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Socio-economic Dimension of the Sustainable Development of Polish Provinces

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Abstract
The aim of this article was to conduct research and present the results of a ratio analysis assessing the implementation of the concept of sustainable development in Polish provinces. It suggests a set of indicators tracking two of the areas of sustainable development: economic and social, in two separate periods: before the 2019 pandemic and during the 2020 pandemic. In addition to determining the performance of Lubusz Province compared to other provinces, the authors' assumption is also to identify the impact of the COVID-19 pandemic on the implementation of economic and social sustainability goals in Poland as a whole. The key issues concerning the concept of sustainable development and the state of research on sustainability indicators at a regional level are presented with the help of literature review. On the basis ratio analysis was rated economic development of 16 Polish provinces was assessed and then benchmarked to determine the position of Lubusz Province. The proposed tracking indicators included the following aspects: economic potential, innovation of the economy, sustainable production patterns, demographic changes, job market, and social integration. The obtained results answered the question concerning the socio-economic development of Polish provinces, in particular that of Lubusz Province, in the context of sustainability before and during the pandemic.

Keywords: socio-economic development, a ratio analysis, COVID-19 pandemic.

1. Introduction

Currently, one of the most important challenges for regional economies is stimulating sustainable development, which includes spatial, economic and social planning, allowing for better coordination of activities and an increase in their effectiveness (Barska, Jędrzejczak-Gas, 2019). For several decades the issue of sustainable development has been one of the most frequently discussed topics at the international, national and regional level. In recent years the discussion on sustainable development has led to opinions that the economic mainstream is becoming more and more powerless in the face of contemporary problems, as it was found out during the financial crisis (2007-2009), and from 2019 the pandemic crisis. The crisis caused by the COVID-19 pandemic and the restrictions meant to limit the spread of the virus made tremendous changes in the economies of individual countries. There has been an unprecedented decline in the pace of economic life, which will eventually have an impact on human development.
Nowadays, the strength of provinces is verified not only by their ability to 'recover from the crisis', but also by their sensitivity to crisis phenomena, as manifested in various responses of regional economies to negative external stimuli and changes in the economic

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situation (Kudełko, Wałachowki, Żmija, 2020, p. 17). The concept of 'regional vulnerability' can be defined as the susceptibility of economies to external economic stimuli, including negative demand and supply shocks, crises or structural changes of a global nature. It refers to their reaction to disturbances in development processes and the ability to follow the right development trajectory.

It seems that in the years to come, i.e. after 2020, the implementation of the regional policy in the European Union will undergo a certain change in the perception of the development priorities of the provinces. Currently, the priorities of sustainable development are focused on social issues, as the greatest effort, in line with the 2030 Agenda, should be eradicating poverty in all its manifestations while securing economic and environmental goals. The new development model for Poland as outlined in the Strategy for Responsible Development (SRD) meets the expectations set out in the 2030 Agenda. The concept of sustainable and responsible development on which the SRD is based is consistent with the vision of the 2030 Agenda – the vision of a world free from poverty, where everyone has the opportunity to benefit from development. Responsible development, in accordance with the provisions listed in the SRD, was defined as 'the one which - by building a competitive strength with the use of new development factors - offers participation and benefits to all social groups living in different parts of the country' (*Strategia na rzecz Odpowiedzialnego Rozwoju*..., 2017, p. 7). Responsible development appeals to the broadly understood social solidarity.

Presenting the multifaceted problems of sustainable development of spatial units and their assessment is a very complex issue, especially when combined with the pandemic crisis. The presented article is the result of the work on the assessment of socio-economic development in the context of the progress in the implementation of the sustainable development concept in 2020, with 2019 adopted as a reference point. The aim of the article is to assess the socio-economic development of Polish regions, in particular the Lubusz Province, in the context of sustainable development before and during the pandemic. The article consists of two parts. In the first part, on the basis of literature, the key issues concerning the concept of sustainable development and the state of research on indicators of sustainable development at the regional level are presented. The second part presents an index analysis on the basis of which the socio-economic development of 16 Polish regions, in particular the Lubuskie Voivodeship, was assessed.

The research covered all 16 regions of Poland, but the authors focus their attention mostly on the Lubusz Province. The preparation of the publication was possible due to the financial support of the Lubusz Province Board as part of the 'Small Grants for Public Universities' programme.

