INDICATORS OF WARMIŃSKO-MAZURSKIE VOIVODSHIP SUSTAINABLE DEVELOPMENT IN THE ECONOMIC ASPECT

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K e y w o r d s: sustainable development, economic system, indicator-based evaluation.

A b s t r a c t

Sustainable development should be analysed considering numerous aspects, including environmental, social and economic system. This study aimed at assessment of the economic order at regional level. The study encompassed Warmińsko-Mazurskie voivodship. The indicators of sustainable development concerning the characteristics of economic system were computed on the base of the statistical data for the years 2003–2007. The data was collected from the Regional Databank (BDR) and processed applying the indicator-based comparative evaluation method. Six areas were identified: 1) environmental impact, 2) employment, 3) investment outlays, 4) entrepreneurship, 5) agriculture and 6) accessibility of products, services and infrastructure. The studies indicate that the majority of indicators scored below the average as compared to the other voivodships and in the covered areas only the agriculture was characterized by scores higher than the average for the other voivodships in the country. The general score for the sustainable economic development was lower than the average for the remaining voivodships of Poland: from 72,18% to 78,88%. The dynamics of changes over the years covered, however, indicates the increase in the total score of economic sustainability.

WSKAŹNIKI ZRÓWNOWAŻONEGO ROZWOJU WOJEWÓDZTWA WARMIŃSKO-MAZURSKIEGO W ASPEKCIE GOSPODARCZYM

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S ł o w a k l u c z o w e: rozwój zrównoważony, ład gospodarczy, ocena wskaźnikowa.

A b s t r a k t

Rozwój zrównoważony należy rozpatrywać, uwzględniając wiele aspektów, w tym ład środowiskowy, społeczny i gospodarczy. Celem badań była ocena ładu gospodarczego na poziomie regionalnym. Badaniami objęto województwo warmińsko-mazurskie. Wskaźniki zrównoważonego rozwoju w zakresie charakterystyki ładu gospodarczego obliczono na podstawie danych statystycznych z lat

2003–2007. Dane zebrane z zasobów Banku Danych Regionalnych (BDR) opracowano wskaźnikową metodą porównawczą. Wyróżniono sześć dziedzin: 1) oddziaływanie na środowisko, 2) zatrudnienie, 3) nakłady inwestycyjne, 4) przedsiębiorczość, 5) rolnictwo i 6) dostępność produktów i usług oraz infrastruktury. Z badań wynika, że większość wskaźników otrzymała oceny poniżej średniej na tle pozostałych województw, a z badanych dziedzin jedynie rolnictwo charakteryzowało się wyższą oceną od średniej pozostałych województw w kraju. Ogólna ocena zrównoważenia rozwoju gospodarczego osiągnęła poziom poniżej średniej w stosunku do pozostałych województw Polski: od 72,18 do 78,88%. Dynamika zmian w badanych latach wskazuje jednak wzrost ogólnej oceny zrównoważenia gospodarczego.

Introduction

The idea of sustainable development is not new. Already during prehistoric times tribes can be found for which maintaining the stability of natural and cultural environment determined the economic and social activities. A similarly highly conscientious economy protecting the resources was conducted by the Karen people living in subtropical regions of north-western Thailand or the people in China with 5000 years of tradition in terraced plots cultivation (KOŚMICKI 2007, pp. 187–192). The term "sustainable development" in current times was used in 1980 in the Global strategy of nature protection and it assumes balancing and durability not only in the natural, but also social and economic categories, which means improvement of widely understood quality of life over a long-term period, maintaining ecosystems with simultaneous economic growth. KOŚMICKI (2007, pp. 187–192) highlights, that stopping the man from negative aspects of activities does not mean the necessity for inhibiting the development and sustainable development should be understood as the lasting process leading to improving the functioning of humanity in both the material and non-material sense that would be harmless to the environment. As a consequence the social and economic issues should not be dismissed and the sustainable development should not be interpreted too narrowly (only from the environmental perspective. KRUK (2009 after Ayala-Carcedo) says that particularly in the developing countries economic growth precedes the social development only after which the sustainable development takes place. Countries aim first at securing economic growth and then the social development takes place. Following the social development, associated with welfare and quality of living of the population, the care for the status of the environment appears. Maintaining balance among the individual aspects of sustainable development (economic, social and environmental) is becoming an important issue also in the developed countries. Monitoring and evaluation of the sustainable development level in the individual aspects: environmental, social and economic at different levels: local, regional and national or even global (BORYS 2005, pp. 22–62) or according to the sectoral approach (BORYS 2009,

pp. 166–185) remains an important issue. Conducting the evaluation would allow investigating the changes at time intervals and determining the level of the attainment of the goals assumed to achieve sustainable development in different types of strategic documents. Appropriately chosen and selected indicators and indexes can facilitate this. The set of selected indicators represents the statistical reflection of the descriptive definition of sustainable development (BORYS 2002, s. 39–40).

The studies aimed at determination of the level of sustainable economic development in Warmińsko-Mazurskie voivodship as compared to the remaining voivodships of Poland during the years 2003–2007.

