in the rankings of voivodeships in 2005 compared to 2013. Other regions changed their positions from 1 to 2 in the ranking in 2013 compared with 2005 (Table 2).

In 2005 and 2013 there was no voivodeship for which the situation could be described as *very favourable* in the area of *demographic changes*. Favourable situations occurred for Małopolskie, Pomorskie, and Wielkopolskie; *moderate* situations occurred for Dolnośląskie, Lubelskie, Mazowieckie, Podlaskie, Śląskie, and Świętokrzyskie. For all other regions, the situation deteriorated: from *favourable* to *moderate* for Kujawsko-Pomorskie, Lubuskie, Podkarpackie, Warmińsko-Mazurskie, and Zachodniopomorskie and from *moderate* to *unfavourable* for Łódzkie and Opolskie.

In the case of eight voivodeships – Dolnośląskie, Kujawsko-Pomorskie, Lubelskie, Lubuskie, Świętokrzyskie, Warmińsko-Mazurskie, Wielkopolskie, and Zachodniopomorskie – the change in the value of the synthetic measure took a value below -0.1, indicating a threat to the development of the region in this area. Lubuskie faced the biggest threat (change = -0.125).

Area: public health

The synthetic measure in the case of *public health* takes values in the range of [0.196; 0.610] for 2005 and in the range of [0.364; 0.735] for the year 2013. In 2013 there was a slight decrease in the value of the synthetic measure in this area compared to 2005 for three voivodeships: Lubuskie, Pomorskie, and Wielkopolskie. All other regions had favourable situations of increases of its value (Table 1).

In the rankings of voivodeships, the best positions in 2005 and 2013 were occupied by Mazowieckie (position 1 in 2005 and 3 in 2013) and Małopolskie (position 2 in 2005 and 1 in 2013). None of the voivodeships kept their positions in the ranking. Śląskie showed the biggest change in the rankings of voivodeships (change of position from 11 in 2005 to 2 in 2013). Other regions were characterized by a change in position from 1 to 5 in the ranking (Table 2).

In 2005 and 2013, there was no voivodeship for which the situation could be described as *very favourable* in the area of *public health*. Improvement of the situation from *moderate* to *favourable* was observed for Małopolskie and Śląskie; from *very unfavourable* to *moderate* for Warmińsko-Mazurskie. We observed a *favourable* situation for Mazowieckie, an *unfavourable* one for Lubuskie, and *moderate* situations for the remaining 11 voivodeships. Śląskie (change = 0.237) and Warmińsko-Mazurskie (change = 0.268) indicated significant progress in the development of the social level in the field of *public health*.

Area: public safety

The synthetic measure of *public safety* takes values from the range [0.267; 0.682] for 2005 and from the range [0.598; 0.919] for the year 2013. All voivodeships had a very favourable situation of growth in the value of the indicator in the year 2013 compared to 2005 (Table 1).

In the rankings of voivodeships, the best positions in 2005 and 2013 were occupied by Podkarpackie (position 1 in 2005 and 1 in 2013) and Lubelskie (position 2 in 2005 and 3 in 2013). Except for Podkarpackie, three voivodeships maintained their positions in the ranking: Podlaskie (4), Wielkopolskie (5), and Małopolskie (9). The biggest change in the rankings of

voivodeships was observed in Lubuskie (change of position from 7 in 2005 to 14 in 2013). Other regions were characterized by a change in position from 1 to 6 in the ranking in 2013 compared with 2005.

In 2005 and 2013 in the area of *public safety*, the situation can be regarded as *moderate* only for Dolnośląskie. In the case of other voivodeships, we observed improvements of the situation: from *unfavourable* to *favourable* for Kujawsko-Pomorskie, Łódzkie, Mazowieckie, Pomorskie, Śląskie, and Zach-odniopomorskie, from *moderate* to *favourable* for Lubuskie, Małopolskie, Warmińsko-Mazurskie, Wielkopolskie, and Opolskie, from *moderate* to *very favourable* for Lubelskie, Podlaskie, and Świętokrzyskie, and from *favourable* to *very favourable* for Podkarpackie. In the case of 13 voivodeships we may talk about clear progress in the development of the social level in the area of *public safety*, while the largest increase in the value of the measure occurred for Zachodniopomorskie (a change of 0.433). For three voivodeships – Dolnośląskie, Lubuskie, and Opolskie – the change in the measure was less than 0.2.

Summary

In this study, we carried out a multidimensional analysis of the level of social development in regional terms on the basis of an integrated system of indicators divided into five subject areas. This enabled the assessment of the level of diversification of the regions and the trends of changes in social development. However, it should be remembered that the final list of diagnostic variables and the choice of the synthetic measure of development largely determine the results of this study. Due to the lack of one recognized method of measuring the level of sustainable development, the conducted study may be considered, at most, as one of the proposals in the context of literature. The synthetic measures of the level of social development are a function of many explanatory variables taken for research that reflect different aspects of social development within the subject areas under consideration.

