Małgorzata **DOLATA** • Mariusz **MALINOWSKI**

LEVEL OF AND TERRITORIAL VARIATION IN THE ENVIRONMENTAL GOVERNANCE ASPECT OF SUSTAINABLE RURAL DEVELOPMENT ACROSS POLISH VOIVODESHIPS

Małgorzata **DOLATA**, PhD • Mariusz **MALINOWSKI**, PhD – *Poznań University of Life Sciences*

Correspondence address:
Faculty of Economics and Social Sciences
Wojska Polskiego Street 28, Poznań, 60-637, Poland
e-mail: malgorzata.dolata@up.poznan.pl

ABSTRCT: The purpose of this paper is to determine the level of and territorial variation in environmental governance in the context of implementing the sustainable development concept in Polish rural areas. The first part of this paper includes theoretical notions related to sustainable development, with particular emphasis on its environmental aspect in rural areas. In turn, the second part presents the research method and analyzes the results. As shown by this study, the level of the environmental governance aspect of sustainable development varies strongly across Polish rural areas. This may affect not only the rural population's quality of living but also the pace of economic development in remote areas.

KEY WORDS: sustainable development, environmental governance, rural areas, synthetic indicator of development

JEL: Q01, C10

Introduction

The global nature of today's economy results in greater environmental risks (including air, soil and water pollution) experienced all around the world (see: Wierzbicka, 2016). Developed in the second half of the twentieth century, the socioeconomic development concept referred to as sustainable development is supposed to address these issues. It became one of the most popular and most widely accepted development concepts (at least when it comes to general assumptions) across the globe (wider: Trzepacz, 2012). As a basic requirement, it calls for a multifaceted economic and social development and considers respect for the environment to be the overarching principle (Żylicz, 2004, p. 197; Leśniewski, 2010, p. 51-52).

The environmental (ecological) objective is one of the three basic goals provided for in the definition of sustainable development. This goal implies a commitment to: maintaining the natural resource capital and the productivity of utility systems in the long term; maintaining the stability, resilience and integrity of ecological processes; maintaining the diversity of species and landscapes; a sustainable and more productive use of resources in production and consumption processes; ensuring healthy living conditions; restricting environmental degradation; and eliminating environmental threats (see: Hadryjańska, 2015, p. 46-47). If effectively implemented, environmental governance is supposed to preserve the condition of natural heritage and deliver it to future generations as a capital that ensures good quality of living.

All of the above commitments are made for the development of each area, also including rural areas which – due to their large size – fulfill basic environmental functions for the entire country. The concept of sustainable rural development includes measures taken to ensure the highest possible standards of living for the rural population and to establish a favorable business climate. Also, as it takes into consideration the key roles of the natural environment for strategic development goals, the sustainable development concept is of particular importance for the activity types whose outcomes depend on natural conditions, including agriculture (Adamowicz, 2000). It is also important for this process to be relatively evenly distributed across the territory.

In Poland, environmental protection and sustainable development concepts are fundamental rights provided for in the constitution. Pursuant to Article 5, "The Republic of Poland shall safeguard the independence and integrity of its territory and ensure the freedoms and rights of persons and citizens, the security of the citizens, safeguard the national heritage, and shall ensure the protection of the natural environment pursuant to the principles

of sustainable development" (see: Konstytucja Rzeczypospolitej Polskiej, 1997).

The purpose of this paper is to determine the level of and territorial variation in environmental governance across the voivodeships in 2016, in the context of implementing the sustainable development concept in Polish rural areas. The study was based on online statistical data delivered as the Local Data Bank by the Central Statistical Office (CSO, 2018).

Sustainable rural development: the environmental aspect

The 1992 UN Earth Summit held in Rio de Janeiro made sustainable development a well-known concept. The conference identified the protection of the environment and its resources as the main goal (together with the fight against poverty) of socioeconomic development. The new approach to development, referred to as "sustainable development," became the underpinning principle for the global environmental policy for the next decades. Sustainable development is a concept of integrated governance defined as a development which ensures that social needs are met while respecting the environmental protection requirements (wider: Górka, 2007). The improvement in standards of living (i.e. economic development) has been inextricably linked with the need to preserve natural resources for future generations. People were made aware of ecological perturbations, impacts of pollution and the finite nature of environmental resources. This created a suitable climate for seeking new development patterns, resulting in the need to define the targets for an environmental policy based on the sustainable development paradigm (see: Burzyńska, Fila, 2007, p. 17-89). Therefore, the goal of the sustainable development concept was to adopt preventive measures to reduce, if not eliminate, the imbalances between economic growth and social development, and between socioeconomic development and natural environment (see: Poskrobko, 2009).

