



Małgorzata STEC • Mariola GRZEBYK • Wiesława CAPUTA •  
Izabela KRAWCZYK-SOKOŁOWSKA

## A COMPARATIVE ANALYSIS OF THE LEVEL OF SUSTAINABLE DEVELOPMENT IN POLISH VOIVODESHIPS IN 2012 AND 2021

Małgorzata **Stec** (ORCID: 0000-0003-0185-4510) – *Institute of Economics and Finance, University of Rzeszow*

Mariola **Grzebyk** (ORCID: 0000-0003-1107-0250) – *Institute of Economics and Finance, University of Rzeszow; University of West Bohemia*

Wiesława **Caputa** (ORCID: 0000-0002-0955-9308) – *WSB Merito University of Poznan*

Izabela **Krawczyk-Sokołowska** (ORCID: 0000-0002-2784-1577) – *Faculty of Management, Czestochowa University of Technology*

Correspondence address:

Ćwiklińskiej Street 2, 35-601 Rzeszow, Poland

email: mgrzebyk@ur.edu.pl

**ABSTRACT:** Sustainable development is an example of a complex phenomenon, which is why it is particularly difficult to compare the level and evaluate the progress made by regions in Poland in implementing its assumptions. This article aims at conducting a multi-dimensional evaluation of changes in the level of sustainable development in Polish voivodeships in 2012 and 2021. The analysis covered three dimensions of sustainable development: social, economic and environmental, which were determined by a total of 30 indicators. The research methodology applied was one of the linear ordering methods – a non-model method with normalisation based on zero unitisation, where as the research itself was conducted from a dynamic perspective. The research results indicate gradual progress in particular regions of Poland (albeit to varying degrees) in implementing the concept of sustainable development in the years under study. The application of the synthetic indicator to evaluate the activities makes it possible to evaluate the results achieved in these voivodeships and take any possible corrective measures. They are also a valuable source of information on development disproportions between voivodeships, which might result in determining potential directions for future activities in the field of sustainable development.

**KEYWORDS:** sustainable development, voivodeship, Poland, comparative analysis, synthetic indicator

## Introduction

Sustainable development has become a fundamental element of each country's policy due to its meaning in facing the challenges of the modern world.

A commonly accepted definition of sustainable development was coined in 1987 in the report entitled "Our Common Future". The report was written as part of the activities conducted by the World Commission on Environment and Development, the so-called Brundtland Commission, which was established in 1983. It was stated therein that sustainable development is development which the needs of the present generation can be met without compromising the ability of future generations to meet their needs (Wichaisri & Sopadang, 2018). It was agreed that civilisation has reached a level of welfare that can be maintained provided that both environmental resources and the climate are preserved (Zakrzewska, 2019; Żelazna & Gołębiowska, 2015).

The concept of sustainable development has been around for many a decade. However, it still remains universal. The final assumptions related to the implementation of the Sustainable Development Goals were stated in the 2030 Agenda, which was adopted by 193 countries in September 2015 at the UN level in New York. The Agenda is comprised of 17 Sustainable Development Goals (SDGs), divided into 169 targets and 304 indicators, with a proviso that all Sustainable Development Goals are equally important and should be achieved collectively (Kostetckaia & Hametner, 2022).

As a result of establishing the Agenda, it became possible to develop a certain framework for the sustainable development policy for a given country by 2030, which should focus on various aspects to facilitate a dignified life and stimulate economic development, taking into consideration the conservation of the natural environment and combating climate change (Cojocar et al., 2022). The actual implementation of sustainable development targets and strategies by respective countries implies taking difficult decisions at a local, national, regional or international level.

Therefore, national priorities which are appropriate for the Polish requirements of development, have been developed in Poland (similar to other countries) (GUS, n.d.a). Priorities for Poland and their corresponding development indicators have been prepared for the purposes of nationwide measurement without taking into consideration regional differences. However, it appears interesting to evaluate the level of development with regard to various aspects of sustainable development, not only at a national level but also at a regional level, and the conditions related thereto. This analysis will make it possible to evaluate infra-national differences in this respect and the factors affecting them.

This article aims at conducting a multi-dimensional evaluation of changes in the level of sustainable development in Polish voivodeships in 2012 and 2021. A voivodeship is a local government unit, a regional self-government community performing tasks in the field of public administration (Act, 1998; Dziekański et al., 2023).