2. Socio-economic consequences of the crisis caused by the COVID-19 pandemic – A Literature Review

The impact of the crisis caused by the COVID-19 epidemic is not symmetrical across all sectors of economy. The biggest loss was suffered by enterprises whose activities were significantly limited or suspended due to the implemented restrictions on social distancing and transportation. The vast majority of industries have suffered from uncertainty and general decline in global demand. Maintaining production chains in a

situation of trade made more difficult among countries has become a challenge. The restrictions introduced by individual states had a negative impact on the level of employment in enterprises where it was not possible to work remotely.
In Poland, the dynamics of industrial production in April 2020 reached only 24.5%, returning to its level of 2013. The decrease in the production of investment goods amounted to 50.9%, durable consumer goods - 47.8%, and intermediate goods - 18.2%. The branch that sustained the greatest losses was the production of motor vehicles, trailers and semi-trailers, which decreased by 78.9%. This branch of the economy recorded a decrease in revenues by 34% (GUS, 2020).
The consequences of the crisis also severely affected enterprises operating in the service sectors of the economy. Maintaining social distancing had an impact, first of all, on entities providing services that require physical proximity with clients, which during the pandemic could not be provided due to the concern for public health (footnote). Severe changes also took place in the tourism services sector (Panasiuk, 2020). The pandemic also had a significant impact on institutions operating within the education sector. According to UNESCO (2022), 90% of all students were affected by the pandemic. The necessity of distance learning forced educational institutions to rapidly undertake changes in the direction of digitization of services and providing them via the Internet. This resulted in a surge in demand for e-learning services.
Still, some researchers believe that the COVID-19 pandemic also triggered a powerful dynamic of positive economic change. There are industries that are 'experiencing' a phase of very rapid growth. This mainly applies to enterprises associated with the fourth industrial revolution. Moreover, it should be noted that the dynamics of the economy turned out to be high. Decreases in GDP almost everywhere in the world were lower than expected (IMF, 2020a; IMF, 2020b; IMF, 2020c; World Bank, 2020; IMF, 2021a; IMF, 2021b). Some researchers believe that the post-pandemic economy will continue to develop, and become even more efficient perhaps as a result of the acceleration of innovation processes due to the increased pace of the fourth industrial revolution. There is also an argument that as a result of the pandemic, people will start to behave more responsibly, which may be manifested in an increase in the propensity to save in case of similar unexpected mishaps in the future. This, in turn, will translate into an increase in investments and acceleration of GDP growth in the long run (Kiełczewski, 2021, p. 155). Accelerating the implementation of the fourth industrial revolution has its darker side: it reduces the demand for cheap and low-skilled labour, which means weakening the competitive position of underdeveloped countries. Their situation is also aggravated by the fact that free international trade has led to an increase in the scale of disruptions in supply chains, stepping up the risk and uncertainty regarding the continuity of production. Investors are therefore losing the incentive to transfer their economic activity abroad. This may cause the economies of highly developed countries to close down, with serious economic and social consequences.

3. Methodology

The article assesses the regional differentiation of the variables' values accounting for the socio-economic development in Poland in the context of the implementation of

the concept of sustainable development, taking into account the changes caused by the COVID-19 pandemic. Secondary sources of information were used to achieve the planned goal. First, the literature on the impact of the COVID-19 pandemic on the socio-economic situation in the world and in Poland was reviewed. Then, the explanatory variables were selected, based on the following criteria: substantive, statistical and formal (mainly relevance, completeness and accessibility for the studied provinces in 2020 and 2019). The analysis was broken down into thematic areas such as: 1) demographic variables, 2) labour market, 3) social integration, 4) potential of the economy, 5) innovation of the economy and 6) sustainable production patterns. The thematic areas are illustrated with selected indicators which, according to the authors, best illustrate the socio-economic development and the idea of sustainable development at the regional level. The analyses included all 16 provinces (voivodeships) of Poland: Masovia, Lubusz, Lublin, Silesian, Lower Silesian, Lesser Poland, West Pomerania, Holy Cross Province, Podlaskie, Lodz, Subcarpathia, Pomerania, Opole, Warmia-Masuria, Kuyavia-Pomerania and Greater Poland, however the territorial focus of the authors is primarily on the Lubusz Province. The preparation of the publication was possible due to the financial support of the Board of the Lubusz Province as part of the 'Small Grants for Public Universities' programme. Lubusz Province is located in western Poland. It is one of her smallest and youngest provinces in the country. Lubuskie has area of 13,987.93 km², and its population in 2021 was approximately 999 205. It was established in 1999 - as a result of the administrative reform – and it includes most territories of the former Gorzowskie and Zielonogórskie Provinces. Due to the short period of functioning of the Lubusz Province as an independent administrative unit, it is necessary to constantly monitor its level of economic development and its stimulation. The presented data reflected the situation in Poland and its respective provinces in 2019 and 2020. The authors used such statistical measures as: minimum value, arithmetic mean, maximum value and the coefficient of variation.

4. Results and discussion

The evaluation of the changes in the level of socio-economic development in Poland was carried out in six thematic areas and within two time-ranges - 2019 and 2020. Monitoring the implementation of directions of activities in provinces operating in accordance with the principle of sustainable development and taking into account social, economic and environmental cohesion is carried out with the use of a properly selected set of individual indicators (Roszkowska, Filipowicz-Chomko, 2016; Jędrzejczak-Gas, Barska, 2019; Barska, Jędrzejczak-Gas, Wyrwa, Kononowicz, 2020, Jędrzejczak-Gas, Barska, Wyrwa, 2021). The suggested indicators of monitoring the socio-economic development enable the creation of the statistical image of Poland and her provinces from the perspective of the implementation of the new paradigm of sustainable development.
The first area studied is demographic changes, characterized on the basis of 6 indicators listed in the Table 1. These are features that are of fundamental importance as far as the determinants of sustainable development are concerned, as the improvement of demographic indicators entails the development of other positive characteristics shaping such a development model (Jakubowski, Bronisz, 2019).