As set out in the definition, a particular role in sustainable development is played by natural resources, usually classified as follows (see: Rogall, 2010):

- renewable resources which, however, will be exhausted after exceeding a certain regeneration level (e.g. plants and animals),
- non-renewable resources: primary energy carriers and resources (e.g. coal, oil),
- quasi-inexhaustible resources (at least within a time frame available to humans), e.g. sun, wind, thermal energy from the earth's interior,
- basic components of the natural environment: resources such as air and water.

The most recent measure taken by the international community to support sustainable development was the definition of new development targets. That process was initiated at the United Nations Conference on Sustainable Development held in June 2012 in Rio de Janeiro as a follow-up to the implementation of the *Millennium Development Goals* (2000) and to the agenda for further global development after 2015. Seventeen new sustainable development goals were defined together with 169 related tasks which reflect the three dimensions of sustainable development: the economic, social and environmental dimension (wider: *Transforming our world: the 2030 Agenda for Sustainable Development,* 2015). Goals set as part of the environmental dimension include: ensure access to water and sanitation for all through sustainable management of water resources (goal 6); ensure access to affordable, reliable, sustainable and modern energy (goal 7); build resilient infrastructure, promote sustainable industrialization and foster innovation (goal 9); and take urgent action to combat climate change and its impacts (goal 13).

In Poland, the sustainable development concept takes on particular importance in the context of rural areas because they represent over 93% of the national territory and are home to 15.3 million people (39.8% of the total population) (CSO, 2018). Also, rural areas cumulate many public goods which are not only valuable in economic and social terms but primarily offer natural values (see: Woś, Zegar, 2002, p. 48). Hence, the domination of remote areas which fulfill basic environmental functions is decisive for the quality of living of the entire society.

By taking into consideration the key importance of the natural environment for strategic goals of rural development, the sustainable development concept is of particular importance for the activity types whose outcomes depend on natural conditions. Moreover, the concept of sustainable development of remote areas primarily includes measures taken to improve the conditions of economic activity and living standards for the rural population while not harming specific rural resources which include natural values, rural landscape, traditions and cultural heritage (Roszkowska-Mądra, 2009).

As the environmental dimension of the sustainable development concept became reinforced in practice, the importance of benefits brought by the modernization and enhancement of the environmental protection infrastructure was recognized. That part of infrastructure, often referred to as ecological infrastructure, was extracted from the economic infrastructure; it mainly includes investment projects implemented to protect and monitor the natural environment and to prevent the emergence and spread of human activity impacts. It is composed of facilities, systems and equipment which deliver the following services, without limitation: wastewater disposal and treat-

ment, water supply, safe landfilling, and air protection (Ratajczak, 2000, p. 17-18). Note that the development process is based on a coherent, complete and mature infrastructure which is strictly related to the use of natural capital. This is yet another reason why the development level of rural infrastructure should be regarded (together with the condition of natural resources) as an indicator of the implementation progress of the environmental governance aspect of sustainable development.

The evolution of the sustainable development concept drove increased interest in creating and using adequate indicators and measurement methods. In the relevant literature, propositions were put forward for the quantification of sustainable development at various territorial levels and in the temporal dimension.

In Poland, the studies on the construction of sustainable development indicators were initiated in the 1990s (wider: Borys, Fiedor, 2008). In turn, in the 2000s, a series of indicators were developed within the public statistics system to measure sustainable development (grouped in accordance with the integrated governance principle) at various levels of the country's territorial division (NUTS). The indicators are grouped by four governance fields: social governance, economic governance, environmental governance, and institutional and political governance. Each of the governance types is applicable to specific areas with associated indicators (Local Data Bank of the CSO, 2018). This approach is consistent with the concept developed by the EU who proposed a set of sustainable development indicators composed of ten thematic areas split into sub-areas enabling the presentation of operational objectives and measures taken under the Sustainable Development Strategy (*Sustainable development in the European Union,* 2015).