The analysis covered three dimensions of sustainable development: social, economic and environmental, which were determined by a total of 30 indicators. The research methodology applied is one of the linear ordering methods – a non-model method with normalisation based on the zero unitisation method. The research was conducted from a dynamic perspective.

The following research questions are raised in this article. The example of a bulleted list:

- Did Polish voivodeships achieve a certain level of progress in sustainable development in the social, economic and environmental dimensions in 2021 compared to 2012?
- Which voivodeships are leaders, and which voivodeships are ranked last in the rankings of voivodeships in 2012 and 2021 in terms of the social, economic and environmental dimensions of sustainable development?
- Which voivodeships are leaders, and which voivodeships are ranked last in the rankings of voivodeships in 2012 and 2021 in terms of the overall level of sustainable development?
- What is the practical meaning of the research conducted?

In order to achieve the main objective of the article and the research questions raised, the text had to be divided into several parts. The first part pertained to a theoretical background. The next part covered a selection of diagnostic variables used to evaluate sustainable development in Polish voivodeships and the research methodology applied for this purpose. The next part presents the results of the research conducted. Against this background, a discussion of the meaning of research

and research limitations was presented. The last part of the article is a summary and a presentation of future directions for research.

## Literature review

The idea of sustainable development is still valid in relation to the deteriorating environmental situation, which is manifested mainly in the form of air and water pollution as well as climate change (extreme weather events and weather changes). This has a direct negative impact on both the quality of people's lives and their health (Gruchelski & Niemczyk, 2015).

The key message behind the concept of sustainable development is to improve the quality of life of people all around the world, which will only be possible once diverse measures have been implemented in the scope of particular regions, resulting in integrating such measures in three key areas: economic, social and environmental (Bocian, 2009). In the economic area, the idea of sustainable development focuses on achieving long-term economic development and equitable distribution of benefits resulting there from, such as facilitating developing countries access to markets (Nkoro & Uko, 2022), financing development, including public funding (Kurekova et al., 2023) and changing irrational consumption and production patterns. In the social area, in turn, the most crucial meaning is assigned to the following issues: fight against poverty (Łuczak & Kalinowski, 2022), considerable access to education and housing (Čermakova et al., 2023), work, energy sources and water, and health care. The third environmental area, in turn, is related to environmental protection and the rational management of natural resources. It pertains to protecting endangered animal and plant species, saving natural ecosystems and promoting renewable energy sources, on the one hand, and limiting pollution and environmental degradation, on the other hand (Perło, 2014).

Nowadays, the notion of sustainable development is used quite commonly and is incorporated in virtually every state document related to development. It is worth mentioning that Article 5 of the Constitution of the Republic of Poland states as follows: "The Republic of Poland safeguards the independence and integrity of its territory, guarantees rights and freedoms of both human beings and citizens and the safety of citizens, safeguards national heritage and ensures environmental protection, following the principle of sustainable development". A reference to the concept of sustainable development is also made in Article 74: "Environmental protection is an obligation of public authorities" (The Constitution of the Republic of Poland, 1997). The sustainable development of the country, recognised as a constitutional principle of the Republic of Poland, was defined in the Environmental Protection Act as "socioeconomic development in which there is a process of integration of political, economic, and social actions while maintaining environmental balance and the continuation of fundamental environmental processes to ensure the ability of communities and citizens of current and future generations to meet their essential needs" (Act, 2001; Martyka et al., 2022).

Taking into consideration the meaning of sustainable development, several thousand articles on this topic have been written over the last decade, and its increasing number reflects the demand for knowledge in this field<sup>1</sup>. According to Kasztelan (2022), matters related to sustainable development remain a constant concern for science, politics and economic practice.

Directions for research pertaining to sustainable development in particular countries, including the European Union as a whole, centre around several issues including but not limited to:

- explaining the essence of the sustainable development concept and the requirements for its implementation (Hopwood et al., 2005; Glavic & Lukman, 2007; Grzebyk & Stec, 2015; Qizilbash, 2001; Ruggerio, 2021),
- implementing and monitoring the objectives of sustainable development (Raszkowski & Bartniczak, 2019; Alaimo & Maggino, 2020; Scharlemann et al., 2020; Bellantuono et al., 2022; Grzebyk et al., 2023; Peña et al., 2023),
- dimensions of sustainable development (Lawn, 2001; Giddings et al., 2002; Duran et al., 2015; Raszkowski & Bartniczak, 2018; Hejdukova et al., 2020; Grzebyk et al., 2022; Faber & Jarosz, 2023),

<sup>1</sup> Data based on the bibliometric analysis conducted on the BazEkon database on 12.01.2024, taking into consideration "sustainable development" as a keyword.

