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THE IMPLEMENTATION OF THE SUSTAINABLE DEVELOPMENT GOALS AT THE LOCAL LEVEL. THE CASE OF THE DISTRICTS OF KUYAVIAN-POMERANIAN PROVINCE

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Abstract. The aim of the paper is to provide the objective assessment of progress in the implementation of the goals of the local sustainable development strategy by the districts of Kuyavian-Pomeranian Province. In order to achieve our aim, we have devised, using methods of taxonomic analysis, the synthetic indicator (taking a lot of different measures of sustainable development into account), which shows the degree of the accomplishment of goals adopted in the sustainable development goals. In the collective of units under study, there is a significant differentiation of the level of indicators analyzed within the framework of the sustainable development strategy. It must be emphasized that there are as many as 12 districts in the lower quartile of the distribution of the synthetic measure, i.e., its level was below 0.25. 11 self-government units were in the second quartile of the distribution, i.e., in range between 0.25 and 0.5 of the synthetic indicator. Relatively big taxonomic distances between synthetic measures for individual districts, with quite a large set of features, show significant differentiation among these parts of Kuyavian-Pomeranian Province in terms of local sustainable development. Despite the fact that the examined objects belong to the same administrative unit, which would appear to be relatively coherent, they do not develop at the same pace. Moreover, given a broad set of indicators, they differ significantly when it comes to the rate of their sustainable development. The findings of this paper highlight the use of multidimensional taxonomic analysis for measuring the progress of local units in the degree of the accomplishment of the sustainable development goals. First of all, it helps to show differences in the implementation of the development strategies across districts. What is more, it shows these differences on the basis of the complete set of diverse features rather than single parameters (e.g., pace of growth). Thus, the multidimensional approach is a lot more precise when it comes to showing differences among the examined objects.

Key words: sustainable development, synthetic measure, taxonomic analysis, local development.

JEL Classification: Q01, H76

1. Introduction

The principle of sustainable development must be considered "a pattern of development that meets the needs of present generations, without compromising the rights of future generations to fulfil their needs" (Brundtland, 2019, p. xv). This pattern should serve as a set of guidelines for governments and international and non-government organizations, supported by self-governments, entrepreneurs and society. In order to put this idea – expressed by former Norwegian Prime Minister – into practice, we should consistently and regularly undertake extensive activities in the area of politics and legislation that will be in line with the following targets: "1. Strengthening human well-being and capabilities; 2. Shifting towards sustainable and just economies; 3. Building sustainable food systems and healthy nutrition patterns; 4. Achieving energy decarbonization and universal access to energy; 5. Promoting sustainable urban and peri-urban development; 6. Securing the global environmental commons" (Brundtland, 2019, p. xvi).

There is no doubt that it is not an easy task to design solutions that will help to accomplish the above plans or implement the existing international and EU regulations and programmes (Alberti, 1996). However, "development issues must be seen as crucial by the political leaders who feel that their countries have reached a plateau towards which other nations must strive" (United Nations, p. 14; see also: Williamson, Radford, Bennetts, 2003, p. 16).

The principle of sustainable development is particularly important in developing societies. In order

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to implement this principle at the local level effectively, a development strategy must be drawn up. It should involve spheres such as economic welfare, social balance and healthy living environment. What is as important as the pursuit of the sustainable development goals is how they are measured. As the issue has a variety of aspects, it is difficult to assess the progress of specific countries or their administrative parts.

In this paper, we address the following research problems:

P1: How should the level of local sustainable development be measured given the multitude of the goals of the sustainable development strategy and of the goal indicators?

P2: Do the districts of Kuyavian-Pomeranian Province maintain the same pace in implementing the assumptions of the sustainable development strategy?

The research process required the adoption of the following hypotheses:

H1: The examined objects exhibit significant differences in taxonomic distances between the synthetic measure of development, which justifies the use of multidimensional analysis for measuring the level of local sustainable development.

H2: Individual districts under study significantly differ in the level of sustainable development despite the fact that they are parts of the same province.

The aim of the paper is to provide the objective assessment of progress in the implementation of the goals of the local sustainable development strategy by the districts of Kuyavian-Pomeranian Province. The term "objective" means here that progress in the implementation of all goals should be measured by a single, synthetic indicator. This means that we evaluate the level of local sustainable development in particular districts by analyzing a variety of aspects of this development at the same time. In order to achieve our aim, we have devised, using methods of taxonomic analysis, the synthetic indicator (taking a lot of different measures of sustainable development into account), which shows the degree of the accomplishment of goals adopted in the sustainable development goals.