In accordance with the classification used by the Central Statistical Office (2011), environmental governance includes the following thematic areas: climate change (3 indicators), energy (4 indicators), air protection (4 indicators), marine ecosystems (1 indicator), fresh water resources (3 indicators), land use (3 indicators), biodiversity (2 indicators), waste management (4 indicators).

Delimitation of rural areas by level of the environmental governance aspect of sustainable development

The level of and variation in the environmental governance aspect of sustainable rural development across rural areas of Polish voivodeships in 2016 was measured in the following steps:

1) based on substantive and statistical requirements, five diagnostic features were selected with values expressed as indicators,

2) the values of diagnostic features were normalized using the median standardization method,
3) the modified positional Hellwig's pattern model (see: Hellwig, 2008) was used to calculate the value of the synthetic indicator of development (see: Lira et al., 2002),
4) the voivodeships were ordered linearly based on the values of the synthetic indicator,
5) typological classes were created to group the voivodeships exhibiting similar levels of the environmental governance aspect of sustainable development (see: Lira, Wysocki, 2004),
6) the harmonic mean was used for each typological class to determine the average values of the five features under consideration.

Because of the nature of this study, both substantive and statistical requirements were taken into account when selecting the diagnostic features. Substantive guidelines were followed to select universal, variable and relevant features among the generally available characteristics of environmental governance. In turn, because of statistical requirements, the features were also selected based on the analysis of diagonal entries of the inverse of the R correlation matrix. Ultimately, the following five diagnostic features were selected with values expressed as indicators:

- share of population served by wastewater treatment plants in total population (%) (treatment plants),
- share of population served by water supply in total population (%) (water supply),
- share of population served by a sewerage network in total population (%) (sewerage network),
- share of forests in total rural territory (%) (forest cover),
- mixed waste in kg per capita (waste).

Table 1 presents the basic numeric characteristics calculated for the selected diagnostic features, i.e. minimum and maximum values; coefficient of variation; lower and upper quartile; marginal median; Weber median; kurtosis; and skewness. In the next stage, these values enabled the construction of a synthetic indicator of the development of environmental governance in Polish rural areas at voivodeship level.

The analysis of particular elements of environmental governance does not enable a comprehensive description of this phenomenon at voivodeship level. This can be done only with a synthetic indicator of environmental governance levels, created using the method referred to above.

Table 1. Basic numeric characteristics of diagnostic features representing the environmental governance in Polish rural areas

Characteristics	Forest cover	Treatment plants	Waste	Water supply	Sewerage network
Classic coefficient of variation [%]	23,8	28,8	32,9	9,1	30,3
Kurtosis	1,96	-0,92	-0,92	0,89	-0,81
Skewness	1,24	-0,12	-0,11	-1,24	-0,15
Minimum	22,1	22,8	70,8	68,4	21,1
Lower quartile	25,7	35,4	128,5	82,8	34,1
Marginal median (1-dimensional)	29,7	44,3	160,0	88,8	42,2
Weber median	29,9	42,6	161,7	88,0	41,9
Upper quartile	34,4	48,5	194,9	92,7	48,1
Maximum	50,4	62,1	241,2	95,1	61,5

Source: author's own work based on Local Data Bank CSO [03-09-2018].

Once calculated and ordered, the values of the synthetic indicator were used to create typological classes grouping voivodeships exhibiting similar levels of environmental government components addressed in this study. Four typological classes were identified for the voivodeships (table 2):

- class 1: voivodeships with a high level of availability of environmental governance components addressed in this study,
- class 2: voivodeships with a medium level of availability of environmental governance components addressed in this study,
- class 3: voivodeships with a low level of availability of environmental governance components addressed in this study,
- class 4: voivodeships with a very low level of availability of environmental governance components addressed in this study.