- planning and building the strategy of sustainable development (Meadowcroft, 2007; Ioppolo et al., 2016; Qu et al., 2020),
- application and good practice (Manzhynski et al., 2016; Chmielewski et al., 2023; Jakubelskas & Skvarciany, 2023).

The complex nature of sustainable development causes difficulties not only in defining it but also in monitoring progress, as the idea of sustainable development is often considered impossible to quantify. Sustainable development is a multi-layered category; therefore, determining specific indicators that should be evaluated in particular areas is the main problem. To date, one commonly applied and acceptable indicator, which would take into consideration all three areas – economic, social and environmental, has not been developed.

Synthetic indicators are frequently used in research on sustainable development (Drabarczyk, 2017).

Therefore, an analysis should focus not on how to achieve balance in development in all its dimensions but on which of them (economic, social or environmental dimension) plays a key role in pursuing sustainable development in a given region. The implementation of the sustainable development concept in practice requires detailed information on progress in implementing this concept, dynamics of changes or interrelations between particular components.

The institutionalisation of sustainable development principles by legislation and global politics has failed to develop effective implementation mechanisms, which is why a slow pace of implementing measures in the field of sustainable development can be observed. Even though sustainable development is willingly included in legal acts or international documents, it is definitely more difficult to monitor and implement it (Lewandowska, 2014).

## Variables used to evaluate sustainable development in Polish voivodeships

A selection of indicators which make it possible to evaluate the implementation of sustainable development concepts is the subject of ongoing debate (Borys, 2010). One of the most common mistakes made in research on sustainable development is creating a set of characteristics describing such development as part of one set of diagnostic characteristics. Such an approach prevents the authors from examining actual changes occurring as part of particular sustainable development dimensions (economic, social and environmental) (Cheba & Bąk, 2019). The final set of variables always constitutes a crucial methodological problem for every researcher and poses a considerable challenge to them, which is exacerbated by the fact that in practice, analyses and diagnoses of multi-dimensional categories are most frequently conducted on the basis of a compromise and consensus between ambitions of the researcher and the information capabilities offered by databases (Klóska, 2017; Stec, 2021).

Taking this criterion into account, in the article the selection of variables determining particular dimensions of sustainable development is dependent mostly on the availability of statistical data. Having regard to this criterion, 10 variables determining particular dimensions of the phenomenon in question were initially selected.

The **social dimension (SD)** is represented by the following variables:

- X1* – population growth per 1,000 people (S),
- X2* – migration balance for permanent residence (inter-voivodeship migrations) per 1,000 people (S),
- X3* – physicians (total working staff) per 10,000 inhabitants (S),
- X4* – deaths due to cancer and cardiovascular diseases per 10,000 inhabitants (D),
- X5* – suicide rate per 10,000 inhabitants (D),
- X6* – persons who were granted social benefits by virtue of a decision per 10,000 inhabitants (D),
- X7* – students per 10,000 inhabitants (S),
- X8* – consumption of water from waterworks in m<sup>3</sup> per 1 inhabitant (D),
- X9* – average monthly consumption of vegetables per 1 person in kg (S),
- X10* – total crimes recorded by the Police per 1,000 inhabitants (D).

The **economic dimension (ED)** is defined by the following variables:

- X11* – national economy entities entered in the REGON (national business) register per 10,000 inhabitants (S),
- X12* – investment expenditures per capita in PLN (S),
- X13* – employees in R&D per 1,000 economically active persons (S),
- X14* – average monthly disposable income per capita (S),
- X15* – patents granted by the Patent Office of the Republic of Poland per 100,000 inhabitants (S),
- X16* – average share of innovative enterprises in the total number of enterprises (%) (S),
- X17* – unemployment rate in % (D),
- X18* – victims of accidents at work per 1,000 employed persons (D),
- X19* – expressways and motorways in km per 100 km<sup>2</sup> of area (S),
- X20* – passenger cars per 1,000 inhabitants (D).

