

Mariola GRZEBYK¹

Małgorzata STEC²

Pavlina HEJDUKOVA³

FINANCIAL SITUATION AND SUSTAINABLE DEVELOPMENT OF TERRITORIAL UNITS – A COMPARATIVE ANALYSIS OF POLISH VOIVODESHIPS

This paper compares and statistically evaluates two complex phenomena emerging from the example of Polish voivodeships in the years 2017-2019: the resulting financial situation and the level of sustainable development. The authors applied a model-free research method of linear ordering for objects, taking into account the dynamics of this approach. Through this method, the authors determined the financial situation and sustainable development of Polish voivodeships by using the values of synthetic measures. The results of the study confirm previous findings about differentiation of Polish voivodeships as regards to both their financial situations and their levels of sustainable development. Conclusions from this study may be the basis for comparison between the territorial units examined, helping future policy makers choose rationally. The methodological approach has great practical value, and might be used in comparative research: e.g., by territorial units in different countries to determine their own financial situations and levels of sustainable development.

Keywords: financial situation; sustainable development; voivodeships in Poland; a multidimensional comparative analysis; synthetic measure; ranking; classification.

1. INTRODUCTION

Financial situation and sustainable development of territorial units are complex phenomena that mutually affect each other. Financial resources of territorial units are the basis of their functioning and development. They also enable the implementation of statutory tasks related to meeting the needs of residents in different areas of life. Sustainable development improves the quality of life of the inhabitants, but the implementation of this

¹ Mariola Grzebyk: DSc, PhD, Associate Prof., University of Rzeszów, Institute of Economics and Finance, Źwiklińskiej 2 Str., 35-601 Rzeszów; e-mail: mgrzebyk@ur.edu.pl (corresponding author). ORCID: 0000-0003-1107-0250.

² Małgorzata Stec: DSc, PhD, Associate Prof., University of Rzeszów, Institute of Economics and Finance, Źwiklińskiej 2 Str., 35-601 Rzeszów; e-mail: mstec@ur.edu.pl. ORCID: 0000-0003-0185-4510.

³ Pavlina Hejdukova: PhD, University of West Bohemia, Faculty of Economics, Univerzitni 22 Str., 30614 Plzen; e-mail: pahejdu@kfu.zcu.cz. ORCID: 0000-0003-3387-1198.

development concept requires certain financial outlays. Shaping the right proportions between the three types of capital: economic, human and natural is important from the point of view of current and future generations. It therefore seems important to carry out comparative studies of the two complex phenomena.

Joining the discussion on the measurement of financial condition and progress in the implementation of the assumptions of sustainable development in the Polish voivodeships, we hope that our research results will contribute to further analyses in this field and serve as preliminary studies of the issues addressed.

The aim of the paper was to compare and statistically assess the financial situation and the level of sustainable development in 2017–2019, on the example of Polish voivodeships.

The implementation of the aim of the paper required proposing a set of variables defining the studied complex phenomena and carrying out their verification, then determining the value of the synthetic measure of the financial situation and the level of sustainable development of Polish voivodeships using a selected method of linear ordering of objects and analysis of the obtained results. The indicators obtained are quantitative information, which helps to explain how specific concerns (phenomena) change over time (Ciegis et.al., 2009).

In order to implement research assumptions, we tried to answer the following questions:

- which Polish voivodeships had the best and the worst financial situation?
- which Polish voivodeships achieved the highest and the lowest level of sustainable development?
- were similar rankings of voivodeships obtained in 2017-2019 for both complex phenomena (financial situation and level of sustainable development)?
- whether in voivodeships of Poland, in the examined years, there was an improvement in the financial situation and whether the examined voivodeships recorded some progress in implementing the concept of sustainable development?
- whether Polish voivodeships achieved a similar level of development considering both complex phenomena together?

2. FINANCIAL SITUATION AND SUSTAINABLE DEVELOPMENT OF LOCAL GOVERNMENT UNITS – LITERATURE REVIEW

Local government units (in Poland these are communes, poviats and voivodeships) operate and develop in an increasingly complex environment, which constitutes a place of economic activity concentration and is a creator of local and regional development. They are characterised by autonomy in decision-making, and their activities are directed at all types of resources, i.e. financial, human, material and information. In the operation of local government units, the management of financial resources acquires special importance, which affects the economic situation of the local government and the decisions taken by the local government authorities (Dworakowska, 2013). Rational management of these public funds, should meet the needs of the local community to the maximum and at the same time have an optimal impact on sustainable development. This situation, however, requires not only current, effective management of available financial resources, but also the cheapest acquisition of external financing (Wang et.al., 2007).

One of the basic principles of local government functioning is independent financial management on the basis of budget, which is the key institution of the financial system.

The analysis of financial management of local government units provides information on their past and present financial situation and the efficiency of their operations, as well as helps to identify their development opportunities. Data on potential threats that may result in the deterioration of the local government's financial situation is important information for managers (Zawora, 2018). The financial situation of voivodeships is determined, on the one hand, by their ability to generate income and, on the other hand, by the size of spending needs in terms of the tasks they carry out. At the same time, it determines the possibilities of indebtedness of local governments and obtaining co-financing with non-returnable funds from the European Union. Funds at the disposal of local government units in Poland determine both the degree and quality of obligatory statutory tasks and activities contributing to their development. The assessment of the financial situation of voivodeships is a complex but necessary process, especially in terms of financial management and decision-making (Raszkowski, Bartniczak, 2018).

Wójtowicz (2014) emphasises that the financial situation is a '...state in which local government authorities are able to provide a range of adequate quality public services appropriate to the needs of the territorial community, as well as to stimulate future socio-economic development'. At the same time, she emphasises that the analysed category has a much broader dimension than just the issues of ensuring the current liquidity or long-term solvency of local government units.

It should be added that the financial situation of territorial units is conditioned by both internal factors, related to dysfunctions in the financial management of self-government authorities (for example: excessive budget expenditures not adjusted to the local income potential; inefficient investment and debt policy; inefficient absorption policy of territorial units relating to EU aid funds; lack of appropriate risk management policy in the context of ensuring financial stability of these units, etc.) and external factors (for example: excessive budget expenditures not adjusted to the local income potential; inefficient investment and debt policy; inefficient absorption policy of territorial units relating to EU aid funds; lack of appropriate risk management policy in the context of ensuring financial stability of these units, etc.), as well as external (for example: instability of economic conditions as a result of the economic downturn; unstable legal environment and related frequent legislative changes destabilising the financial systems of local government units; excessively limited scope of financial independence of these units by the state, translating into limited 'leeway' of local government authorities in the aspect of the financial management carried out, especially in the situation of unexpected and unfavourable disturbances; imposition of additional public tasks on local government units by central authorities, disregarding the financial compensation required by the binding legal regulations, etc.) (Poniatowicz, 2016).

The condition of public finance, including financial standing, is an extremely important issue, determining and influencing various areas of local government operation.

The concept of sustainable development was introduced primarily to mitigate the negative effects of economic progress, which resulted in adverse environmental changes leading to pollution and even degradation.

Sustainable development is a contested concept with a wide range of meanings. It is embraced by big business, governments, social reformers and environmental activists, all of which put their own interpretation on what sustainable development means (Atstaja et.al., 2017; Giddings et.al, 2002; Kiselakova et.al., 2020). The discussion on the interpretation of sustainable development is very broad and results in numerous definitions of this development. Currently, there are dozens of definitions and interpretations of this concept.

The consequence of this is that sustainable development is a fluid, ambiguous category and burdened with a dose of subjectivity. The concepts of sustainable development largely depend on the fact who their author is. The popularity of the term means that it is sometimes difficult to assess whether we are dealing with a real economic and ecological category, or only with a marketing trick (Fura, 2015; Grzebyk, Stec, 2015).