The values of the indicator have allowed us to come up with the ranking of all districts of Kuyavian-Pomeranian Province according to the level of progress in the implementation of sustainable development goals.

2. Literature review

The principle of sustainable development should be one of the most important priorities defining governments' action plans both at the national and local level. This concept, as indicated by Yigitcanlar, Dur and Dizdaroglu, "plays a key role in a critical role in securing prosperity of our cities and societies" (Yigitcanlar, Dur, Dizdaroglu, 2015).

The concept of sustainable development has been the subject of studies conducted by representatives of many natural, social and economic sciences. However, the notion has not been defined in a uniform, comprehensive way yet (Bukowski, 2012). Bujak-Szwaczka and Kolas pointed out that its principal objective is "to reach prosperity, justice (intra- and intergenerational) and security" (Bujak-Szwaczka, Kolas, 2010). It will be impossible to attain sustainable development without ensuring: economic growth, social inclusion and environmental protection (United Nations Information Centre in Warsaw, 2015).

Pawłowski defines that "the concept of sustainable development, referring to the fulfilment of rights and needs of future generations is considered mainly in three dimensions: ecological, social and economic" (Pawłowski, 2009). Rakoczy points out that "the principle of sustainable development focuses on finding normative solutions which will take into account legally protected conflicting values, at the same time having regard for the needs of future generations" (Rakoczy, 2015).

In his study, Sekuła argues that the implementation of the concept of sustainable development, which involves taking care of the natural environment and the respect of social equality, brings about a number of positive results of a qualitative character. It helps to reduce the negative consequences of the scientific-technological development or to prevent conflicts in the field of spatial management (including environmental degradation). It also shows that, at the local level, the principle of sustainable development is implemented with the use of many specialized instruments, such as the model of the simulation of pollution spread in a commune, environmental reliefs, or the construction of bicycle paths (Sekuła, 2002).

The concept of sustainable development should be perceived as a process of change in which the use of resources, investment direction, technological progress and institutional changes are in line with present and future needs (United Nations, General Assembly, 1987).

Considering all these aspects, Olejarczyk has stated that the principle of sustainable development is currently a political idea rather than a plan serving the purpose of drawing up a broad economic project reflected in the state's policy. Sustainable development leads to positive qualitative and quantitative changes in a given area, while respecting the environmental values and the principle of social equality. It follows from the pursuit of the development which, firstly, reduces the negative consequences of the scientific-technological revolution, and, secondly, prevents conflicts in space management reflected mainly in environmental degradation (Olejarczyk, 2016).

In the document Transforming our world: the 2030 Agenda for Sustainable Development, signed by 193 member states, the United Nations defined 17 major Sustainable Development Goals:

– Goal 1. End poverty in all its forms everywhere;
– Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture;
– Goal 3. Ensure healthy lives and promote well-being for all at all ages;
– Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all;
– Goal 5. Achieve gender equality and empower all women and girls;
– Goal 6. Ensure availability and sustainable management of water and sanitation for all;
– Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all;
– Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all;
– Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation;
– Goal 10. Reduce inequality within and among countries;
– Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable;
– Goal 12. Ensure sustainable consumption and production patterns;
– Goal 13. Take urgent action to combat climate change and its impacts;
– Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development;
– Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss;
– Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels;
– Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development (United Nations, General Assembly, 2015).

Dhingra and Chattopadhyay (2016), later emphasized by Trindade, Hinnig, da Costa et al. (2017), have found that it is possible to attain sustainable development at the local level by way of accomplishing the following goals: improve the quality of life of citizens; ensure economic growth with more opportunities for employment; increase the prosperity of citizens by securing access to social and community services; establish an environmentally responsible and sustainable approach to development; guarantee the efficient delivery of basic services and infrastructure, such as public transportation, water supply and sanitation, telecommunication and other utilities; be able to address climate change and environmental issues; and establish the efficient regulatory and local government mechanism ensuring equitable policies (Dhingra, Chattopadhyay, 2016).

According to Pope, Annandale and Morrison-Saunders, the progress of the implementation of the principle of sustainable development is assessed by analyzing not only the initiatives and proposals under preparation, but also current policies, programmes and plans, binding law, real practice and actions taken (Pope, Annandale, Morrison-Saunders, 2004).