The greatest diversification of provinces in Poland in terms of demographic changes (coefficient of variation above 100%) can be observed only for two indicators: migration of foreign people of working age and population growth. The analyzed data show that the demographic structure in Poland is not significantly diversified (Table 1).

The current trend of demographic changes is mainly influenced by the migration activity. Migration is an important element of demographic changes taking place at the national level, it can partially offset the effects of an aging population, it also has an impact on the size of the labour force and the economic development of the country. The rationale for using this indicator is that migrants tend to leave provinces that are underdeveloped, where there are no attractive living and working conditions, for those that offer them better prospects. In 2019, 11 provinces had a negative net migration of working age people, while in 2020 - as many as 13 provinces of Poland did so. Masovia province had the highest positive balance of foreign migration of working age people in 2019 in the analyzed period. On the other hand, in 2020, in the two provinces, i.e. Lublin and Podlaskie, the balance of foreign migration of working age people was slightly positive.

Another indicator characterizing demographic changes is the population growth rate. When analyzing the birth rate, it should be noted that in 2019 it was negative in 11 provinces, and in 2020 - in all 16 provinces of Poland. In 2019, Pomerania Province had the highest positive natural increase.

When assessing the impact of demographic characteristics of the population on social conditions, the fertility rate and the demographic dependency ratio are also applied. There is little regional variation in Poland in terms of the fertility rate. In 2019 and 2020, the highest fertility rate was noted in Pomerania Province, while the lowest in Holy Cross Province. When analyzing the changes in this respect in 2019 and 2020, it should be noted that in all provinces the fertility rates decreased. On the other hand, in 2019 and 2020, the highest demographic dependency ratio was recorded in Łódź Province, and the lowest - in Warmia-Masuria.

Demographic changes are also related to the health of the society. The tool to monitor the processes affecting the health situation of the country are, among others, the following indicators: live births and deaths. Births are a key factor influencing the number and structure of any population. Meanwhile, the birth decrease was observed in 2019-2020. During this period, the number of live births decreased in all provinces. It should be noted that in order to ensure stable demographic development of a country, for every 100 women aged 15-49 there should be an average of 210-215 children. It is about maintaining such a demographic potential in which every woman is replaced by a daughter. Currently, the fertility rate in Poland is far from the desired. What is more, the number of deaths in 2020 exceeded by over 100,000. the average annual value from the last 50 years (477 thousand compared to 364 thousand), and the death rate per 100 thousand of the population peaked since 1951. In 2020, 477,335 people died - the number higher by almost 68,000 compared to 2019. The 45th week of 2020 (from 2 to 8 November) turned out to be particularly dramatic with over 16 thousand deaths (GUS, 2021a). The analysis of the data on deaths in 2019 and 2020 indicates an increase in mortality in all provinces of Poland. The highest increases - over 20% - were recorded in the following provinces: Subcarpathia and Holy Cross Province. The main cause of the increase in the number of deaths in Poland in 2020 was the SARS-CoV-2 pandemic, the peak of which occurred in the last months of the year.

Direct victims of COVID-19 account for approx. 60% of the recorded increase in mortality (GUS, 2021a).

Table 1. Descriptive characteristics of the variables accounting for the area of demographic changes in Polish provinces in 2019 and 2020

Index of the descriptive variable	Year	Describing statistics				
		Min	Max	Lubusz	Poland	Ratio volatility
Birth rate	2019	-3.64 (Lodz)	1.54 (Pomerania)	-2.01	-0.91	133.06
	2020	-6.36 (Holy Cross Province)	-0.5 (Pomerania)	-3.95	-3.18	49.62
Fertility rate	2019	1.235 (Holy Cross Province)	1.598 (Pomerania)	1.326	1.419	7.75
	2020	1.177 (Holy Cross Province)	1.531 (Pomerania)	1.306	1.378	8.04
Foreign migration (working age people)	2019	-8.6 (Opole)	4.6 (Masovia)	-1.9	-0.4	273.93
	2020	-8.0 (Opole)	3.5 (Masovia)	-1.0	-0.5	223.76
Demographic dependency rates	2019	24.4 (Warmia-Masuria)	30.7 (Lodz)	26.2	27.2	6.73
	2020	25.5 (Warmia-Masuria Province)	31.8 (Lodz Province)	27.4	28.2	6.75
Live births	2019	8.26 (Holy Cross Province)	11.14 (Pomeranian Province)	8.92	9.77	9.80
	2020	7.71 (Holy Cross Province)	10.45 (Masovian Province)	8.55	9.26	10.00
Total deaths	2019	941.5 (Subcarpathia)	1244.2 (Łódź Province)	1092.8	1067.3	7.58
	2020	1093.6 (Pomeranian Province)	1462.3 (Lodz Province)	1249.8	1244.6	8.01

Source: own study.