The **environmental dimension (EnD)** is defined by the following variables:

- X21* – forest cover in % (S),
- X22* – share of legally protected areas in the total area (%) (S),
- X23* – certified organic farms – share of agricultural area in total agricultural area (%) (S),
- X24* – expenditure on fixed assets for environmental protection and water management in PLN thousand/1 inhabitant (S),
- X25* – share of renewable energy in total electricity production (%) (S),
- X26* – emission of gaseous pollutants from particularly onerous facilities in t/y per 1 km<sup>2</sup> of area (D),
- X27* – emission of particulate pollutants from particularly onerous facilities in t/y per 1 km<sup>2</sup> of area (D),
- X28* – wastewater treated during the year in dam<sup>3</sup>, discharged per inhabitant (S),
- X29* – share of waste generated during the year, recycled in total waste (%) (S),
- X30* – share of devastated and degraded land requiring rehabilitation in the total area (D).

“S” symbolises a stimulant, whereas “D” symbolises a destimulant.

The social dimension of sustainable development in voivodeships determines its most crucial aspects related to demographic changes, including migration (Kurekova, 2022), the health situation in the population, the level of education, public safety and sustainable consumption patterns. The economic dimension is represented by variables determining economic development, the labour market, R&D and innovation activities of enterprises, the economic situation of households and the technical infrastructure. The environmental dimension, in turn, covers the most important characteristics that make it possible to evaluate the condition and quality of the environment (Kiselakova et al., 2020).

The variables suggested for the purposes of evaluating sustainable development in voivodeships in its particular dimensions were verified statistically by evaluating levels of variability and correlation. In order to evaluate the variability, a coefficient of variability expressed as a quotient of the standard deviation of a variable and its arithmetic mean was applied. Variables with a coefficient less than or equal to 0.10 were eliminated. The inverse correlation matrix method developed by Malina and Zeliaś (1997) was used to evaluate the correlation of variables.

Table 1. presents variables eliminated from the initial set of variables as they did not meet the required criteria.

**Table 1.** Statistical verification of variables determining sustainable development in 2021

Criterion	Social dimension (SD)	Economic dimension (ED)	Environmental dimension (EnD)
Too low variability	<i>X4, X9</i>	<i>X14, X20</i>	
High correlation	<i>X2</i>	<i>X11</i>	<i>X27</i>

The final set of diagnostic variables selected for evaluating sustainable development in voivodeships in 2021 contains 23 variables (7 variables determining the social dimension, 7 variables deter-

mining the economic dimension and 9 determining the environmental dimension). In order to maintain the comparability of results, the same set of diagnostic variables was adopted for 2012.

## Research methodology

In order to evaluate sustainable development in Polish voivodeships, one of the methods of multidimensional comparative analysis – a non-model method with normalisation based on zero unitisation – was applied. The research methodology suggested that research is a tool that is frequently used for such analyses, even by international institutions responsible for developing, i.e., the Human Development Index (HDI) or the Summary Innovation Index (Hollanders, 2019).

It should be added that the research was conducted from a dynamic perspective, which means that normalisation parameters were determined by taking into consideration statistical data for both years under study.

General assumptions of this method are as follows (Kukuła, 2000):

1. Representation of the variable values  $X_j$  ( $j = 1, 2, \dots, m$ ) for every object  $O_i$  ( $i = 1, 2, \dots, n$ ) in the form of a matrix of observations:

$$\mathbf{X} = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1m} \\ x_{21} & x_{22} & \dots & x_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ x_{n1} & x_{n2} & \dots & x_{nm} \end{bmatrix}, \quad (1)$$

2. Determination of the nature of variables

Variables can be used as stimulants or destimulants. Stimulants are characteristics whose high values are desirable from the adopted point of view (e.g. the level of sustainable development), while low values are not desirable. Destimulants, in turn, are characteristics whose low values are desirable from the perspective of the phenomenon under study, while their high values are undesirable (Hellwig, 1968).

3. Normalisation of variable values using the following formulas:

For stimulants:

$$z_{ij} = \frac{x_{ij} - \min_i \{x_{ij}\}}{R_j}, \quad (2)$$

For destimulants:

$$z_{ij} = \frac{\max_i \{x_{ij}\} - x_{ij}}{R_j}, \quad (3)$$

4. Determination of the value of the synthetic indicator using the following formula:

$$MS_i = \frac{1}{m} \sum_{j=1}^m z_{ij}, \quad (4)$$

where:

$MS_i$  – a synthetic indicator for the  $i$ -th object,

$z_{ij}$  – normalised values of variables,

$m$  – the number of variables.