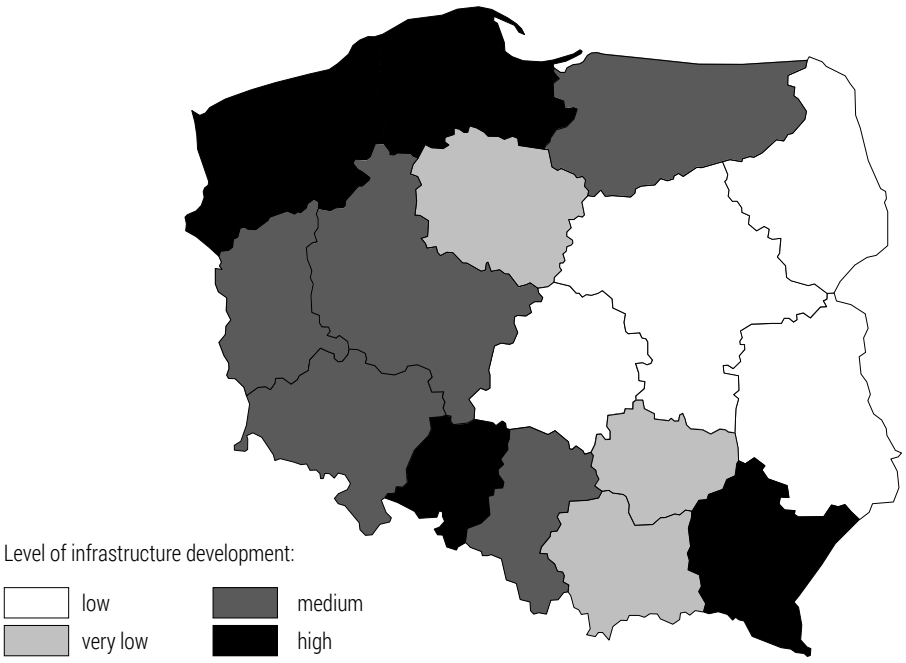
To provide a more accurate picture of differences in levels of the environmental governance aspect of sustainable development across Polish rural areas, the results of the classification procedure were shown on a map (figure 1).

Table 2. Classification of voivodeships by value of the synthetic indicator of environmental governance levels

The level of the indicator	Value of the indicator	Number of voivodeships	Voivodeships
High	above 0,5	4	Zachodniopomorskie, Podkarpackie, Pomorskie, Opolskie
Medium	-0,009 – 0,177	5	Wielkopolskie, Śląskie, Dolnośląskie, Warmińsko-Mazurskie, Lubuskie
Low	-0,266 – -0,310	3	Małopolskie, Kujawsko-Pomorskie, Świętokrzyskie
Very low	below -0,688	4	Mazowieckie, Podlaskie, Łódzkie, Lubelskie

Source: author's own work based on Local Data Bank CSO [03-09-2018].

Figure 1. Delimitation of Polish rural areas by level of the environmental governance dimension of sustainable development in 2016 (at voivodeship level)



Source: author's own work.

The first class (rural areas at the highest level of implementation of environmental governance) includes four voivodeships: two located in the north-western part of the country (Zachodniopomorskie and Pomorskie)

and two in the south (Podkarpackie and Opolskie). In these voivodeships, the synthetic indicator of ecological governance went beyond 0.5. In this class, the minimum values of indicators of environmental components of sustainable development (as selected in this study) were considerably higher than in other classes only in the "wastewater treatment plant" and "sewerage network" categories. When it comes to other components, the minimum values were similar (forest cover) or even lower (water supply and waste) than in class 2. In turn, the maximum values of all components (except for forest cover) were higher than in other classes (table 3). Remarkably, in the class of voivodeships at high levels of environmental governance, the availability of water supply networks is 0.7 percentage points below the national average level expressed with the harmonic mean.

The largest (second) class comprised five voivodeships described with a synthetic indicator of environmental governance ranging from -0.009 to 0.177. The voivodeships grouped in this class (representing medium levels of environmental governance) created a large compact area in western Poland (Wielkopolskie, Dolnośląskie and Lubuskie). Also, one voivodeship (Śląskie) was located in the south and another one (Warmińsko-Mazurskie) in the north. The average values of indicators of the phenomenon considered mainly suggest that, compared to class 1, the rural population had poorer access to wastewater treatment and water supply services. In each case, the maximum indicator values in class 2 were higher than in class 3 which grouped voivodeships at lower levels of implementation of environmental governance. Compared to other classes and to the national average, a considerably larger amount of mixed waste per capita (192.9 kg) was observed in class 2. What is also characteristic is that all average values of other indicators calculated at countrywide level were lower than the corresponding values in this class.