Sustainable development according to Ihlen and Roper (2014) can be defined as sustainable development, i.e. socio-economic development of modern societies, consisting in satisfying their needs in such a way as not to reduce the possibility of satisfying the needs of future generations by shaping the right proportions between three types of capital: economic, human and natural.

Poskrobko (2007) understands sustainable growth as such a way of conducting economic activity, shaping and using the potential of the environment and such an organisation of social life, which ensure dynamic development of qualitatively new production processes, management systems, sustainability of the use of natural resources and improvement (in the first period), and then maintenance of high quality of life of people – individuals, families and societies.

Whereas Rogall (2009) notes that sustainable development aims to ensure high ecological, economic and socio-cultural standards for all people living today and future generations, while not exceeding the limits of the environment's capacity. It should be pursued in a continuous manner and in different dimensions simultaneously – on a national scale and within territorial units.

The implementation of sustainable development concept at the regional level should, on the one hand, enhance the exploitation of emerging opportunities and, on the other, facilitate overcoming problems (Giorgetta, 2002). The most universal and synthetic approach of sustainable development describes it as one that should be economically strength, ecologically sound and socially acceptable (Alaimo, 2018; Barbier, 2016; Bond et.al., 2001; Grzebyk, Stec, 2015).

Thus, sustainable development leads to positive qualitative and quantitative changes in a given area with simultaneous respect for environmental values and the principle of social equality. It is the result of the search for development that firstly minimises the negative effects of scientific and technical revolution, and secondly prevents conflicts in space management manifested mainly by environmental degradation (Grzebyk, Stec, 2015; Fura, 2020; Stec, 2018).

Great importance in the implementation of the principles of sustainable development in individual regions falls on the finances of local government units, in particular the spending policy conducted by public authorities. Regional public managers should be characterized by strong leadership, present the skill of inspiring others in carrying out the set goals and taking advantage of both intellectual and organization potential at their disposal (Czudec, Zając, 2020; Gelder, 2005; Gibney, 2012; Sotarauta et.al., 2012).

Strong emphasis on environmental and social issues at the local government level very often leads to budget imbalances and, consequently, to indebtedness of territorial units (Działo, 2012). The issue of assessing the legitimacy of maintaining budget imbalances and their impact on the development of countries or individual regions is a very difficult task and has been a source of controversy among economists for many years (Buchanan, 1997).

Most researchers agree, according to Gupta (2002), that in the long-term perspective the primary objective of the financial policy pursued by local governments should be to maintain a balanced budget. However, if increased budgetary expenditure is to be justified

by improvement of living conditions of the population or environmental protection, budgetary imbalance should not be assessed negatively. In the area of local government finance, it is even pointed out that the justification for incurring debts in excess of income is the implementation of projects promoting sustainable development.

The Act on public finance in Poland enacted in 2009 introduced many changes for local government units concerning local finance management and debt level. It provides, for example, the necessity of balancing the budget in the area of current expenditure, in accordance with Article 242 of the Act it cannot be higher than the planned current income increased by budget surplus from previous years and free funds as surplus of cash on the current account of the budget of the local government unit resulting from the settlement of issued securities, loans and borrowings from previous years. Operating surplus makes it possible to assess the extent to which the local government unit finances current expenditures from current income and whether it has the capacity to incur liabilities and service them. With an operating deficit, the local government unit is not able to finance its current expenditure with current income (Ustawa..., 2009). This indicates the need to finance the current activities of the local government from new liabilities or the sale of assets.

The research contained in the source literature shows that sustainable development has gained popularity in recent literature (Alaimo, Maggino 2020; Maggino, Alaimo 2021), but there is no comprehensive study that shows the possibilities of implementing sustainable development principles depending on the financial situation of local government units. There is a need to focus on economic, environmental and social sustainability, which also take into account factors that directly or indirectly influence the maintenance of all three aspects mentioned earlier.

Sustainable development is a process that cannot be measured directly. It is only feasible to describe it with certain quantitative variables using adequate measurement methods and tools. Different quantitative methods are used in research to assess sustainable development (Cohon, 2003). However, there is no standard model used to evaluate the sustainable development of territorial units. Many publications consider the problem of multidimensional analysis of complex phenomena, i.e., sustainable development (Łuczak, Just, 2021).

3. RESEARCH METHOD

3.1. Statistical Database

In the article, the research was conducted on the example of 16 Polish voivodeships. The indicators for evaluating the financial situation of voivodeships were officially adopted by the Ministry of Finance for evaluating territorial units of Poland. They were downloaded from the website (<https://www.gov.pl/web/finanse/wskazniki-do-oceny-sytuacji-finansowej-jednostek-samorzadu-terytorialnego-w-latach-2017-2019>). Statistical data on sustainable development of Polish voivodeships came from the Local Data Bank of Statistics Poland in Warsaw [<https://bdl.stat.gov.pl/BDL/start>].

Voivodeship is a territorial unit corresponding to the EU space division at NUTS 2 level. In Poland, since 1999, there is a three-tier administrative division for 16 voivodeships, 380 poviats and 2478 communes. The five-tier division of territorial units for statistical purposes (NUTS) has also been in force since Poland's accession to the European Union. NUTS divides Poland into units of five levels, three of which are defined at the regional level

(NUTS 1 – regions, NUTS 2 – voivodeships – 16 units – statistical division corresponds to the administrative division; NUTS 3 – subregions (groups of poviats), and two at the local level (NUTS 4 – poviats, NUTS 5 – gminas/communes). This system was developed by Eurostat to build Community regional statistics.

In terms of the theory of regional economy voivodeships are administrative regions, i.e. territorial units with clearly defined boundaries, introduced by the central authorities and designed as functional regions to provide one or many administrative services, different from the local government and federal division of the country within which they are located and also equipped with administration with clearly defined conditions of mutual dependence, occupying a particular niche, i.e. a place in the overall territorial organization system (Bullmann, 2015; Raszkowski, Bartniczak, 2018).

The financial situation of the examined territorial units is a complex phenomenon, which is difficult to describe using one universal indicator. Therefore, in order to assess Polish voivodeships in terms of their financial situation, 13 variables divided into three groups were initially proposed: budget indicators, indicators *per capita*, and indicators for liabilities by debt titles: The S symbol stands for stimulants (those features with high values that are desirable from a certain point of view (e.g. financial situation or the level of sustainable development), while low values are undesirable), while the D symbol stands for destimulants (those features with low values that are desirable from a certain point of view of the studied phenomenon, while high values are undesirable). These concepts were introduced to the literature by Hellwig (1968).

I. Budgetary indicators

$X1_{FS}$ – share of current income in total income (%) (S),

$X2_{FS}$ – share of own income in total income (%) (S),

$X3_{FS}$ – share of operating surplus in total income (%) (S),

$X4_{FS}$ – share of property expenditure in total expenditure (%) (S),

$X5_{FS}$ – burden of current expenditure on salaries and related items (%) (D),

$X6_{FS}$ – share of operating surplus and income from sale of assets in total income (%) (S),

$X7_{FS}$ – self-financing ratio (%) (S).

II. Per capita indicators

$X8_{FS}$ – current transfers *per capita* in PLN (S),

$X9_{FS}$ – operating surplus *per capita* in PLN (S),

$X10_{FS}$ – total liabilities *per capita* in PLN (D).

III. Ratios for liabilities by debt titles

$X11_{FS}$ – share of total liabilities in total income (%) (D),

$X12_{FS}$ – debt service burden on total income (%) (D),

$X13_{FS}$ – debt service burden on own income (%) (D).

It should be noted that the variables proposed for the assessment of the financial situation of voivodeships represent its most important aspects and may be the basis for comparing individual local government units, the possibility of incurring liabilities or making developmental decisions. In the above set of indicators most of the features are stimulants. Destimulants refer to all commitment indicators and the variable $X5_{FS}$ and $X10_{FS}$.