The values of the synthetic indicator were calculated separately for each dimension of sustainable development, i.e. social, economic and environmental. A general synthetic indicator of sustainable development, on the other hand, is an arithmetic mean of synthetic indicators for its particular dimensions:

$$MS_i^O = \frac{1}{3} (MS_i^{SD} + MS_i^{ED} + MS_i^{EnD}). \quad (i=1,2,\dots,n) \quad (5)$$

where:

- $MS_i^O$  – a general synthetic indicator of sustainable development,  
 $MS_i^{SD}$  – a synthetic indicator of development in its social dimension,  
 $MS_i^{ED}$  – a synthetic indicator of development in its economic dimension,  
 $MS_i^{EnD}$  – a synthetic indicator of development in its environmental dimension.

## Results of the research

At the following stage of research, based on the diagnostic values determining particular dimensions of sustainable development, values of synthetic indicators were determined in accordance with formula no. 4.

Table 2. contains the results of calculations for the social dimension of sustainable development in voivodeships in 2012 and 2021.

**Table 2.** Value of synthetic indicator for the social dimension of sustainable development in voivodeships in 2012 and 2021

Voivodeship	Social dimension (SD)		Position		Change of position 2012-2021
	2012	2021	2012	2021	
Dolnośląskie	0.545	0.506	11	12	-1
Kujawsko-pomorskie	0.514	0.497	13	13	0
Lubelskie	0.598	0.487	7	15	-8
Lubuskie	0.484	0.480	14	16	-2
Łódzkie	0.518	0.545	12	7	5
Małopolskie	0.730	0.571	1	5	-4
Mazowieckie	0.689	0.595	3	2	1
Opolskie	0.556	0.535	10	8	2
Podkarpackie	0.607	0.582	6	3	3
Podlaskie	0.644	0.527	4	9	-5
Pomorskie	0.707	0.580	2	4	-2
Śląskie	0.614	0.525	5	10	-5
Świętokrzyskie	0.374	0.487	16	14	2
Warmińsko-mazurskie	0.593	0.562	8	6	2
Wielkopolskie	0.577	0.614	9	1	8
Zachodniopomorskie	0.424	0.523	15	11	4

Source: authors' work based on GUS. (n.d.b).

Taking into consideration the social dimension of sustainable development in voivodeships in 2012 and 2021, considerable changes can be noticed in Polish voivodeships (Table 3). In 2012, Małopolskie, Pomorskie and Mazowieckie Voivodeships were the leaders. However, in 2021, Wielkopolskie ranked first, while Mazowieckie and Podkarpackie Voivodeships ranked second and third. Świętokrzyskie, Zachodniopomorskie and Lubuskie Voivodeships and Lubuskie, Lubelskie and Świętokrzyskie Voivodeships ranked last in terms of the social dimension of sustainable development in 2012 and 2021, respectively. Over the 10 years under study, Wielkopolskie Voivodeship has

improved its ranking the most – from the 9th place in 2012 to the 1st place in 2021. As many as 7 voivodeships (Łódzkie, Mazowieckie, Opolskie, Podkarpackie, Świętokrzyskie, Warmińsko-mazurskie and Zachodniopomorskie) have also improved their rankings. A deterioration in terms of the social dimension of sustainable development in voivodeships in 2012 and 2021 was observed for 7 voivodeships, with the largest one in the case of Lubelskie (8 ranks down), Podlaskie and Śląskie (5 ranks down) and Małopolskiego (4 ranks down).

Table 3 presents values of the synthetic indicator for the social economic of sustainable development in voivodeships in 2012 and 2021. In 2012, the value ranged between 0.088 for Warmińsko-mazurskie Voivodeship and 0.476 for Mazowieckie Voivodeship. Małopolskie and Dolnośląskie Voivodeships also ranked high (second and third, respectively). Warmińsko-mazurskie, Lubuskie and Kujawsko-pomorskie Voivodeships, in turn, are regions with the highest level of economic dimension of sustainable development.

In 2021, compared to 2012, all Polish voivodeships increased the value of the synthetic indicator with regard to the economic dimension of sustainable development. The value ranged between 0.363 for Świętokrzyskie Voivodeship and 0.873 for Mazowieckie Voivodeship. In 2012–2021, despite an improved level of the economic dimension of sustainable development in voivodeships, no considerable changes occurred in the ranking. As many as 8 voivodeships improved their ranking by 1–3 ranks, whereas 4 voivodeships (with the largest decrease recorded by Opolskie and Świętokrzyskie – a decrease by 6 and 4 ranks, respectively) worsened their ranking.