The smallest (third) class groups voivodeships at low levels of environmental sustainability and consists of three voivodeships, two of them (Małopolskie and Świętokrzyskie) being located in the southern part and one (Kujawsko-Pomorskie) in central Poland. In this class, the synthetic indicator ranged from -0.266 to -0.310. The average values of indicators describing the diagnostic features selected for this study were lower than in class 2 but higher (except for the share of population served by water supply services) than in class 4. In class 3, the maximum values of particular elements were above the corresponding values recorded in the class of voivodeships at very low levels of availability (except for forest cover). In this class, all average indicator values describing the diagnostic features used in the study were lower than the indicators of corresponding values recorded in rural areas all over the country.

The fourth typological class included four voivodeships located in eastern (Podlaskie and Lubelskie) and central (Mazowieckie and Łódzkie) Poland. The synthetic indicator calculated for this class of voivodeships (characterized by a very low level of environmental governance) fell below -0.688. In this class, the average values of indicators describing the phenomenon taking place in Polish rural areas were considerably lower than in the previous class. The exception was the share of population served by water supply networks in total rural population, which was 5.5 percentage points higher than in class 3. In turn, the maximum values of indicators of ecological governance in this class of voivodeships were much lower than in the previous class, with the two exceptions of water supply and waste. In class 4, the average values of all indicators of the availability of environmental governance components in rural areas were below the corresponding values recorded at countrywide level. The biggest differences concern the access to services delivered by the wastewater disposal and treatment system.

Table 3. Inter-class differences in levels of the environmental governance aspect of sustainable development across rural areas in 2016

Class	Level of the indicator	Characteristics	Forest cover	Treatment plants	Waste	Water supply	Sewerage network
I	high	min	27,0	54,7	96,4	71,5	52,5
		harmonic average	36,3	58,1	161,7	84,3	57,1
		max	39,4	62,1	241,2	95,1	61,5
II	medium	min	26,4	42,9	156,9	87,8	40,8
		harmonic average	32,6	46,0	192,9	90,7	45,2
		max	50,4	46,5	233,1	94,7	46,6
III	low	min	23,8	37,2	70,8	68,4	35,7
		harmonic average	26,8	38,3	129,2	78,7	37,9
		max	29,3	39,0	163,1	93,1	38,5
IV	very low	min	22,1	22,8	81,5	80,3	21,1
		harmonic average	25,0	27,0	121,1	84,2	25,4
		max	31,4	30,0	140,7	92,5	29,2

Source: author's own work based on Local Data Bank CSO [03-09-2018].

Conclusions

The analysis of the level of and territorial variation in the environmental governance aspect of sustainable rural development in Poland allows to formulate the following basic conclusions:

1. In 2016, there were considerable differences in levels of the phenomenon covered by this study across the territory; this is true both for environmental governance as a whole and for its individual elements.
2. The highest level of sustainable development in its environmental aspect was recorded in rural areas of four voivodeships located in the north-western (Zachodniopomorskie and Pomorskie) and southern (Podkarpackie and Opolskie) part of the country. This class of voivodeships was found to enjoy a relatively high availability of services delivered by wastewater treatment plants and water supply networks. Also, they reported a high share of forests in total rural territory.
3. The lowest level of environmental governance was observed in a class composed of four voivodeships located in the eastern (Podlaskie and Lubelskie) and central (Mazowieckie and Łódzkie) part of Poland. In these voivodeships, the rural population's access to sewerage networks and wastewater treatment plants was at a much lower level than the corresponding values in other classes and the countrywide average values calculated for rural areas. The same is true for the forest cover level.

The contribution of the authors

Małgorzata Dolata – 50% (data collection, analysis and interpretation of results).
Mariusz Malinowski – 50% (concept, theoretical part, conclusions).

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