Other social factors that were examined in view of the possibility of sustainable development in individual provinces of Poland were the features characterizing the situation on the labour market. This area was described using 5 indicators presented in the Table 2.

There is only slight regional differentiation in terms of the situation on the labour market in Poland (Table 2). Among the analyzed labour market indicators, the unemployment rate was the most differentiating factor (the coefficient of variation in 2020 was 26.44% and decreased by 5.28% compared to 2019).

In Poland, in the years 2019-2020, there was a simultaneous increase in employment and unemployment. The employment rate increased slightly from 74.5% to 74.9% and in parallel there was an increase in unemployment from 5.2% to 6.3%. When analyzing the changes in the unemployment rate in 2019 and 2020, it can be concluded that the unemployment rate increased in all provinces. The increase in the unemployment rate should be considered relatively small, especially in the context of formulating forecasts at a level higher than 10%. In 2020, the unemployment rate above 10% was achieved only in the Warmia-Masuria Province (Table 2). On the other hand, the highest increase in the unemployment rate was observed in the following provinces: Silesian, Greater Poland and Pomerania (an increase of over 30%). The increase in unemployment can be interpreted as one of the symptoms of provinces' sensitivity to the effects of the COVID-19 crisis.

Employment growth is a fundamental factor in reducing the risk of the lack of social cohesion. In the years 2019-2020, Poland recorded a decrease in the share of people aged 18-59 living in jobless households (by 8.5%). The indicator is calculated as the share of the number of people in a given age group who are members of jobless households in the total number of household members in the same age group. Among the provinces in Poland, both in 2019 and 2020, the percentage of people aged 18-59 living in jobless households varied. The lowest level of this indicator was recorded in the Lesser Poland province with the highest in Warmia-Masuria province.

Table 2. Descriptive characteristics of the variables accounting for the area of the job market in Polish provinces in 2019 and 2020

Index of the descriptive variable	Year	Describing statistics				
		Min	Max	Lubusz	Poland	Ratio volatility
Unemployment rate	2019	2.8 (Greater Poland)	9.1 (Warmian-Masurian Province)	4.9	5.2	31.72
	2020	3.7 (Greater Poland)	10.2 (Warmia-Masuria Province)	6.3	6.3	26.44
Employment rate for people aged 18-59/64	2019	69.5 (Warmia-Masuria Province)	78.9 (Masovian Province)	73.3	74.5	3.79
	2020	70.7 (Warmia-Masuria Province)	78.5 (Masovian Province)	74.3	74.9	3.30

Professional activity rate	2019	52.7 (Warmia-Masuria Province)	60.3 (Masovian Province)	55.0	56.2	3.97
	2020	52.6 (Silesia)	60.1 (Masovian Province)	54.8	56.1	3.54
People in households without working persons	2019	3.3 (Lesser Poland)	8.1 (Warmian-Masurian Province)	5.1	4.7	26.21
	2020	2.3 (Lesser Poland)	7.2 (Warmia-Masuria Province)	7.0	4.3	31.80
Average monthly gross salaries in relation to the national average	2019	83.4 (Warmia-Masuria Province)	120.6 (Masovian Province)	88.0	100.0	9.95
	2020	85.2 (Subcarpathia)	119.2 (Masovian Province)	87.5	100.0	9.39

Source: own study.

The third component influencing social development in the context of sustainable development was social integration. This area was described using 6 indicators showed in the Table 3.

A high level of social cohesion is the goal of sustainable development. The COVID-19 pandemic has revealed inequalities in the income structure between Polish provinces, however, in individual provinces, over the years 2019-2020, only slight differences in the value of the coefficient of variation could be observed.

One of the analyzed measures of social integration was the risk of poverty or social exclusion indicator. Social exclusion and poverty are the main problems that act as barriers to achieving economic growth and high quality of life. The poverty and social exclusion index reveals the multifaceted nature of this phenomenon, which is a challenge in terms of sustainable development. It illustrates the effects of low income and unemployment affecting the quality of life and the ability to meet the needs recognized as basic by European standards. It is worth emphasizing, however, that poverty is the result of certain endogenous and exogenous activities and cannot be reduced only to the lack of funds, it is also a matter of determining the deprivation of needs and difficulties in participating in collective life. This indicator illustrates the phenomenon of poverty and social exclusion, which is one of the main challenges for sustainable development. Goal 1 of the 2030 Agenda challenges countries around the world to eradicate poverty in all its forms. In the analyzed period, the percentage of people at risk of poverty and those socially excluded increased in 7 provinces of Poland. The greatest deterioration of the situation in this respect was recorded in Podlaskie Province (an increase of nearly 20%). It should be noted

that the increasing scope of poverty increases the likelihood of the development of social conflicts.