**Table 3.** Value of the synthetic indicator for the economic dimension of sustainable development in voivodeships in 2012 and 2021

Voivodeship	Economic dimension (ED)		Position		Change of position 2012-2021
	2012	2021	2012	2021	
Dolnośląskie	0.373	0.748	3	2	1
Kujawsko-pomorskie	0.187	0.450	14	13	1
Lubelskie	0.233	0.548	11	9	2
Lubuskie	0.183	0.444	15	14	1
Łódzkie	0.329	0.631	5	5	0
Małopolskie	0.402	0.741	2	3	-1
Mazowieckie	0.476	0.873	1	1	0
Opolskie	0.272	0.469	6	12	-6
Podkarpackie	0.234	0.564	10	8	2
Podlaskie	0.205	0.498	13	10	3
Pomorskie	0.259	0.604	8	6	2
Śląskie	0.367	0.685	4	4	0
Świętokrzyskie	0.210	0.363	12	16	-4
Warmińsko-mazurskie	0.088	0.431	16	15	1
Wielkopolskie	0.268	0.579	7	7	0
Zachodniopomorskie	0.237	0.482	9	11	-2

Source: authors' work based on GUS. (n.d.b).

An environmental aspect was another dimension of sustainable development in voivodeship under study. The values of the synthetic indicator for the economic dimension of sustainable development in voivodeships in 2012 and 2021 are presented in Table 4. In 2012, it ranged between 0.199 for Śląskie Voivodeship and 0.509 for Małopolskie Voivodeship. In 2021, the value of the synthetic indicator increased for all voivodeships. However, the changes were not considerable. The value ranged between 0.252 for Łódzkie Voivodeship and 0.643 for Lubuskie Voivodeship. In 2012-2021, as



many as 7 voivodeships improved their ranking in terms of the environmental dimension of sustainable development (Lubuskie the most – 4 ranks up), whereas 9 voivodeships worsened their ranking (with the largest decrease recorded by Małopolskie – 5 ranks down).

**Table 4.** Value of the synthetic indicator for the environmental dimension of sustainable development in voivodeships in 2012 and 2021

Voivodeship	Environmental Dimension (EnD)		Position		Change of position 2012-2021
	2012	2021	2012	2021	
Dolnośląskie	0.239	0.402	14	13	1
Kujawsko-pomorskie	0.344	0.430	9	10	-1
Lubelskie	0.291	0.459	12	8	4
Lubuskie	0.472	0.643	4	1	3
Łódzkie	0.206	0.252	15	16	-1
Małopolskie	0.509	0.536	1	6	-5
Mazowieckie	0.278	0.418	13	11	2
Opolskie	0.325	0.418	10	12	-2
Podkarpackie	0.451	0.507	5	7	-2
Podlaskie	0.406	0.536	8	5	3
Pomorskie	0.425	0.567	6	4	2
Śląskie	0.199	0.323	16	15	1
Świętokrzyskie	0.424	0.458	7	9	-2
Warmińsko-mazurskie	0.481	0.636	3	2	1
Wielkopolskie	0.314	0.401	11	14	-3
Zachodniopomorskie	0.483	0.597	2	3	-1

Source: authors' work based on GUS. (n.d.b).

At the subsequent stage of research, using formula no. 5, values of the general synthetic indicator of sustainable development in 2012 and 2021 were calculated as an arithmetic mean of the following dimensions: social, economic and environmental (Table 5).

**Table 5.** Value of the general synthetic indicator of sustainable development in voivodeships in 2012 and 2021

Voivodeship	The general synthetic indicator		Position		Change of position 2012-2021
	2012	2021	2012	2021	
Dolnośląskie	0.386	0.552	9	4	5
Kujawsko-pomorskie	0.348	0.459	15	15	0
Lubelskie	0.374	0.498	13	12	1
Lubuskie	0.380	0.522	12	9	3
Łódzkie	0.351	0.476	14	13	1
Małopolskie	0.547	0.616	1	2	-1
Mazowieckie	0.481	0.629	2	1	1
Opolskie	0.385	0.474	10	14	-4
Podkarpackie	0.431	0.551	4	5	-1
Podlaskie	0.418	0.520	5	10	-5

Voivodeship	The general synthetic indicator		Position		Change of position 2012-2021
	2012	2021	2012	2021	
Pomorskie	0.463	0.583	3	3	0
Śląskie	0.393	0.511	6	11	-5
Świętokrzyskie	0.336	0.436	16	16	0
Warmińsko-mazurskie	0.387	0.543	7	6	1
Wielkopolskie	0.386	0.531	8	8	0
Zachodniopomorskie	0.381	0.534	11	7	4

Source: authors' work based on GUS. (n.d.b).