3. Methods

The evaluation of the degree of the accomplishment of the local sustainable development goals according to the GUS (*Główny Urząd Statystyczny* – Main Statistical Office) methodology, which is consistent with the international methodology, consists of 22 groups of indicators (corresponding to four main areas), such as: demographic change, public health, consumption patterns, adequacy, income in the old age, health determinants, crime, road accidents, economic growth, participation in transportation, climate change, energy, air protection, biodiversity, waste management, openness and participation, and economic instruments. Within this framework, almost 180 various indicators were defined to follow the progress of a territorial unit (a state or its part) in the implementation of the idea of sustainable development.

It is extremely difficult to compare this progress as a whole, given the multitude of indicators. On the other hand, if we compare territorial units with the use of one or a few selected indicators, we will not get a clear answer to the question which districts are quicker and which are slower in the implementation of the sustainable development goals. In such a case, the so-called multidimensional analyses come to the aid.

In this paper, we conduct the taxonomic study of the local sustainable development of the districts of Kuyavian-Pomeranian Province in four areas: social order, economic order, environmental order and institutional-political order. To this end, we applied the method of linear ordering, used for assessing the level of diversification of objects with the application of a closed set of statistical features (Grabiński, Wydymus, Zielaś, 1989). We presented the adopted method in detail in other studies, so there is no need to discuss it any further. (Siemiątkowski, 2015; Siemiątkowski, 2017; Siemiątkowski, Tomaszewski, 2018; Siemiątkowski, Jankowska, 2020). It should only be noted here that we standardized features based on model methods, which assume that there exists the reference model object in relation to which the taxonomic distances of the examined objects were determined.

The synthetic measure was calculated according to Hellwig's method, based on the formula:

$$d_i = 1 - \frac{d_{i0}}{d_0}$$

where:

d_{i0} – the Euclidean distance of object x_i from reference object x_0,

d_0 – the critical distance of a given unit from the reference object (Ostasiewicz, 1998).

It should also be pointed out that we have already conducted empirical studies concerning the selected aspects of sustainable development involving a significant number of inhabitants of Kuyavian-Pomeranian Province (research sample of approximately 4,500 people). Some findings of these studies have already been published (Siemiątkowski, Tomaszewski, Jurgilewicz, & Poplavska, 2019), while the others will be published in a monograph which is in print (Siemiątkowski, Tomaszewski, 2020).

4. Research results

In order to carry out the taxonomic study of the progress in the implementation of the sustainable development goals of the districts of Kuyavian-Pomeranian Province, using the database of the Main Statistical Office, we preliminarily selected 89 features of objects (districts). It must be emphasized here that the list of indicators considered when building the synthetic measure is limited by the very assumptions of the sustainable development strategy. This means that we did not include here features other than those indicated in the GUS statistics, consistent with international recommendations concerning the sustainable development goals.

Social governance:

$X1_t$ – birth rate per 1,000 of population,

$X2_t$ – the rate of migration for a permanent stay of people in working age per 10,000 of working age population,

$X3_t$ – post-working age population per 100 of working age population,

$X4_t$ – non-working age population per 100 of working age population,

$X5_t$ – post-working age population per 100 of post-working population,

$X6_t$ – infant mortality rate per 1,000 live births,

$X7_t$ – deaths caused by cardiovascular diseases in percent of the total number of deaths,

$X8_t$ – deaths caused by cancer in percent of the total number of deaths,

$X9_t$ – deaths caused by respiratory diseases in percent of the total number of deaths,

$X10_t$ – number of deaths of people under 65 years of age per 1,000 of population in this age,

$X11_t$ – number of people in households benefiting from social welfare in percent of total population,

$X12_t$ – average monthly gross salary (business entities with more than nine people),

$X13_t$ – average usable floor area of a flat per one person,

$X14_t$ – kindergarten children in percent of the total number of children in the age of three to five,

$X15_t$ – kindergarten children in percent of the total number of children in the age of three to five in rural areas,

$X16_t$ – pass rate of final examinations in vocational high schools,

$X17_t$ – pass rate of final examinations in high schools,

$X18_t$ – the long-term unemployed (longer than one year) in percent of the total number of the unemployed,

$X19_t$ – the registered unemployed in percent of the total working age population (as of December 31) – unemployed – women,

$X20_t$ – number of the registered unemployed in percent of the total working age population (as of December 31), the unemployed with a university degree,

$X21_t$ – job offers for people with disability per 1,000 unemployed with disability,

$X22_t$ – graduates (previously non-working) in percent of the total number of people unemployed,

$X23_t$ – graduates (previously non-working) in percent of the total number of people unemployed, female graduates,