The conducted studies indicate differential levels of socio-economic development of voivodeships in particular subject areas that describe the level of development in the years 2005–2013.[17] Significant differences were

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[17] The research results also confirm conclusions drawn by the authors of other studies (for example: B. Bal-Domańska, J. Wilk, op. cit.; B. Bal-Domańska, J. Wilk, B. Bartnic-zak, *Pomiar postępów …*, op. cit.; B. Bal-Domańska, J. Wilk, B. Bartniczak, *Ocena realizacji …*, op. cit.; B. Kryk, *Zrównoważona jakość …*, op. cit.; J. Wilk, T. Bartłomowicz, op. cit.; E. Roszkowska, R. Karwowska, E.I. Misiewicz … op. cit.; D. Perło, E. Roszkowska, op. cit.; R. Karwowska, E. Roszkowska, op. cit.) about differential levels of social devel-

observed between the regions with the highest and lowest values of the synthetic measure. The largest span occurred for the area of *public health* (0.441 in 2005 and 0.375 in 2013), and the smallest occurred for the area of *social inclusion* (0.191 in 2005 and 0.194 in 2013). In 2013, the level of regional cohesion improved slightly in the areas of *public health* and *public safety.* In other areas, it worsened slightly.

The obtained results also showed that among the regions in Poland there is neither a model (ideal) voivodeship that would be the leader in each of the studied areas nor a voivodeship that would represent the anti-pattern of development in each of the analysed areas. Only a few voivodeships in selected areas remained at constant levels in the years 2005 and 2013. The positions of most voivodeships in the rankings change considerably. Relatively small changes in positions of the regions in the ranking occurred in the area of *demographic changes*, while relatively large ones occurred in the area of *social inclusion*. These observations are supported by Pearson coefficients between the measures for the years 2005 and 2013 within the subject areas, which respectively amount to 0.933 for the area of *sustainable production and consumption*, 0.610 for *social inclusion*; 0.957 for *demographic changes*; 0.614 for *public health*, and 0.760 of *public safety*. In the case of three areas – *sustainable production and consumption*, *demographic changes,* and *public health* – the leading voivodeships usually occupied similar positions in 2013 and 2005. A similar trend was observed for the regions closing the ranking.

Also, we observed a fairly fast pace and differentiation regarding the direction of changes of the regions within the areas. For example, compared with 2005, in 2013 Śląskie and Warmińsko-Mazurskie reported **significant progress** in the areas of *social inclusion*, *public health*, and *public safety*, with simultaneous **threats** to Śląskie in the area of *sustainable production and consumption* and Warmińsko-Mazurskie in the areas of *sustainable production and consumption* and *demographic changes*. In the areas of *social inclusion* and *public safety*, **significant progress** was achieved by Kujawsko-Pomorskie, Lubelskie, Łódzkie, Małopolskie, Mazowieckie, Pomorskie, Świętokrzyskie, Wielkopolskie, and Zachodniopomorskie. Kujawsko-Pomorskie, Lubelskie, Świętokrzyskie, Wielkopolskie, and Zachodniopomorskie recorded **threats** in the areas of *sustainable production and consumption* and *demographic changes*, while Łódzkie, Małopolskie, Mazowieckie, and Pomorskie did so in the area of *sustainable production and consumption*. It is also worth noting that in most cases, the voivodeships are characterized by *moderate* situations within the areas under consideration. The exception here is the

opment in the subject areas of Polish regions in terms of both time and space. Depending on the selection of variables for the research, the synthetic measure, and the research period, the results differ in terms of the ranking of regions.

areas of *social inclusion* and *public safety* in 2013, where for most voivodeships the situation should be considered as *favourable*.

In 2013, in relation to 2005, most beneficial changes associated with the improvement of the situation of all voivodeships and the increase of territorial cohesion were observed in the areas of *social inclusion* and *public safety*, where each region shifted in the direction of the pattern of development in these areas, whereas the growth rate was varied. In the area of *social inclusion,* the greatest progress was made by Pomorskie, and in the area of *public safety,* the most progress was made by Zachodniopomorskie. Most adverse changes related to the deterioration of the situation of all voivodeships were observed for the area of *sustainable production and consumption*, while the largest regression occurred in Lubuskie. In the other areas, the development was uneven: the situations of some voivodeships improved and those of others worsened.

Differentiation of rankings and differentiation of synthetic measure values within the subject areas prove that Poland is still at the stage of developing a coherent policy that would foster harmonious social development of individual regions in the country. In-depth analysis of individual indicators and synthetic measures of social development on a regional basis may be helpful in determining the direction and strength of social development of the region using its specific conditions or resources.

Contributions of the authors to the creation of the article:

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