The second complex phenomenon analysed is the sustainable development of Polish voivodeships. Poland represents one of the precursors of research on sustainable development indicators. The interest in practical applications of multivariate comparative

analysis in the assessment of country and development of other territorial units was already observed in the 70s and 80s. It was manifested not only in the attempts to estimate the discussed development, but also in the abundant theoretical output (Borys, 2005).

The conditions and needs of the implementation of the rules of sustainable development have changed over the last years since the arrangements (Sneddon et al., 2006). Nonetheless, the core concept remains the same (Byrne, Glower, 2002). In the international literature one can find various attempts to operationalize the level of sustainable development. Difficulties in measuring sustainable development arise from the diversity of definitions and determinants of this development. Lack of agreement among researchers regarding the importance of individual planes creating sustainable development results in many ways of measuring this phenomenon (Taylor, 2014).

The selection of indicators that allow measuring the implementation of the concept of sustainable development is the subject of constant discussion. They are to answer the question to what extent development in the studied case corresponds to this idea. However, the use of sustainable development indicators usually aims to illustrate the degree of implementation of the principles and individual goals adopted in the sustainable development strategy (Borys, 2011).

Indicators should be characterized by the following features: simplicity, wide coverage, possibility of qualitative assessment that allows for setting trends. Integrated sustainability assessment itself is the most important and difficult sphere of potential indicator use because such an assessment should include wide spectrum of different problems and issues (Stec, Grzebyk, 2018; Dahl, 2007).

In the paper, 30 variables were initially used to assess the level of sustainable development of Polish voivodeships. The selection of variables for the study referred to each of the spheres responsible for sustainable development, i.e. social, economic and environmental sphere. The variables were selected after an extensive review of sustainability research (Stec, 2021):

I. The social dimension (SD) is determined by the following variables:

$X1_{SD}$ – population growth per 1,000 people (S),

$X2_{SD}$ – migration balance for permanent residence (inter-voivodeship migrations) per 1,000 people (S),

$X3_{SD}$ – deaths due to cancer and cardiovascular diseases per 10,000 inhabitants (D),

$X4_{SD}$ – suicide rate per 10,000 inhabitants (D),

$X5_{SD}$ – physicians (total working staff) per 10,000 population (S),

$X6_{SD}$ – extreme poverty risk rate in % (D),

$X7_{SD}$ – students per 10,000 inhabitants (S),

$X8_{SD}$ – total crimes recorded by the Police per 1,000 inhabitants (D),

$X9_{SD}$ – average monthly consumption of vegetables per 1 person in kg (S),

$X10_{SD}$ – consumption of water from waterworks in m³ per 1 inhabitant (D).

II. The economic dimension (ED) is represented by the variables:

$X11_{SD}$ – national economy entities entered in the REGON (Business) register per 10,000 inhabitants (S),

$X12_{SD}$ – investment expenditures *per capita* in PLN (S),

$X13_{SD}$ – employees in R&D per 1,000 economically active persons (S),

$X14_{SD}$ – average share of innovative enterprises in the total number of enterprise (%) (S),

- $X15_{SD}$ – patents granted by the Patent Office of the Republic of Poland per 100,000 inhabitants (S),
 $X16_{SD}$ – unemployment rate in % (D),
 $X17_{SD}$ – victims of accidents at work per 1,000 employed persons (D),
 $X18_{SD}$ – average monthly disposable income *per capita* (S),
 $X19_{SD}$ – expressways and motorways in km per 100 km² of area (S),
 $X20_{SD}$ – passenger cars per 1,000 inhabitants (D).

III. The environmental dimension (ED) is defined by the following variables:

- $X21_{SD}$ – forest cover in % (S),
 $X22_{SD}$ – share of legally protected areas in the total area (%) (S),
 $X23_{SD}$ – certified organic farms – share of agricultural area in total agricultural area (%) (S),
 $X24_{SD}$ – share of renewable energy in total electricity production (%) (S),
 $X25_{SD}$ – emission of gaseous pollutants from particularly onerous facilities in t/y per 100 km² of area (D),
 $X26_{SD}$ – emission of particulate pollutants from particularly onerous facilities in t/y per 100 km² of area (D),
 $X27_{SD}$ – wastewater treated during the year in dam³, discharged per 1 inhabitant (S)
 $X28_{SD}$ – share of waste generated during the year, recycled in total waste (%) (S),
 $X29_{SD}$ – share of devastated and degraded land requiring rehabilitation in the total area (D),
 $X30_{SD}$ – expenditure on fixed assets for environmental protection and water management in thousand PLN/1 inhabitant (S).

The variables proposed to assess the level of sustainable development in its three dimensions define its most important aspects. In the social dimension, they assess demographic change, the health situation and level of wealth of the population, the level of education, public safety and sustainable consumption patterns. In the economic dimension, they determine economic development, the labour market, R&D and innovation activities of enterprises, technical infrastructure and the economic situation of households. Meanwhile, in the environmental dimension, they include variables that make it possible to assess the state and quality of the environment (Pawlewicz, K., Pawlewicz, A., 2020).

In the next stage of the research, sets of variables determining the financial situation and sustainable development of Polish voivodeships were subjected to statistical verification by assessing the level of variation and correlation between variables in 2019 in the cross-section of its individual dimensions.

The classical coefficient of variation defined by v_j the following formula (Nowak, 1990) was adopted as a measure of the level of variation:

$$v_j = \frac{s_j}{\bar{x}_j} \quad (j = 1, 2, \dots, m) \quad (1)$$

where: s_j – standard deviation of the X_j feature,
 \bar{x}_j – arithmetic mean of the X_j feature,
 calculated from the formulas:

$$s_j = \sqrt{\frac{1}{n} \sum_{i=1}^n (x_{ij} - \bar{x}_j)^2} \quad (j = 1, 2, \dots, m) \quad (2)$$

$$\bar{x}_j = \frac{1}{n} \sum_{i=1}^n x_{ij} \quad (j = 1, 2, \dots, m) \quad (3)$$

From the set of potential diagnostic variables, variables that met the following condition were eliminated:

$$|v_j| \leq v^* \quad (4)$$

where: v^* – the critical value of the coefficient of variation (usually taken at the level of 0.10).

An important criterion for the selection of diagnostic variables is a proper correlation of individual variables. The inverse correlation matrix method developed by A. Malina and A. Zeliaś is helpful in this respect.

The steps in this method include (Malina, Zeliaś, 1997; Malina, Zeliaś, 1998) determination of the \mathbf{R} matrix of linear correlation coefficients of the form:

$$\mathbf{R} = \begin{bmatrix} 1 & r_{12} & \dots & r_{1m} \\ r_{21} & 1 & \dots & r_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ r_{m1} & r_{m2} & \dots & 1 \end{bmatrix} \quad (5)$$

where: r_{jk} – Pearson's linear correlation coefficient between the variables X_j and X_k .

- determination of the inverse matrix to the \mathbf{R} matrix,

$$\mathbf{R}^{-1} = [r^{(ij)}] \quad (6)$$

where: $r^{(ij)}$ ($i, j = 1, 2, \dots, m$) are the elements of the inverse matrix \mathbf{R}^{-1} .

When a variable is excessively correlated with the other variables, then the diagonal elements of the inverse matrix \mathbf{R}^{-1} are much larger than unity, which is a symptom of poor numerical conditioning of the \mathbf{R} matrix.

- eliminating from the set of variables those for which the condition is met:

$$|r^{(jj)}| > r^* \quad (7)$$

where: $r^{(jj)}$ – diagonal element of the matrix \mathbf{R}^{-1} ,

r^* – critical value of diagonal elements of the matrix \mathbf{R}^{-1} , most often set at the level of 10.

The described procedure of statistical verification of variables was applied separately for both examined complex phenomena, i.e. financial situation and sustainable development of Polish voivodeships.