$X24_t$ – registered unemployment rate,

$X25_t$ – number of passenger cars per 1,000 of population,

$X26_t$ – consumption of utilities in households over a year per person – electricity,

$X27_t$ – consumption of utilities in households over a year per person – gas,

$X28_t$ – consumption of utilities in households over a year per person – water,

$X29_t$ – the registered long-term unemployed (more than one year) in the age 55-64 in percent of the total number of people unemployed in the age 55-64,

$X30_t$ – people in post-working age in households benefiting from social welfare in percent of the total number of people in this age,

$X31_t$ – people injured in industrial accidents per 1,000 of working population,

$X32_t$ – health clinics per 10,000 of population,

$X33_t$ – detection rate of offences discovered by the police,

$X34_t$ – offences discovered by the police per 1,000 of population,

$X35_t$ – criminal offences discovered by the police per 1,000 of population,

$X36_t$ – economic offences discovered by the police per 1,000 of population

$X37_t$ – road traffic offences discovered by the police per 1,000 of population,

$X38_t$ – offences against life and health discovered by the police per 1,000 of population,

$X39_t$ – offences against property discovered by the police per 1,000 of population,

$X40_t$ – road accident victims per 100,000 of registered vehicles – injured,

$X41_t$ – road accident victims per 100,000 of registered vehicles – fatal accidents.

Economic governance

$X42_t$ – capital expenditure in enterprises (current prices; without business entities with up to nine employees) per one person of working age,

$X43_t$ – entities of the national economy newly registered in REGON (National Business Registry) per 10,000 of working age population,

$X44_t$ – value of the foreign capital of companies per person of working age,

$X45_t$ – capital expenditure according to PKD (Polish Classification of Activity) in percent of the total capital expenditure of enterprises (without business entities with up to nine employees) – agriculture, forestry, hunting and fishery,

$X46_t$ – capital expenditure according to PKD (Polish Classification of Activity) in percent of the total capital expenditure of enterprises (without business entities with up to nine employees) – industry and construction,

$X47_t$ – capital expenditure according to PKD (Polish Classification of Activity) in percent of the total capital expenditure of enterprises (without business entities with up to nine employees) – commerce, vehicle repair, transportation and warehousing, accommodation and catering, information and communication technology,

$X48_t$ – capital expenditure according to PKD (Polish Classification of Activity) in percent of the total capital expenditure of enterprises (without business entities with up to nine employees) – financial and insurance activity, real estate activities,

$X49_t$ – capital expenditure according to PKD (Polish Classification of Activity) in percent of the total capital expenditure of enterprises (without business entities with up to nine employees) – other services,

$X50_t$ – natural persons conducting business activity per 100 of working age population,

$X51_t$ – entities of the national economy registered in REGON according to size per 10,000 of working age population – total,

$X52_t$ – entities of the national economy registered in REGON according to size per 10,000 of working age population – micro (up to nine employees),

$X53_t$ – entities of the national economy registered in REGON according to size per 10,000 of working age population – small (from 10 to 49 employees),

$X54_t$ – entities of the national economy registered in REGON according to size per 10,000 of working age population – medium (from 50 to 249 employees),

$X55_t$ – entities of the national economy registered in REGON according to size per 10,000 of working age population – large (over 250 employees),

$X56_t$ – length of bicycle paths per 10,000 sq km,

$X57_t$ – length of bicycle paths per 10,000 of population,

$X58_t$ – length of local public roads per 100 sq km – paved surface,

$X59_t$ – length of local public roads per 100 sq km – dirt roads,

$X60_t$ – communes' expenditure on public roads in percent of their total expenditure,

$X61_t$ – districts' expenditure on public roads in percent of their total expenditure.

Environmental governance:

$X62_t$ – carbon dioxide emissions from plants especially noxious to air purity,

$X63_t$ – communes' expenditure on the protection of air and climate per person,

$X64_t$ – consumption of electricity per person – total,

$X65_t$ – consumption of electricity per person – urban areas,

$X66_t$ – consumption of electricity per person – rural areas,

$X67_t$ – emissions of air pollutants from plants especially noxious to air purity — gases,

$X68_t$ – emissions of air pollutants from plants especially noxious to air purity — particulates,

$X69_t$ – pollutants retained or neutralized in pollutant reduction systems in plants especially noxious to air purity in percent of pollutants generated – gases without carbon dioxide,

$X70_t$ – pollutants retained or neutralized in pollutant reduction systems in plants especially noxious to air purity in percent of pollutants generated – particulates,

$X71_t$ – forest cover,

$X72_t$ – degree of afforestation,

$X73_t$ – legally protected land in percent of the total area,

$X74_t$ – green areas in percent of the total area,

$X75_t$ – amount of mixed municipal waste of household collected during the year per one inhabitant,

$X76_t$ – amount of municipal and industrial waste water after treatment in percent of the total amount of waste water to be treated,

$X77_t$ – number of domestic biological waste water treatment plants,

$X78_t$ – uncontrolled dumping sites (number per 100 sq km),

$X79_t$ – uncontrolled dumping sites (area per 100 sq km).