The increase in the number of poor and socially excluded people should result in more recipients of social assistance. Still, the results of the research show that the range of benefiting from social welfare according to the income criterion decreased in all provinces of Poland. Both in 2019 and 2020, the most favourable, i.e. the lowest value, was recorded in Silesian Province. The above tendency is the result of the social welfare institutions' 'cut off' of contacts with outside people. This was due to the fact that employees of these institutions were most exposed to the severe course of COVID-19 infection.

The scope of social inequalities can be represented by the average monthly disposable income. In the years 2019-2020, an increase in disposable income was recorded in all provinces of Poland. The level of the average monthly disposable income per person in 2020 amounted to PLN 1,919 and was higher by 2.0% in real terms (by 5.4% in nominal terms) than the income for 2019. Thus, the upward trend of disposable income was maintained, but its dynamics slowed down. In territorial terms, the income higher than the national average was recorded in the following provinces: Masovia, Silesian, Lower Silesian, Lubusz and Podlaskie. As in 2019, by far the highest average income per person was reported by households from Masovia Province (PLN 2,241). This income was higher than the average national income per person by 16.7%. On the other hand, the lowest income (as in 2019) was achieved by households from Subcarpathia Province (PLN 1,589) - 17.2% lower than the national average. The other provinces with the lowest level of income were Lublin (12.5% less than the average for Poland) and Opole (10.8% less). The difference between the highest and the lowest average income per capita in provinces, compared to the national average, decreased by 1.1% compared to 2019 and amounted to 33.9%. The average household income is considered to be one of the basic measures of wealth and standard of living. However, this information is insufficient to define the level of differentiation of the society in terms of income obtained. More appropriate is the inequality of income distribution index, which measures income disparities between the richest and poorest sections of the society. This indicator expresses the ratio of the sum of income earned by 20% of people with the highest income level (the highest quintile group) to the sum of income earned by 20% of people with the lowest income level (the lowest quintile group). When assessing the level of this indicator, it can be noted that its most favourable rate was recorded both in 2019 and 2020 in the Lublin Province. On the other hand, the lowest values in the analyzed period are recorded for Lubusz Province. Reducing income inequality helps to reduce the marginalization of the most vulnerable groups in the society. In the years 2019-2020, a decrease in the income distribution inequality index was recorded in almost all provinces of Poland, with the exception of Masovia and Podlaskie provinces, which means that the discrepancies between the income earned by the richest and the poorest sections of the society decreased. This is a positive trend. According to the Central Statistical Office, in 2020, the financial situation of households improved slightly despite the COVID-19 pandemic, which had a significant impact, in particular, on the level and structure of expenses. Households achieved higher incomes, but spent significantly less compared to 2019. Spending changed in response to the dynamics and constraints of the pandemic. The average monthly expenditure per capita in households in 2020 amounted to PLN 1,210 and was lower in real terms by 6.5% (by

3.4% in nominal terms) than the expenditure in 2019. Expenditure on consumer goods and services amounted to PLN 1,165 and was lower in real terms by 6.2% (3.0% in nominal terms) compared to 2019. At the same time, compared to 2019, the expenditure on food and non-alcoholic beverages as well as home use and energy (which have the highest share in the expenditure structure) increased. These changes were conditioned by the changing dynamics of the COVID-19 pandemic and the related limitations (GUS, 2021b). Average monthly expenses per 1 person above the average for Poland in 2020 were recorded in the following provinces: Masovia, Lower Silesian, Pomerania, Opole, Silesian, West Pomerania and Lodz. As in 2019, the highest average monthly expenditure per person (PLN 1,443) was recorded in the Masovia Province and it was higher than the national average by 19.3%. The lowest average expenditure per 1 person was recorded in Subcarpathia province (PLN 931) and compared to the average for the whole country, it was lower by 23.0% and in Holy Cross Province (lower by 17.8%). The difference between the highest and the lowest average expenditure per person in provinces increased by 4.8% compared to 2019 and amounted to 42.3% (Table 3).

Table 3. Descriptive characteristics of the variables explaining the area of the social integration in Polish provinces in 2019 and 2020

Index of the descriptive variable	Year	Describing statistics				
		Min	Max	Lubusz	Poland	Ratio volatility
Risk of poverty or social exclusion	2019	13.8 (Silesian)	28.8 (Lublin)	14.5	18.2	21.97
	2020	12.2 (Silesian)	26.6 (Lublin)	15.5	17.3	25.03
Impact of social transfers (excluding pensions) on poverty reduction	2019	25.3 (Lublin)	48.7 (Lubusz)	48.7	36.9	15.23
	2020	22.6 (Lower Silesian)	50.7 (Pomerania)	40.3	36.7	22.87
Extent of using community social assistance according to the income criterion	2019	3.0 (Silesian)	8.0 (Warmia-Masuria)	5.1	4.6	26.60
	2020	2.8 (Silesian)	7.2 (Warmia-Masuria)	4.7	4.1	26.17
Inequality of income distribution	2019	3.5 (Lubusz)	4.8 (Lublin)	3.5	4.4	7.84
	2020	3.2 (Lubusz)	4.6 (Lublin Province)	3.2	4.1	8.88

Average monthly income per 1 person	2019	1471.49 (Subcarpathia)	2108.01 (Masovian Province)	1794.12	1819.14	8.89
	2020	930.94 (Subcarpathia)	1443.01 (Masovian Province)	1157.30	1209.58	8.60
Average monthly expenses per 1 person	2019	1006.9 (Warmian-Masurian Province)	1476.26 (Masovian Province)	1223.71	1251.73	12.50
	2020	930.94 (Subcarpathia)	1443.01 (Masovian Province)	1157.30	1209.58	12.16

Source: own study.