Therefore 13 variables describing the financial situation of Polish voivodeships, divided into 3 groups, were assessed. After the research it turned out that the level of variable variation was from 0.1342 for variable X_{IFS} (Share of current income in total income) to

0.7591 for variable $X13_{FS}$ (Debt service burden on own income). None of the studied variables was therefore eliminated due to the level of variability.

On the other hand, when examining the level of correlation between variables describing the financial situation of Polish voivodeships using the inverse correlation matrix method, the following variables were eliminated: $X1_{FS}$ – Share of current income in total income (%) and $X6_{FS}$ – share of operating surplus and income from sale of assets in total income (%). Finally, the set of diagnostic variables in the financial situation of Polish voivodeships included 11 variables.

Statistical verification of variables determining sustainable development of Polish voivodeships was performed in a similar way.

Too low level of variation was observed for variables $X3_{SD}$ – deaths due to cancer and cardiovascular diseases per 10,000 inhabitants (coefficient of variation 0.034), $X9_{SD}$ – average monthly consumption of vegetables per 1 person in kg (0.091), $X18_{SD}$ – average monthly disposable income per person (0.086) and $X20_{SD}$ – passenger cars per 1,000 inhabitants (0.072). When examining the level of correlation between variables using the inverse correlation matrix method, the following variables were eliminated: $X2_{SD}$ – migration balance for permanent residence (inter-voivodeship migrations) per 1,000 population and $X13_{SD}$ – employees in R&D per 1,000 economically active persons. However, among the variables representing the environmental dimension of sustainable development, none of them was excluded due to too high correlation. Thus, the set of diagnostic variables for sustainable development of Polish voivodeships included 24 variables.

It should be noted that in order to maintain comparability of results, the same sets of diagnostic variables were also adopted for 2017 and 2018.

3.2. Statistical Methods

In the assessment of the examined complex phenomena, i.e. the financial situation and the level of sustainable development of Polish voivodeships, the model-free method of linear ordering of objects with normalisation by means of zero unitarisation was used. The research period was 2017–2019.

The method assumptions and its subsequent stages included (Kukuła, 2000)

1. Presenting of diagnostic variable values X_j ($j = 1, 2, \dots, m$) describing the studied objects (Polish voivodeships) O_i ($i = 1, 2, \dots, n$) in each of the studied periods (2017, 2018, 2019) in the form of a two-dimensional matrix:

$$\mathbf{X} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ x_{n1} & x_{n2} & \cdots & x_{nm} \end{bmatrix} \quad (8)$$

2. Normalisation of the variables to maintain comparability of statistical data, according to the following formulas:

for stimulants:

$$z_{ij} = \frac{x_{ij} - \min_i \{x_{ij}\}}{R_j} \quad (9)$$

for destimulants:

$$z_{ij} = \frac{\max_i\{x_{ij}\} - x_{ij}}{R_j} \quad (10)$$

where: z_{ij} – the normalised value of a j -th variable for the i -th object, x_{ij} – the value of a j -th variable for the i -th object, R_j – range for the j th variable. Normalisation was carried out for “object-periods”, i.e. $\min_i\{x_{ij}\}$, $\max_i\{x_{ij}\}$, and R_j values were identified for all four studied years.

3. Calculating the synthetic measure values for the for individual dimensions of the studied complex phenomena as an arithmetical mean of normalised variable values, using the formula (4):

$$MS_i = \frac{1}{m} \sum_{j=1}^m z_{ij} \quad (11)$$

where: MS_i – synthetic measure for three groups of variables (I–III), z_{ij} – the normalised value of the j -th variable for the i -th object. Thus, the value of the general synthetic measure of the financial situation of Polish voivodeships and the level of balanced development is the arithmetic mean of the synthetic measures calculated for three dimensions of variables (I–III):

$$MS_i^G = \frac{1}{3} (MS_i^I + MS_i^{II} + MS_i^{III}) \quad (12)$$

where: MS_i^G – the general synthetic measure of a complex phenomenon (financial situation of Polish voivodeships, level of sustainable development),

MS_i^I – the synthetic measure of dimension I,

MS_i^{II} – the synthetic measure of dimension II,

MS_i^{III} – the synthetic measure of dimension III.

The synthetic measure takes values from the [0,1] range. The higher the general synthetic measure value, the higher the level of the examined complex phenomenon.

4. Classifying Polish voivodeships into 4 groups, according to the following formulas:

Group 1:	$MS_i^G \geq \overline{MS}_i^G + S_i^G$	high level	
Group 2:	$\overline{MS}_i^G + S_i^G > MS_i^G \geq \overline{MS}_i^G$	medium-high level	(13)
Group 3:	$\overline{MS}_i^G > MS_i^G \geq \overline{MS}_i^G - S_i^G$	medium-low level	
Group 4:	$S_i^G < \overline{MS}_i^G - S_i^G$	low level	

where: \overline{MS}_i^G – the mean value of the general synthetic measure, S_i^G – standard deviation of the general synthetic measure.

4. RESEARCH RESULTS

4.1. Descriptive statistics

A preliminary assessment of the financial situation and sustainable development was carried out by determining and interpreting basic statistical measures [maximum, minimum and average value, coefficient of variation (CV) and coefficient of asymmetry (CA) for the diagnostic variables defining them in 2019 (Table 1–2).

Table 1. Descriptive statistics of diagnostic variables determining the financial situation of Polish voivodeships in 2019

Indicator	Maximum value		Minimum value		Mean	Coefficient of variation (%)	Coefficient of asymmetry
$X2_{FS}$	Mazowieckie	84.5	Podlaskie	19.3	44.7	42.8	0.53
$X3_{FS}$	Mazowieckie	27.2	Podlaskie	10.3	17.8	25.1	0.21
$X4_{FS}$	Podlaskie	63.7	Śląskie	26.8	38.9	24.9	1.07
$X5_{FS}$	Lubuskie	33.3	Mazowieckie	18.9	28.4	13.8	-0.93
$X7_{FS}$	Śląskie	142.4	Lubuskie	82.0	106.4	14.3	0.55
$X8_{FS}$	Warmińsko-Mazurskie	269.1	Mazowieckie	58.8	173.3	42.8	-0.29
$X9_{FS}$	Mazowieckie	166.8	Lubuskie	52.6	88.3	29.4	1.64
$X10_{FS}$	Lubelskie	334.5	Podkarpackie	99.8	163.3	40.8	1.27
$X11_{FS}$	Łódzkie	63.5	Opolskie	17.9	33.4	42.8	0.93
$X12_{FS}$	Lubelskie	12.6	Podlaskie	1.5	5.5	49.0	0.84
$X13_{FS}$	Lubelskie	51.0	Wielkopolskie	4.2	14.4	75.9	2.59

Source: own calculations.

The financial situation of the Polish voivodeships was described by 13 diagnostic variables.

In 2019, the maximum value of the variable $X2_{FS}$ – share of own income in total income, which is a symptom of financial independence of voivodeships was in 84.5%. The undisputed leader in this respect was the Mazowieckie Voivodeship. The worst situation was in the Podlaskie Voivodeship, with the indicator at the level of 19.3%. The average value of the $X2_{FS}$ variable for Polish voivodeships amounted to 44.7%, and the level of voivodeship differentiation in terms of this variable can be considered moderate.

The indicator informing about investment opportunities or the scope of increasing current expenditure is the variable $X3_{FS}$ – the share of operating surplus in total income. In 2019, its value ranged from 10.3% (Podlaskie Voivodeship) to 27.2% (Mazowieckie Voivodeship). The average value of the variable for all Polish voivodeships was 17.8%. The variation of voivodeships in terms of this indicator is not high (the coefficient of variation amounted to 25.1%).