Institutional and political governance:

$X80_t$ – number of registered foundations, associations and social organizations per 10,000 of population,

$X81_t$ – voter turnout in self-government elections – first round,

$X82_t$ – voter turnout in self-government elections – second round

$X83_t$ – councilwomen and councilpersons with higher education in percent of the legislative organs of communes and districts – women,

$X84_t$ – councilwomen and councilpersons with higher education in percent of the legislative organs of communes and districts – people with higher education,

$X85_t$ – revenues to communes' budgets from service charges per person,

$X86_t$ – the European Union funds for financing EU programmes and projects obtained by communes and districts per person,

$X87_t$ – expenditure from the budgets of communes and districts on servicing public debt per 1,000 PLN of the total budget income of communes and districts (the total of communes and districts combined),

Table 1
The selection of features of particular districts

Governance	Stimulants	Destimulants
Social	$X1_t$, $X12_t$, $X13_t$, $X14_t$, $X16_t$, $X17_t$, $X25_t$, $X32_t$	$X3_t$, $X4_t$, $X5_t$, $X7_t$, $X8_t$, $X9_t$, $X10_t$, $X11_t$, $X18_t$, $X19_t$, $X20_t$, $X22_t$, $X23_t$, $X24_t$, $X26_t$, $X28_t$, $X29_t$, $X30_t$, $X31_t$
Economic	$X42_t$, $X43_t$, $X44_t$, $X45_t$, $X46_t$, $X47_t$, $X48_t$, $X49_t$, $X50_t$, $X51_t$, $X52_t$, $X53_t$, $X54_t$, $X55_t$, $X56_t$, $X57_t$, $X58_t$, $X59_t$, $X60_t$	
Environmental	$X71_t$, $X73_t$, $X77_t$	$X64_t$, $X65_t$, $X75_t$, $X76_t$
Institutional-political	$X80_t$, $X83_t$, $X84_t$, $X88_t$, $X89_t$	$X87_t$

Source: authors' own work

$X88_t$ – capital expenditure of communes and districts in percent of the total expenditure (communes and districts combined),

$X89_t$ – area of land covered by local spatial development plans in percent of the total area.

When choosing features for the construction of the synthetic measure of the sustainable development of districts, we had to select them carefully. As the features had to meet the requirements of the completeness of statistical data and of the unified methodology of data gathering, some of the indicators mentioned above could not be qualified to the subsequent stages of the construction of the synthetic measure. The main problems were the incompleteness of statistical data, their heterogeneity for different districts, the lack of any data, and the lack of information about ways of collecting data by authorized entities.

Among the features that met the above requirements, 35 were recognized as stimulants, while 24 were deemed destimulants (see: Table 1). The remaining features failed to fulfil strict methodological requirements typical of synthetic taxonomic measures. The features selected for further procedure did not show an excessive degree of correlation towards each other; thus, they were all included in the synthetic indicator.