The group of indicators expressing economic development are the indicators illustrating the potential of the economy. This area was described using 6 indicators presented in the Table 4.

A well-known measure of the standard of living of an average person is GDP *per capita*, which is the average amount of GDP per country resident. In 2020, a significant decrease in the gross domestic dynamics per capita was recorded (Table 4). The most difficult situation in 2020 in this regard was in Silesian Province, it was the region most affected by the COVID-19 pandemic. It should be noted that the province was still leading in this field in 2019. This phenomenon was a consequence of the fact that the decline in industrial production was felt more strongly here than in other provinces. The analysis of the variation index for this variable, which was 100.2%, suggests very large variation between provinces, and in 2019 this index was only 12.6%. Kudełko and his team (2020, p. 19) prove that the most vulnerable to crisis phenomena are the most developed provinces. The Authors say, that this provinces characterized by low sensitivity[1] and high ability to react to negative shocks[2].

An important indicator of economic development is investment expenditure per capita, whose aim is to develop new fixed assets as well as improve the existing ones, and therefore it usually constitutes a decisive factor of economic growth. This indicator decreased in 2020. Lubusz province was below the national average in 2020 when it comes to the ratio of investment outlays per capita (current prices, Poland = 100). According to a report by Ernst & Young Global Limited more than half of the companies withdrew from investments due to the pandemic, and only one third of companies plan to invest in the forthcoming years.

[1] The economy is less sensitive, which is characterized by, among others: a high level of education of its participants, a high level of entrepreneurship, a high employment rate, advanced technologies, a large share of high- and medium-technologically advanced production and service sectors, a large diversification of the economy, high efficiency of the economy and large share of private sector expenditure on R&D (Kudełko *et al.* 2020, p. 18).

[2] Regional economies with: high-quality institutions, high level of human and social capital, advanced technology, high capital resources of enterprises and territorial authorities as well as high value of external funding are characterized by greater resilience (Kudełko *et al.* 2020, pp. 18-19).

Investment expenditures per capita decreased by 3.5% in Poland in 2020 compared to 2019. In 2020, in Lubusz Province, they amounted to PLN 5,910, and their value reached 73.4% of the national average - which places the province in the 14th place in the country. Other economic indicators allowing for the assessment of the economic situation of the country in the context of sustainable development are energy and water consumption of industry and share of electricity consumption in the transport sector in total consumption (%). Changes in this respect were not large, which was due to the pandemic halt in certain sectors of the economy. When analysing energy consumption in transport, the relationship between energy consumption in transport and economic growth can be assessed. The increase in gross domestic product should not be a consequence of the increase in energy consumption in transport. This indicator is about the transition process to clean energy. Adequate access to water is essential not only for the quality of life, but also for sustainable economic development. From the economic point of view, it is important to reduce the water consumption and energy consumption of production processes and those related to municipal needs. Limitation should be pursued to protect water resources excessive water consumption, so as not to exceed the natural ability to renew resources. Rational use of these resources should make it possible to meet the needs of both the population, the economy and ecosystems. Rational use of water and energy should make it possible to meet the needs of the population, economy and ecosystems. The share of industry in total water consumption in Lubusz Province was the lowest since the summer, which is mainly the result of the non-industrial nature of the province.

Table 4. Descriptive characteristics of the variables accounting for the area of the economic potential in Polish provinces in 2019 and 2020

Index of the descriptive variable	Year	Describing statistics				
		Min	Max	Lubusz	Poland	Ratio volatility
Dynamics of GDP per capita	2019	6.0 (Kuyavian-Pomeranian)	9.4 (Lodz)	6.7	8.2	12.6
	2020	-1.9 (Silesia)	4.7 (Lodz)	1.8	1.5	100.2
Investment outlays per capita	2019	4999 (Holy Cross)	13477 (Masovian)	6252	8361	28.7
	2020	4930 (Holy Cross)	12955 (Masovian)	5910	8068	26.6
Gross value of fixed assets in enterprises per capita	2019	52.4 (Lublin)	178.7 (Masovian)	99.6	100.0	35.7
	2020	51.6 (Lublin)	176.9 (Masovian)	98.2	100.0	35.8
The share of electricity consumption in the industrial sector in total consumption	2019	19.6 (Lodz)	48.7 (Kuyavian-Pomeranian)	43.9	34.5	19.7
	2020	20.1 (Lodz)	49.0 (Kuyavian-Pomeranian)	42.7	34.6	20.2

The share of electricity consumption in the transportation sector in total consumption	2019	1.5 (Subcarpathia)	5.6 (Greater Poland)	3.0	3.3	40.1
	2020	1.3 (Subcarpathia)	5.3 (Pomeranian)	3.1	2.3	38.9
Industry share in total water consumption	2019	14.1 (Lubusz)	91.8 (Holy Cross)	14.1	71.4	54.1
	2020	14.5 (Lubusz)	90.8 (West Pomeranian)	14.5	70.9	55.5

Source: own study.