Another analysed indicator is variable $X4_{FS}$ – share of property expenditure in total expenditure. It should be added that property expenditures include mainly investments and investment purchases, and their high share in total expenditures is a pro-development factor for local government units. In 2019, the highest value of variable $X4_{FS}$ (63.7%) was achieved by the Podlaskie Voivodeship, while the lowest value was achieved by the Śląskie

Voivodeship (26.8%). The average for all voivodeships was 38.9%. The examined voivodeships are poorly diversified in terms of the value of this variable (the coefficient of variation amounted to 24.9%), but for most of them, the value of the indicator was below the average.

The lowest burden of current expenditure on salaries and salary derivatives (variable $X5_{FS}$) was in the Mazowieckie Voivodeship (18.9%), which can be considered a positive phenomenon. The highest percentage was observed in the Lubuskie Voivodeship (33.3%). The average value for all voivodeships was 28.4%, while the value above the average was reached by 9 voivodeships.

An important indicator in assessing the financial condition of Polish voivodeships is variable $X7_{FS}$ - self-financing index. It evaluates the extent to which a local government unit finances investments with its own funds. In 2019, the value of variable $X7_{FS}$ ranged from 82.0% in the Lubuskie Voivodeship to 142.4% in the Śląskie Voivodeship. The average level of this variable for the Polish voivodeships was 106.4%. The coefficient of variation oscillated at the level of 14.3%, which indicates a weak differentiation of voivodeships in terms of the value of the analysed variable.

In the second group of indicators used to assess the financial condition of voivodeships there were 3 variables $X8_{FS} - X10_{FS}$.

The variable $X8_{FS}$ - being the value of current transfers (general subsidy and current grants) *per capita* in PLN - determines the financial strength of an entity and its ability to meet the needs of a given community. Among Polish voivodeships, the highest value of this variable was achieved by the Warmińsko-Mazurskie voivodeship (269.1 PLN/1 inhabitant), while the lowest value was achieved by the Mazowieckie voivodeship (58.8 PLN/1 inhabitant). The value of 173.3 PLN/1 inhabitant was the average for all voivodeships. Moreover, Polish voivodeships were characterised by moderate diversity in terms of the $X8_{FS}$ variable.

Another indicator - variable $X9_{FS}$ - operating surplus per 1 inhabitant in PLN determines the positive value of the current result (i.e. the difference between current income and current expenditure of the unit) calculated per 1 inhabitant. It indicates the potential capacity of the local government unit to repay its liabilities and to finance its investment expenditure. In 2019, the highest value of this indicator (166.8 PLN/1 inhabitant) was reached by the Mazowieckie voivodeship. The Lubuskie Voivodeship has achieved a value which is almost three times lower (52.6 PLN/1 inhabitant). The average level of the examined variable for Polish voivodeships was 88.3 PLN per 1 inhabitant. The asymmetry coefficient for voivodeships reached 1.64, which means that in most voivodeships the value of the $X9_{FS}$ variable was below the average.

A high ratio of liabilities *per capita* ($X10_{FS}$) may limit the financing of the implementation of the tasks of the unit, but it is quite often associated with financing the implementation of investments through external sources of funding. In the future, this may generate higher revenues and indicate a high investment commitment of the entity, but may also result in additional costs. In 2019, the highest indicator of liabilities *per capita* was in the Lubelskie Voivodeship (334.5 PLN/ 1 inhabitant), while the lowest was in the Podkarpackie Voivodeship (99.8 PLN/ 1 inhabitant).

The last group of indicators to evaluate the financial situation of voivodeships included 3 variables $X11_{FS} - X13_{FS}$. They determine the degree of burden of debt service on total income and own income.

In 2019, the value of variable $X11_{FS}$ – the share of total liabilities in total income ranged from 17.9% (the Opolskie Voivodeship) to 63.5% (the Łódzkie Voivodeship) The average for all the voivodeships was 33.4%. while the variation coefficient at the level of 42.8% indicates a moderate differentiation of voivodeships in terms of the value of the analysed variable.

The best situation in terms of the burden of debt service on total income ($X12_{FS}$) was in the Podlaskie Voivodeship. Only 1.5% of its income was burdened with debt service. The worst situation was in the Lubelskie voivodeship. with the indicator at the level of 12.6%. The average for all voivodeships was 5.5%. In terms of the value of this variable. Polish voivodeships were moderately diversified ($CV = 49.0\%$) and moreover half of them obtained a lower ratio of total income burdened with debt service than its average level.

The last indicator used in the assessment of the financial situation of Polish voivodeships informs about the burden of debt service on their own income ($X13_{FS}$). High values of this indicator may lead to the risk of insolvency of a given local government unit. In the case of the examined voivodeships. the value of the $X13_{FS}$ variable ranged from 4.2% (the Wielkopolskie voivodeship) to 51.0% (the Lubelskie voivodeship). The average value was 14.4%. However, the obtained value of the coefficient of variation (75.9%) indicates a fairly strong differentiation of voivodeships in terms of the value of this indicator. Also a strong right asymmetry was observed ($CA = 2.59$), so most of the voivodeships had a value of the examined variable below the average.

The basic statistical characteristics of the variables determining the sustainable development of Polish voivodeships in 2019 are presented in Table 2.

The social dimension of sustainable development is defined by 7 diagnostic variables.

In 2019, the highest population growth per 1.000 people (variable $X1_{SD}$) was recorded in the Pomorskie Voivodeship (1.5). while the lowest in the Łódzkie Voivodeship (-3.7). The average index for Poland was negative and amounted to -1.2. It should be noted that Polish voivodeships are highly differentiated in terms of variable $X1_{SD}$ ($CV = 128.8\%$).

Another variable concerned the number of suicides per 10.000 inhabitants ($X4_{SD}$). In 2019. the highest number of suicides was observed in the Świętokrzyskie Voivodeship (1.6 per 10.000 inhabitants). The voivodeships with the lowest number were the Opolskie and the Śląskie voivodeships (0.7 each). The average for all voivodeships was 1.2 per 10.000 inhabitants In terms of the value of this variable. the Polish voivodeships were poorly diversified ($CV = 22.4\%$).

The level of health care is represented by the variable $X5_{SD}$ – doctors per 10.000 residents.

The leader in this respect was the Mazowieckie Voivodeship. where there were about 80 physicians per 10.000 population The last place in the ranking of voivodeships in terms of the number of physicians per 10.000 population was occupied by the Wielkopolskie Voivodeship with the indicator at the level of 36.7. For all the voivodeships. the average value of the $X5_{SD}$ variable was 54.9 physicians per 10.000 population. The studied voivodeships were also poorly differentiated in terms of the value of the variable ($CV = 20.7\%$).

In 2019. the percentage of population at risk of extreme poverty ranged from 1.3% in the Opolskie Voivodeship to 7.5% in the Małopolskie Voivodeship. The average value of the $X6_{SD}$ indicator for the Polish voivodeships was 4.3%. the variation between voivodeships can be considered moderate ($CV = 47.5\%$).