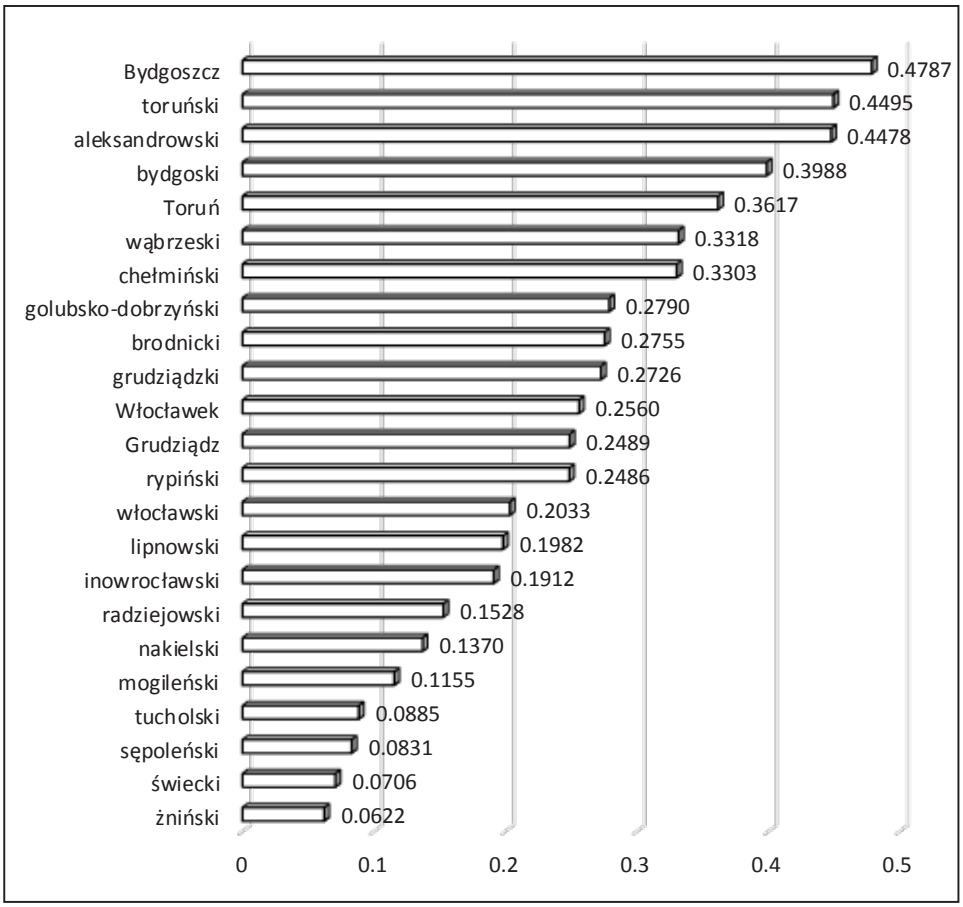

Figure 1. The synthetic measure of sustainable development of the districts of Kuyavian-Pomeranian Province

Source: authors' own work

Having carried out all necessary procedures (among others, the choice of the reference model, the standardization of features), we calculated the values of the synthetic measure of sustainable development, which were presented in Figure 1.

The ranking presented in Figure 1 shows significant taxonomic distances between the synthetic measures of particular districts. The difference between the best and the worst district as expressed in the value of a synthetic measure was as much as 0.4165. This shows considerable disparities in the implementation of sustainable development strategies across individual districts.

Another conclusion refers to the level of sustainable development in the districts of Kuyavian-Pomeranian Province. The maximum value of the synthetic indicator was nearly 0.48. This means that all the examined districts are below the second quartile of the distribution of the indicator value. This may be interpreted as the low and very low level of sustainable development.

The districts of the city of Bydgoszcz and toruński were at the top of the ranking. They are both highly urbanized areas. Aleksandrowski district was also ranked high, although it does not significantly distinguish itself with high indicator values. The following positions were occupied by other strongly urbanized districts: bydgoski and the city of Toruń.

At the bottom of the ranking, we find peripheral districts: żniński, świecki, sępoleński and tucholski. It should be pointed out that the ranking covered a significant number of features so, basically, it is reliable. Further in-depth study is required to find the cause for which these districts were ranked on the lowest positions of the ranking. It would help to identify which of the four most important areas of sustainable development weighs on their result.

5. Conclusion

The use of multidimensional taxonomic analysis for measuring the progress of local units in the degree of the accomplishment of the sustainable development goals has undeniable advantages. First of all, it helps to show differences in the implementation of the development strategies across districts. What is more, it shows these differences on the basis of the complete set of diverse features rather than single parameters (e.g., pace of growth). Thus, the multidimensional approach is a lot more precise when it comes to showing differences between the examined objects.

In the collective of units under study, there is significant differentiation of the level of indicators analyzed within the framework of the sustainable development strategy. It must be emphasized that there are as many as 12 districts in the lower quartile of the distribution of the synthetic measure, i.e., its level has been below 0.25. 11 self-government units were in the second quartile of the distribution, i.e., in range between 0.25 and 0.5 of the synthetic indicator.

Relatively big taxonomic distances between synthetic measures for individual districts, with quite a large set of features, show signifcant differentiation among these parts of Kuyavian-Pomeranian Province in terms of local sustainable development. Despite the fact that the examined objects belong to the same administrative unit, which would appear to be relatively coherent, they do not develop at the same pace. Moreover, given a broad set of indicators, they differ significantly when it comes to the rate of their sustainable development.

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