Another area that was analysed and that significantly determines the socio-economic development is the innovativeness of the economy, which was characterized with the use of 4 indicators listed in the Table 5. Innovation plays a fundamental role in strengthening the market position and the competitive struggle of products and services both on the internal and international markets. Saturation of the economy with innovative products (high-tech, based on modern technologies) increases the competitiveness of the economy, creating a solid basis for sustainable development.

An important indicator illustrating the innovativeness of the economy is the share of innovative enterprises in the total number of enterprises. In this respect, an improvement in this indicator was noticed throughout Poland and in Lubusz Province, as well as the decreasing differentiation was noticed among provinces. In 2020, 19.5% of enterprises in Lubusz Province were innovative. The national average of this indicator is much higher and amounts to 31.2%. It should be noted, however, that in 2020 this indicator increased in Poland by 100% compared to 2019. The positive phenomenon recorded in 2020 in relation to 2019 is the decrease by almost 20% of the variability index in relation to the variable. The share of innovative enterprises in the total number of enterprises (%), which indicates the evening of the situation in individual provinces. The pandemic became the catalyst for technological change in all industries. It accelerated the digitization of services and processes, made people familiar with dealing with important and less important matters online and immerse themselves in remote work. This applies primarily to companies associated with the fourth industrial revolution. The development of a modern, innovative economy requires the harnessing of creativity and research and scientific potential creating new solutions and technologies in order to meet such goals as increasing the quality of life while protecting natural resources. The creation of new solutions determines sustainable economic development, it can be expressed by the number of inventions and the level of employment in the R&D sector. Unfortunately, the year 2020 brought unfavourable changes when it comes to the number of inventions and the level of employment in the R&D sector. Bearing in mind that the most expenditure on R&D is incurred in Masovia and Lesser Poland provinces, with the most people employed in R&D per 1,000 professionally active people there. In 2020, this indicator in Mazovia was 2.78, and in Lubusz it was only 0.32 – a result more than three times lower than the national average (1.12). The improvement of the number of inventions and the level of

employment in the R&D sector is positively correlated with outlays on innovative activities in enterprises. In 2020, the lowest rates were recorded in Lubusz Province - the share of innovative enterprises in the total number of enterprises (%) and patents granted by the PPO per 100,000 inhabitants, and in the last but one rank when analyzing the share of people employed in R&D in the economically active population (%) and the share of enterprises that incurred expenditure on innovative activities in the total number of enterprises (%) (Table 5).

Table 5. Descriptive characteristics of the variables accounting for the area of economic innovation in Polish provinces in 2019 and 2020

Index of the descriptive variable	Year	Describing statistics				
		Min	Max	Lubusz	Poland	Ratio volatility
Share of innovative enterprises in the total number of enterprises	2019	10.2 (Lubusz)	19.3 (Lesser Poland)	10.2	15.4	19.84
	2020	19.5 (Lubusz)	37.9 (Masovian)	19.5	31.2	14.42
Patents granted by the PPO for 100 thousand inhabitants	2019	2.7 (Lubusz)	10.9 (West Pomeranian)	2.7	7.7	36.44
	2020	1.7 (Lubusz)	8.5 (Lesser Poland)	1.7	5.9	40.69
Share of people employed in R&D in the economically active population	2019	0.31 (Holy Cross)	2.76 (Masovian)	0.35	1.08	70.86
	2020	0.31 (Holy Cross)	2.78 (Masovian)	0.32	1.12	71.30
Share of enterprises that incurred expenditure on innovative activities in the total number of enterprises	2019	8.8 (West Pomeranian)	22.6 (Podlaskie)	12.3	14.4	21.79
	2020	6.8 (Holy Cross)	13.4 (Podlaskie)	6.9	9.7	23.14

Source: own study.

An important area influencing sustainable socio-economic development is sustainable production patterns, which are characterized using 4 indicators showed in the Table 6. Due to the aim of the article which is to present the socio-economic development of

provinces in the context of the implementation of sustainable development, the selected production indicators were strongly related to sustainable development. They are related to the promotion of the consumption of renewable energy and other resources, investments in sustainable infrastructure in the environmental sector and the development of organic farms.

Outlays on fixed assets for environmental protection and water management per capita (PLN) nationwide in 2020, compared to 2019, decreased by almost 10%, in Lubusz Province by 1.5%, a smaller decrease, which contributed to the improvement of the region's rank within the country from 14 to 13.