Table 2. Descriptive statistics of diagnostic variables defining sustainable development of Polish voivodeships in 2019

Indica- tor	Maximum value	Minimum value	Mean	Coefficient of variation (%)	Coefficient of asymmetry		
2019							
<i>X1_{SD}</i>	Pomorskie	1.5	Łódzkie	-3.7	-1.2	128.8	0.35
<i>X4_{SD}</i>	Świętokrzyskie	1.6	Opolskie. Śląskie	0.7	1.2	22.4	-0.52
<i>X5_{SD}</i>	Mazowieckie	80.1	Wielkopolskie	36.7	54.9	20.7	0.53
<i>X6_{SD}</i>	Małopolskie	7.5	Opolskie	1.3	4.3	47.5	0.20
<i>X7_{SD}</i>	Mazowieckie	452.0	Lubuskie	125.0	278.3	33.3	0.38
<i>X8_{SD}</i>	Zachodniopomorskie	30.4	Podkarpackie	12.2	20.2	22.8	0.52
<i>X10_{SD}</i>	Wielkopolskie	40.3	Podkarpackie	23.9	32.9	13.3	-0.11
<i>X11_{SD}</i>	Mazowieckie	1576.0	Podkarpackie	851.0	1113.6	18.1	0.65
<i>X12_{SD}</i>	Mazowieckie	13477.0	Świętokrzyskie	4999.0	7579.8	27.8	1.75
<i>X14_{SD}</i>	Małopolskie	19.3	Lubuskie	10.2	14.3	19.2	0.23
<i>X15_{SD}</i>	Zachodniopomorskie	10.9	Lubuskie	2.7	6.9	35.3	0.02
<i>X16_{SD}</i>	Warmińsko- -Mazurskie	9.1	Wielkopolskie	2.8	5.9	30.7	0.10
<i>X17_{SD}</i>	Dolnośląskie	7.6	Mazowieckie	4.5	6.4	14.0	-1.00
<i>X19_{SD}</i>	Śląskie	2.8	Podlaskie	0.5	1.4	47.1	0.96
<i>X21_{SD}</i>	Lubuskie	49.3	Łódzkie	21.5	30.3	22.6	1.25
<i>X22_{SD}</i>	Świętokrzyskie	64.9	Dolnośląskie	18.6	33.4	37.8	1.09
<i>X23_{SD}</i>	Warmińsko- -mazurskie	8.6	Opolskie	0.5	2.8	95.2	1.48
<i>X24_{SD}</i>	Warmińsko- -Mazurskie	85.7	Opolskie	4.0	29.2	86.0	1.03
<i>X25_{SD}</i>	Śląskie	262972.8	Warmińsko- -Mazurskie	7128.8	73105.2	99.7	1.55
<i>X26_{SD}</i>	Śląskie	45.1	Warmińsko- -Mazurskie	2.6	10.1	95.8	3.18
<i>X27_{SD}</i>	Mazowieckie	0.04	Lubelskie	0.02	0.03	13.31	-0.25
<i>X28_{SD}</i>	Małopolskie	0.56	Lubelskie	0.02	0.20	79.06	0.92
<i>X29_{SD}</i>	Śląskie	0.40	Mazowieckie	0.10	0.21	46.10	0.61
<i>X30_{SD}</i>	Mazowieckie	0.44	Warmińsko- -Mazurskie	0.18	0.30	20.77	0.17

Source: own calculations.

The Mazowieckie Voivodeship had the highest number of students per 10.000 inhabitants (452.0), whereas the Lubuskie Voivodeship had the lowest (125.0). On average, there were about 278 students per 10.000 inhabitants in the country, and the differentiation of voivodeships in terms of *X7_{SD}* can be considered weak.

The level of security in Poland can be indicated by the variable *X8_{SD}* – total crimes recorded by the police per 1.000 people. The voivodeship with the lowest number of crimes in 2019 turned out to be the Podkarpackie voivodeship with an indicator at the level of 12.2, while the Zachodniopomorskie voivodeship was one of the most threatened with crime.

where the number of crimes recorded by the Police per 1.000 inhabitants amounted to 30.4. On average in Poland, about 20.2 crimes per 1.000 of population were stated, the differentiation of voivodeships can be considered weak ($CV = 22.8\%$).

Water consumption from waterworks in m^3 per 1 inhabitant (variable $X10_{SD}$) ranged from 23.9 m^3 in the Podkarpackie Voivodeship to 40.3 m^3 in the Wielkopolskie Voivodeship, with the Polish average at the level of 32.9 m^3 per 1 inhabitant. The coefficient of variation amounting to 13.3% indicates low differentiation of voivodeships in relation to this variable.

The economic dimension of sustainable development is represented by 7 diagnostic variables. The variable $X11_{SD}$ defines the number of national economy entities entered in the REGON (Business) register per 10.000 people. In 2019, the leader in this respect was the Mazowieckie Voivodeship with an indicator of 1.576 entities. The least number of business entities was registered in the Podkarpackie Voivodeship (851). The Polish voivodeships are poorly diversified in terms of the value of variable $X11_{SD}$ and in 9 of them fewer business entities were registered than the national average (about 1.114 entities).

Another variable of the economic dimension of sustainable development determines the value of investment expenditures *per capita* in PLN (variable $X12_{SD}$). In 2019, the best voivodeship in this regard was the Mazowieckie Voivodeship, where the value of variable $X12_{SD}$ was 13.477 PLN *per capita*. In contrast, the worst voivodeship, i.e. the Świętokrzyskie voivodeship, was at a level more than 2.5 times lower than the best. The Polish voivodeships were poorly diversified in terms of the value of investment outlays per 1 inhabitant in PLN, but the high value of the asymmetry coefficient ($CA = 1.75$) indicates that in most of them it was below the average.

The leader in terms of the average share of innovative enterprises in the total number of enterprises in 2019 was the Małopolskie Voivodeship with an indicator of 19.3%. The lowest share of such enterprises was recorded in the Lubuskie Voivodeship (10.2). The average value of the $X14_{SD}$ variable was around 14.3%. The voivodeships were also poorly diversified in terms of the examined variable.

The number of patents granted by the Patent Office of the Republic of Poland per 100.000 inhabitants (variable $X15_{SD}$) in Polish voivodeships was not high, ranging from 2.7 in the Lubuskie Voivodeship to 10.9 in the Zachodniopomorskie Voivodeship. The average value of the variable was 6.9 patents granted by the Patent Office of the Republic of Poland per 100.000 inhabitants.

An important indicator of the labour market was the variable $X16_{SD}$ - unemployment rate in %. In 2019, the voivodeship with the lowest unemployment rate was the Wielkopolskie voivodeship (2.8%), while the Warmińsko-Mazurskie voivodeship had the most difficult situation (9.1%). The average value of the variable for Polish voivodeships was 5.9% and the coefficient of variation at the level of 30.7% indicates their weak differentiation.

Another variable was $X17_{SD}$ - victims of accidents at work per 1.000 employed persons. Its value ranged from 4.5 in the Mazowieckie voivodeship to 7.6 in the Dolnośląskie voivodeship. This variable in the voivodeships was characterised by weak differentiation and moderate left asymmetry.

The level of technical infrastructure in Poland's voivodeships was determined by variable $X19_{SD}$ - expressways and motorways in km per 100 km^2 of area. The highest number of such roads was observed in the Śląskie voivodeship, and the lowest in the Podlaskie voivodeship. The level of differentiation of Poland's voivodeships in terms of the value of variable $X19_{SD}$ can be considered moderate.

The environmental dimension of sustainable development was determined by 10 diagnostic variables. The first of these was variable $X21_{SD}$ – forest cover in %. In 2019, this indicator ranged from 21.5% in the Łódzkie Voivodeship to 49.3% in the Lubuskie Voivodeship. On average approximately 30.3% of the country's total area was covered by forests. Differentiation of voivodeships in terms of $X21_{SD}$ variable was weak, in most of the voivodeships the value of the examined indicator was lower than the average.

The highest share of legally protected areas in the total area (variable $X22_{SD}$) was in the Świętokrzyskie Voivodeship (64.9%), the lowest in the Dolnośląskie Voivodeship (18.6%). In most voivodeships the value of the examined indicator was below the average (33.4%).

In 2019, organic farms did not account for a large share of agricultural land in Poland. It ranged from 0.5% in the Opolskie Voivodeship to 8.6% in the Warmińsko-Mazurskie Voivodeship. Differentiation of voivodeships in terms of $X23_{SD}$ variable was strong, in most of the voivodeships the value of the examined indicator was lower than the average (2.8%).

Another variable of the environmental dimension of sustainable development concerned the share of renewable energy in total electricity production (variable $X24_{SD}$). The voivodeship with the highest share was the Warmińsko-Mazurskie voivodeship (85.7%), while the lowest share was observed in the Opolskie voivodeship (4.0%). The average value of variable $X24_{SD}$ for Poland was 29.2%, and the differentiation of voivodeships in terms of the share of renewable energy in total electricity production can be considered strong (CV = 86%).