The value of the general synthetic indicator of sustainable development in voivodeships in 2012 ranged between 0.336 and 0.547. The best voivodeships in terms of the three dimensions of sustainable development were Małopolskie, Mazowieckie and Pomorskie Voivodeships, while the worst ones were Świętokrzyskie, Kujawsko-pomorskie and Łódzkie Voivodeships. In 2021, the value of the general synthetic indicator of sustainable development increased in all Polish voivodeships. Mazowieckie, Małopolskie and Pomorskie Voivodeships were the leaders. Therefore, it can be noticed that after 10 years, the composition of top voivodeships in the ranking in terms of the value of the general synthetic indicator of sustainable development remained unchanged, the only exception being the first two voivodeships that swapped their ranks. Just like in 2012, Świętokrzyskie and Kujawsko-pomorskie Voivodeships ranked last, while Łódzkie Voivodeship was replaced by Opolskie Voivodeship.

By comparing the ranks of voivodeships in terms of the value of the general synthetic indicator of sustainable development in 2012 and 2021, it can be noticed that the largest positive changes occurred in Dolnośląskie and Zachodniopomorskie Voivodeships (5 and 4 ranks up, respectively), with Podlaskie and Śląskie Voivodeships recording the largest decrease (5 ranks down) and Opolskie (4 ranks down).

## Discussion/Limitation and future research

With respect to the literature review covering sustainable development of regions in Poland, issues such as evaluating the level of development in voivodeships in the context of economic, social and environmental development and relations between them were frequently addressed using various statistical methods. Some of the studies focused on determining the level of development, while others focused on determining the progress. Some studies also classified voivodeships or created groups characterised by a similar level of development.

An exemplary study taking into consideration all three dimensions of sustainable development was the analysis of voivodeships conducted by Telega (2011), Roszkowska and Karwowska (2014), Roszkowska et al. (2014), Fura (2015) or Drabarczyk (2017). The results of such studies were diversified, while the results of studies conducted by some authors differed depending on the analysis assumptions adopted, the methodology adopted, the indicators used, and how the study was conducted. Both the availability and completeness of statistical data by region were a considerable limitation in many studies (Borychowski et al., 2016).

In many studies, Małopolskie, Mazowieckie or Pomorskie Voivodeships were indicated in the group of the best voivodeships in terms of the sustainable development level. Opolskie and Świętokrzyskie Voivodeships, in turn, dominated the group of the worst voivodeships.

Studies on sustainable development usually covered all three components; however, there were also some studies that evaluated particular dimensions separately. The study conducted by Korol (2008), Bal-Domańska and Wilk (2011) was an exemplary study covering exclusively the economic dimension, whereas a study exclusively on the economic and social dimension (excluding the envi-

ronmental dimension) was conducted by Stec (2011). In these studies, Mazowieckie Voivodeship ranked the highest. A positive direction of changes was, however, noticeable in all studies.

Such studies are of practical importance. They provide an overall picture of the problem in question, while regions characterised by a lower degree to which the objectives of sustainable development have been achieved can, for instance, apply for aid funds as part of the EU cohesion policy or take advantage of the experience gathered by countries with higher levels of development. Accelerating the process of creating sustainable development requires giving an impetus to various groups of factors in each of the regions in Poland. An important role in this process should be played by institutions responsible for supporting it.

Furthermore, the process of achieving the objectives requires involving a broad group of stakeholders representing various environments, thus creating social and institutional partnerships to support their implementation. Increasing the effectiveness of achieving sustainable development objectives in the years to come will also require expenditure as part of public policies in particular regions of the country.

As Giorgetta (2002) notes, the implementation of the sustainable development concept at a regional level should facilitate taking advantage of emerging opportunities, on the one hand, and making it easier to overcome problems, on the other hand.