A high index of variability concerns the share of certified organic farms in the total agricultural area (%), which proves different pro-ecological orientation of the provinces. Lubusz Province is significantly above the national average in this respect. In terms of the size of this indicator, Lubusz Province was third in the overall ranking in 2019, and second in 2020 (Table 6). The model of an ecological farm, in line with the concept of sustainable agriculture, assumes environmental friendliness and the production of agricultural products with high nutritional values through the use of environment-friendly production methods. Currently, organic farming in Poland receives financial support from the national and the EU budgets.

An important indicator of economic development related to sustainable development is the share of renewable energy in the total electricity production (%) (Table 6). Renewable energy sources are those that self-regenerate and are generally recognized as environmentally friendly during their operation due to low greenhouse gas emissions and air pollutants. This indicator informs about the degree of use of energy from renewable sources in the final energy consumption in the country, it enables the monitoring of the effects of activities in the field of promoting the production and consumption of renewable energy in all sectors. The legitimacy of using this indicator results from the challenges that Poland faces in terms of reducing the energy intensity of the economy in the medium and long term perspective (Barska, Jędrzejczak-Gas, 2019; Barska *et al.* 2022). In this respect, the situation in Poland and the province has improved. The replacement of coal and crude oil with cleaner, alternative fuels clearly contributes to a significant reduction in greenhouse gas emissions, in particular in sectors strongly linked to electricity consumption.

Table 6. Descriptive characteristics of the variables accounting for the area of sustainable production patterns in Polish provinces in 2019 and 2020

Index of the descriptive variable	Year	Describing statistics				
		Min	Max	Lubusz	Poland	Ratio volatility
Outlays on fixed assets for environmental protection and water management per capita	2019	234.29 (Warmia-Masuria)	573.56 (Silesian)	311.50	407.41	23.82
	2020	206.46 (Warmia-Masuria)	443.01 (Holy Cross)	306.67	367.78	19.29

Certified organic farms - share of agricultural land in total agricultural land	2019	0.45 (Opole)	8.63 (Warmia-Masuria)	7.17	2.66	100.85
	2020	0.58 (Opole)	8.68 (West Pomeranian)	7.13	2.73	100.12
Renewable energy share in total electricity production	2019	4.0 (Opole)	85.7 (Warmia-Masuria)	21.6	15.5	85.98
	2020	4.1 (Opole)	87.1 (Warmia-Masuria)	22.5	17.9	81.84
Industrial sewage treated per 100 km^2	2019	17.18 (Warmia-Masuria)	1363.15 (Silesia)	37.56	234.67	131.73
	2020	28.12 (Warmia-Masuria)	1340.33 (Silesia)	38.08	235.61	129.08

Source: own study.

The subsidies allocated to the implementation of projects under the Infrastructure and Environment Operational Program were an important instrument used by the European Union to implement sustainable production patterns in companies.

5. Conclusions

The article presents an analysis and assessment of a set of indicators tracking two areas of sustainable development in Polish regions: economic and social, in two separate periods: before the 2019 pandemic and during the 2020 pandemic.

The research shows that in 2020 Polish regions have already experienced some negative effects related to the COVID-19 pandemic, both in the economic and social dimensions. The pandemic had a visible impact on the number of deaths, in 2020 it was responsible for 9% of all deaths in Poland. The COVID-19 pandemic highlighted the inequalities in the income structure between provinces in Poland. Households achieved higher incomes, but spent significantly less compared to 2019. The average monthly expenditure per capita in households in this period amounted to PLN 1,210 in 2020 and was lower in real terms by 6.5% (by 3.4% in nominal terms) than the expenditure in 2019. The national economy also slowed down, despite the introduction of budgetary measures to support corporate liquidity and other national policy measures to increase the capacity of national health systems and to help citizens and sectors particularly affected by the pandemic. Demand in the economy was constrained by recommendations to stay at home, cuts in wages and jobs, and restrictions abroad. The supply, in turn, was reduced due to the necessity to temporarily suspend the activities of some companies, less availability of supplies from abroad and an increased absence of employees. The decline in the economic activity - as a result of the pandemic and related restrictions - was very significant. When assessing the differentiation of social and economic development in the territorial dimension, according

to provinces, it should be noted that this differentiation concerns the economic dimension rather than the social one. This is indicated by the value of the variability index for individual variables.

Although Polish regions are already feeling the negative socio-economic effects of the COVID-19 pandemic, it seems that the Polish economy should be less acutely affected by the negative consequences of the pandemic than other European Union countries. First of all, due to the economy's lower dependence on exports, weaker trade ties with China, a smaller share of the tourism sector in generating GDP, a high level of economic diversification and a higher GDP growth rate in 2019 (Sieroń 2020). In addition, some positive side effects will have an important impact on the socio-economic development of Polish voivodeships, such as the accelerated development of the digital economy, including the services market. There are industries that are more prone to digitization, which achieve increased operational efficiency and financial results despite the ongoing pandemic.

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