Variables $X25_{SD}$ and $X26_{SD}$ were related to the volume of pollution from particularly onerous facilities in t/y per 100 km² (gaseous and particulate pollutants, respectively). In 2019, the most polluted voivodeship was the Śląskie voivodeship, while the Warmińsko-Mazurskie voivodeship was the least polluted. In terms of the values of both variables, the Polish voivodeships were strongly differentiated. It is good that in most of the voivodeships, however, the values of the studied indicators were lower than the average value.

The highest amount of wastewater treated per year in dam³ *per capita* was discharged in the Mazowieckie Voivodeship, and the lowest in the Lubelskie Voivodeship. The national average was about 0.03 dam³ per 1 inhabitant, and the variation of voivodeships in terms of the $X27_{SD}$ variable can be considered weak.

On the other hand, when assessing the share of waste generated during the year recycled in total waste (variable $X28_{SD}$), it can be seen that in 2019 the leader in this respect was the Małopolskie Voivodeship, while in last place was the Lubelskie Voivodeship.

The differentiation of voivodeships in terms of the variable $X28_{SD}$ was strong (CV = 79.06%), in most voivodeships the value of the examined indicator was lower than the average.

In 2019, in terms of the share of devastated and degraded land requiring rehabilitation in the total area (variable $X29_{SD}$), the Śląskie Voivodeship dominated, the Mazowieckie Voivodeship had the least such land. The average for Poland was 0.21%, while the diversity of voivodeships in terms of the value of variable $X29_{SD}$ can be considered moderate.

The improvement of the situation in the field of environment is supported by the expenditures incurred for this activity. Their value ranged from 0.18 thousand PLN per 1 inhabitant in the Warmińsko-Mazurskie Voivodeship to 0.44 thousand PLN per 1 inhabitant in the Mazowieckie Voivodeship. The average for all voivodeships was 0.30 thousand PLN per 1 inhabitant and the differentiation of voivodeships in terms of the $X30_{SD}$ variable was weak.

It should be noted that the conducted general statistical evaluation of values of particular indicators assessing the financial situation and the level of sustainable development of voivodeships gave an overview of the examined complex phenomena in various cross-sections. However, it did not allow to assess the phenomena comprehensively, taking into account all diagnostic variables for both studied complex phenomena. Therefore, in the further part of the paper, the study of the financial situation and the level of sustainable development of voivodeships was carried out using the selected method of multidimensional comparative analysis for data from 2017–2019.

4.2. Rankings

After applying the selected method of linear ordering of objects, the values of the overall synthetic measure were obtained for both studied complex phenomena, i.e. the financial situation (Table 3) and the level of sustainable development (Table 4) of Polish voivodeships in 2017–2019.

Table 3. Values of the overall synthetic measure for Polish voivodeships in terms of financial situation in 2017–2019

Voivodeship	2017	Position	2018	Position	2019	Position	Change of position 2017–2019
Dolnośląskie	0.4211	11	0.4476	13	0.4774	12	-1
Kujawsko-Pomorskie	0.4348	9	0.4756	12	0.5813	8	1
Lubelskie	0.2889	16	0.2173	16	0.3048	16	0
Lubuskie	0.4192	12	0.4234	14	0.4394	13	-1
Łódzkie	0.4423	8	0.4784	10	0.4117	14	-6
Małopolskie	0.3844	14	0.4780	11	0.5812	9	5
Mazowieckie	0.5484	3	0.6559	2	0.6700	2	1
Opolskie	0.5301	5	0.5536	7	0.6216	5	0
Podkarpackie	0.5508	2	0.6689	1	0.6750	1	1
Podlaskie	0.6330	1	0.5880	3	0.5916	7	-6
Pomorskie	0.5343	4	0.5702	5	0.6480	4	0
Śląskie	0.3959	13	0.5139	9	0.5712	10	3
Świętokrzyskie	0.5033	7	0.5722	4	0.6649	3	4
Warmińsko-Mazurskie	0.3557	15	0.3813	15	0.4079	15	0
Wielkopolskie	0.4330	10	0.5603	6	0.6009	6	4
Zachodniopomorskie	0.5209	6	0.5403	8	0.5482	11	-5

Source: own calculations

Analysing the information in Table 3, it can be noted that in 2017–2019 the values of the overall synthetic measure of the financial situation increase for most Polish voivodeships. This proves correct management of financial resources in the studied territorial units.

In 2019, the best in terms of financial situation among the voivodeships of Poland turned out to be the Podkarpackie voivodeship (synthetic measure value 0.6750), followed by: the Mazowieckie voivodeship (0.6699) and the Świętokrzyskie voivodeship (0.6649). Seven voivodeships (i.e. the Pomorskie, Opolskie, Wielkopolskie, Podlaskie, Kujawsko-

-Pomorskie, Małopolskie and Śląskie Voivodeships) were qualified to group II – with a medium-high level of the analysed compound phenomenon. On the other hand, the Zachodniopomorskie and Dolnośląskie Voivodeships had a medium low level. The Lubuskie, Łódzkie, Warmińsko-Mazurskie and Lubelskie Voivodeships had the worst financial situation (Figure 1).

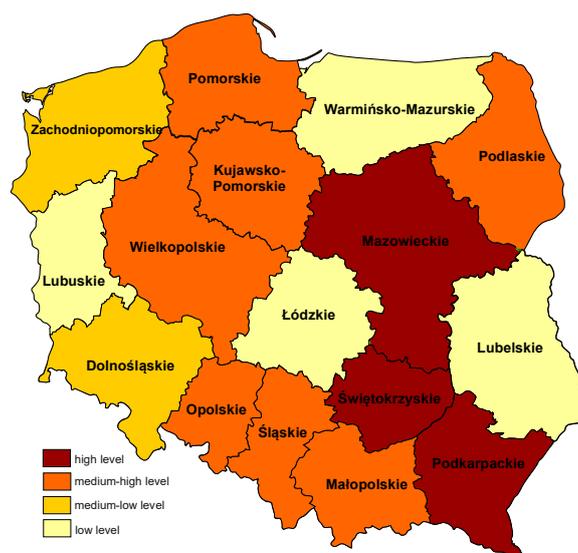


Figure 1. Classification of Polish voivodeships into groups with a similar level of financial situation in 2019. Source: own calculations.

In 2019, compared to 2017, 7 voivodeships have improved their positions in relation to the whole country (including the Małopolskie voivodeship by 5 places, the Świętokrzyskie and the Wielkopolskie voivodeships by 4 places). The Lubelskie, Opolskie, Pomorskie and Warmińsko-Mazurskie Voivodeships maintained their positions in the regional structure of the country. The greatest fall in positions in comparison to the country as regards financial standing was recorded in the Łódzkie and Podlaskie Voivodeships (by 6 places) and the Zachodniopomorskie Voivodeship (by 5 places).

While assessing the level of sustainable development of Polish voivodeships determined by the value of the overall synthetic measure, a systematic increase of this measure in the period 2017–2019 can be observed for 11 voivodeships. For the remaining 5 voivodeships (the Lubelskie, Opolskie, Podlaskie, Pomorskie and Zachodniopomorskie Voivodeships) there was a slight decrease in the value of the synthetic measure in 2019 compared to the previous year (Table 4).

In 2019, the leaders in terms of the level of sustainable development were the Mazowieckie, Małopolskie and Pomorskie Voivodeships. An average high level was shown by 4 voivodeships: the Podkarpackie, Dolnośląskie, Zachodniopomorskie and Śląskie Voivodeships. Eight Polish voivodeships formed a group with a medium low level of sustainable development (the Wielkopolskie, Lubuskie, Podlaskie, Opolskie, Łódzkie, Warmińsko-Mazurskie, Lubelskie and Kujawsko-Pomorskie Voivodeships). Only 1

voivodeship (the Świętokrzyskie Voivodeship) had a low level of sustainable development (Figure 2).