The authors are aware that the research conducted has its limits. They include limited availability of data in public statistics, which translates into a selection of variables analysed, comparability of statistical data or amendments to the legislation. Moreover, a relatively short period covered by the analysis prevents the authors from recognising trends occurring in the long term. For that reason, the authors plan to extend their research in the long term in order to further monitor the implementation of sustainable development objectives in Polish voivodeships by extending the analysis over subsequent years, adding more diagnostic variables or applying other research methodologies. Such measures are aimed at obtaining more reliability and effectiveness in determining the overall level of sustainable development and the economic, social, and environmental development of individual regions. This may lead to opening new research avenues and obtaining interesting observations.

## Conclusions

Studies on evaluating the actual level of sustainable development in particular regions are of key importance as they allow policymakers to make deliberate decisions and take measures. They are also a valuable source of information on development disproportions between voivodeships, which might result in determining potential directions for future activities in the field of sustainable development. They can constitute grounds for supporting weaker regions in the process of change by regional authorities so that they can get closer to those characterised by higher levels of development in the future.

As emphasised by Sachs et al. (2022), only developing results-based policies can be effective since it allows policymakers to implement the policies based on statistics and data, understand weak points, the remaining challenges and good practice.

Understanding various social, environmental and economic factors impacting sustainable development allows policymakers to specify the areas of measures and prepare an appropriate strategy (Boggia et al., 2018).

The results of the research conducted indicate gradual progress in particular regions of Poland (albeit to varying degrees) in implementing the concept of sustainable development in the years under study. As regards the implementation of the social dimension, voivodeships in south-eastern Poland dominated in 2012, while voivodeships in south and central Poland dominated in 2021. With regard to the economic dimension, voivodeships from central and southern Poland rank first in the years under study. An analysis of the results related to the environmental dimension in 2021 indicates that voivodeships in northern Poland rank the best. In 2012, they were accompanied by voivodeships in southern Poland. Taking into consideration the levels of sustainable development in voivodeships with regard to all three components of sustainable development (social, economic and environmental) in 2012 and 2021, it can be noticed that voivodeships located in a belt extending from the north of Poland (Pomorskie) to the south of Poland (Małopolskie, Podkarpackie) dominate, excluding

Opolskie and Świętokrzyskie Voivodeships. Irrespective of the year under study and the dimension of sustainable development, the latter voivodeships rank last in the ranking of voivodeships.

## Acknowledgements

The publication was financed by University of Rzeszów and WSB Merito University Poznań.

## The contribution of the authors

Conceptualization, M.G. and M.S.; literature review, M.G.; methodology, M.S.; writing, M.G., M.S., W.C. and I.K.-S.; conclusions and discussion, M.G., M.S., W.C. and I.K.-S.

The authors have read and agreed to the published version of the manuscript.

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Małgorzata STEC • Mariola GRZEBYK • Wiesława Caputa • Izabela KRAWCZYK-SOKOŁOWSKA

## ANALIZA PORÓWNAWCZA POZIOMU ROZWOJU ZRÓWNOWAŻONEGO WOJEWÓDZTW POLSKI W 2012 I 2021 ROKU

**STRESZCZENIE:** Rozwój zrównoważony należy do zjawisk złożonych, dlatego porównanie poziomu i ocena postępów regionów Polski we wdrażaniu jego założeń są szczególnie trudne. Celem artykułu było przeprowadzenie wielowymiarowej oceny zmian poziomu zrównoważonego rozwoju województw Polski w 2012 i 2021 roku. Analizie poddano trzy wymiary rozwoju zrównoważonego: społeczny, ekonomiczny i środowiskowy określone łącznie przez 30 wskaźników. Zastosowaną metodą badawczą była jedna z metod porządkowania liniowego-metoda bezwzorcowa z normalizacją opartą na unitaryzacji zerowanej, a badania przeprowadzono w ujęciu dynamicznym. Wyniki badań pokazują dokonujący się w poszczególnych regionach Polski stopniowy postęp (choć w różnym stopniu) we wprowadzaniu koncepcji zrównoważonego rozwoju w badanych latach. Zastosowanie syntetycznego miernika oceny działań pozwala na ocenę efektów osiągniętych w tych województwach, a także podjęcie ewentualnych działań korygujących. Są też cennym źródłem informacji o dysproporcjach rozwojowych pomiędzy województwami, co może przekładać się na ustalenie potencjalnych kierunków przyszłych działań w zakresie rozwoju zrównoważonego.

**SŁOWA KLUCZOWE:** rozwój zrównoważony, województwo, Polska, analiza porównawcza, wskaźnik syntetyczny