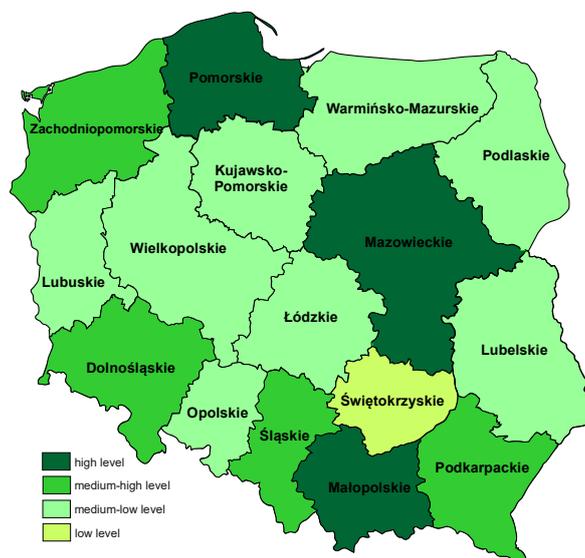


Figure 2. Classification of Polish voivodeships into groups with a similar level of sustainable development's in 2019. Source: own calculations.

Table 4. Values of the overall synthetic measure for Polish voivodeships in terms of the level of sustainable development in 2017–2019

Voivodeship	2017	Position	2018	Position	2019	Position	Change of position 2017-2019
Dolnośląskie	0.4462	7	0.4985	6	0.5064	5	2
Kujawsko-Pomorskie	0.4032	11	0.4144	13	0.4210	15	-4
Lubelskie	0.3704	14	0.4297	12	0.4227	14	0
Lubuskie	0.4526	6	0.4566	9	0.4702	9	-3
Łódzkie	0.4059	10	0.4103	14	0.4270	12	-2
Małopolskie	0.5632	2	0.5993	2	0.6057	2	0
Mazowieckie	0.5967	1	0.6281	1	0.6401	1	0
Opolskie	0.3994	12	0.4459	11	0.4373	11	1
Podkarpackie	0.4624	5	0.4987	5	0.5179	4	1
Podlaskie	0.3968	13	0.4540	10	0.4450	10	3
Pomorskie	0.5528	3	0.5958	3	0.5606	3	0
Śląskie	0.4383	8	0.4677	7	0.4868	7	1
Świętokrzyskie	0.3262	16	0.3505	16	0.3660	16	0
Warmińsko-Mazurskie	0.3602	15	0.3926	15	0.4269	13	2
Wielkopolskie	0.4338	9	0.4654	8	0.4741	8	1
Zachodniopomorskie	0.5087	4	0.5212	4	0.4985	6	-2

Source: own calculations.

On the other hand, analysing the positions of Polish voivodeships in terms of the level of sustainable development in 2019 in comparison with 2017, it can be noted that the changes are not significant (promotion by 1–3 positions for 7 voivodeships and decrease by 2–4 positions for 4 voivodeships).

It also seems worthwhile to analyse together the results of the obtained classification of Polish voivodeships in terms of both financial situation and level of sustainable development. Table 5 provides a summary for 2019.

Table 5. Classification of Polish voivodeships in terms of both complex phenomena in 2019

Development groups	Financial situation	Sustainable development
I high level	Podkarpackie, Mazowieckie, Świętokrzyskie	Mazowieckie, Małopolskie, Pomorskie
II medium-high level	Pomorskie, Opolskie, Wielkopolskie, Podlaskie, Kujawsko-Pomorskie, Małopolskie, Śląskie	Podkarpackie, Dolnośląskie, Zachodniopomorskie, Śląskie
III medium-low level	Zachodniopomorskie, Dolnośląskie	Wielkopolskie, Lubuskie, Podlaskie, Opolskie, Łódzkie, Warmińsko-Mazurskie, Lubelskie, Kujawsko-Pomorskie
IV low level	Lubuskie, Łódzkie, Warmińsko-Mazurskie, Lubelskie	Świętokrzyskie

Source: own calculations.

Assessing the compositions of the individual development groups obtained for 2019, it can be seen that the leader in terms of both composite phenomena, i.e., financial situation and sustainable development, was the Mazowieckie Voivodeship, classified in group I with a high level of development. The Podkarpackie Voivodeship (group I in terms of financial situation and group II in terms of sustainable development) and the Małopolskie and Pomorskie Voivodeships (group II in terms of financial situation and group I in terms of sustainable development) were in an equally good situation. In general, some shifts of voivodeships within separate development groups can be observed (mostly to a higher or lower group), but they were not too distant. The greatest changes can be observed in the case of the Świętokrzyskie Voivodeship, which is a leader in terms of financial situation (group I) and at the same time reaches a low level of sustainable development (group IV). In this case, the effective financial management of the voivodeship does not always go hand in hand with the implementation of the concept of sustainable development.

5. CONCLUSIONS

Sustainable development is a priority for the activities of each level of local government. Striving for short-term and long-term goals of this development is conditioned by the financial situation of the local government, including securing financial resources for this development. Territorial units should ensure that the sources of financing of their development are characterised by stability and maximum efficiency. In the research on

sustainable development, there is no detailed reference linking the implementation of the assumptions of this development with the financial situation of these units.

To sum up the study of two complex phenomena, i.e. the financial situation and the level of sustainable development of voivodeships in Poland, it may be noted that:

1. Poland is a diverse region, both in terms of financial situation and level of sustainable development.
2. In 2019, the best Polish voivodeships in terms of financial situation were the Podkarpackie, Mazowieckie and Świętokrzyskie Voivodeships. An equally good financial situation is observed in the Pomorskie, Opolskie, Wielkopolskie, Podlaskie, Kujawsko-Pomorskie, Małopolskie and Śląskie Voivodeships. Two voivodeships had problems with financial activity: the Zachodniopomorskie and Dolnośląskie Voivodeships. The most difficult financial situation was observed in the Lubuskie, Łódzkie, Warmińsko-Mazurskie and Lubelskie Voivodeships. In the assessment of the financial situation of Polish voivodeships, it is good that in 2017–2019 the values of the overall synthetic measure of the financial situation are increasing for the majority of Polish voivodeships. This proves correct management of financial resources in the studied territorial units.
3. While assessing the level of sustainable development of Polish voivodeships it was found that in 2019 the leaders in the implementation of this concept of development were the following voivodeships: the Mazowieckie, Małopolskie and Pomorskie Voivodeships. Four voivodeships: the Podkarpackie, Dolnośląskie, Zachodniopomorskie and Śląskie Voivodeships had a medium-high level of sustainable development.

An average low level of sustainable development was found in 8 Polish voivodeships (the Wielkopolskie, Lubuskie, Podlaskie, Opolskie, Łódzkie, Warmińsko-Mazurskie, Lubelskie and Kujawsko-Pomorskie Voivodeships) and only 1 voivodeship (the Świętokrzyskie Voivodeship) had a low level of sustainable development.

However, in the whole examined period, i.e. 2017–2019, an increase in the value of the overall synthetic measure was observed for the majority of Polish voivodeships, which indicates some progress of voivodeships in implementing the concept of sustainable development.

Evaluating the two complex phenomena together, i.e. financial situation and sustainable development, it can be concluded that several of the studied Polish voivodeships achieved a similar level of their development. For the majority, some slight shifts between development groups were observed. Only in the case of the Świętokrzyskie Voivodeship they turned out to be significant.

In conclusion, it may be noted that the assessment of the financial situation and the level of sustainable development on the example of Polish voivodeships may constitute a basis for further research in the future, specialisation and implementation of a specific policy both by self-governmental authorities in Poland, but also in other EU countries. It should be added that introducing changes in the concept of sustainable development requires time and considerable financial outlays, and its effects will be more noticeable in the long run.

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