Methodology of studies

The data was processed applying the indicator-based comparative evaluation method. Chosen indicators were selected to characterize the economic sustainability and computed on the base of the statistical data for the years 2003–2007. The data was collected from the Regional Databank (BDR) for the years 2003–2007. Twenty five indicators grouped in six areas: 1) environmental impact, 2) employment, 3) investment outlays, 4) entrepreneurship, 5) agriculture and 6) accessibility of products, services and infrastructure were used for evaluation of the economic system. The selected areas were described using the following characteristics:

1) environmental impact:
– W_1 – electric power consumption (in kWh) per capita,
– W^2 – water consumption (in m^3) per capita,
– W_3 – gas consumption (in m^3) per capita,
– W_4 – industrial waste generated in a year (in Mg) per 1 enterprise generating waste,
– W_5 – wastewater drained by sewers network (in dm^3);

2) employment:
– W_6 – share of employed under conditions involving work environment risks in the total number of employed (in %),
– W_7 – employment ratio in age group 15–64 years (in %),
– W_8 – demographic burden ratio (in %),
– W_9 – share of employment in market services sector in the total number of employed (in %),
– W_{10} – share of employed in the industrial sector in the total number of employed (in %),

3) investment outlays:
– W_{11} – investment outlays per capita (in PLN),

– W_{12} – outlays on innovation in industry (in PLN M);

4) entrepreneurship:

– W_{13} – share of private sector economic entities in the total number of economic entities (in %),

– W_{14} – entities registered with the REGON register per 10,000 of population,

– W_{15} – entities newly registered with the REGON register per 10,000 of population,

– W_{16} – entities removed from the REGON register per 10,000 of population;

5) agriculture:

– W_{17} – purchases of agricultural products per 1 ha of agricultural land (in kg),

– W_{18} – consumption of mineral fertilizers per 1 ha of agricultural land (in kg NPK),

– W_{19} – share of agricultural production in total production (in %);

6) accessibility of products, services and infrastructure:

– W_{20} – number of beds in collective accommodation facilities per 1000 residents,

– W_{21} – number of cars per 1000 residents,

– W_{22} – length of operating gas network (in km),

– W_{23} – length of hardened surface public roads (in km),

– W_{24} – length of operating railway lines per 100 km^2 of voivodship area (in km),

– W_{25} – length of operating sewers network per 100 km^2 of voivodship area (in km).

Indicators W_1, W_2, W_4, W_6, W_8, W_{16} and W_{19} were treated as de-stimulating factors, the other ones as stimulating factors. For each indicator the so-called score showing by how many percent that indicator is better or worse than the average for the compared voivodships was computed (ROGALA 2005, pp. 237–246). The evaluation considers the uniform preference, i.e. the higher the score the better the situation of the investigated entity, while the average for the other units was 100%. In the studies the method of zero unitarisation of referencing the "unitarised" indicators to the average applying the following formulas was applied (BORYS 1984, BORYS and ROGALA 2004 pp. 601–608, ROGALA 2005 pp. 237–246):

for stimulating factors

(1) $O_P = [(W_i - W_{min})/(W_{max} - W_{min})] \cdot 100\%$

for de-stimulating factors

(2) $O_R = [(W_{max} - W_i)/(W_{max} - W_{min})] \cdot 100\%$

for the average stimulator indicator

(3) $O_{P-śr} = [(W_{śred} - W_{min})/(W_{max} - W_{min})] \cdot 100\%$

for the average de-stimulator indicator

(4) $O_{R-śr} = [(W_{ma}{}^x - W_{śred})/(W_{max} - W_{min})] \cdot 100\%$

where:

O_P or O_R – score of the W indicator for the voivodship,

$O_{P-śr}$ or $O_{R-śr}$ – score of the average of the indicators for the group of units (voivodships) compared); that score depends on the distribution of the indicator values,

W_i – value of the indicator of the evaluated unit,

W_{min} – minimum value of the indicator for the given sample,

W_{max} – maximum value of the indicator for the given sample,

$W_{śred}$ – average value of the indicator for the given sample.

Next, the values of the indicators were compared to the average level in the group of units (voivodships) compared according to the formula:

(5) $[(O_P/O_{P-śr}) \cdot 100\%] - 100\%$ or $[(O_R/O_{R-śr}) \cdot 100\%] - 100\%$.

The tables present the scores of the indicators and the average scores for areas with dynamics of changes.

Results of studies on Warmińsko-Mazurskie voivodship sustainable economic development

Characteristic of the area of study

The area of Warmińsko-Mazurskie voivodship is 24203 km² representing 7.7% of the territory of Poland. It is the fourth largest in area voivodship in the country. It has diversified morphology and it is characterized by diversity of natural resources with a large share of inland surface waters (over 6% of the area). The percentage of forests at 29% is close to the national average. Agricultural land represents over 54% of the area. The population of the voivodship is over 1.4 million while the population density is the lowest in the country at 59 persons per 1 km². It is ethnically diversified. The population of the voivodship is relatively young with 23.2% of the population in pre-productive age, 13.3% in post-productive age and 63.5% of the population are people in the productive age. The voivodship is one of the least polluted in the country. The major industries are food industry and furniture industry. Tourism develops as a consequence of favourable conditions. The same applies to fishery. In 2007, 113058 business entities were recorded in the REGON system i.e. 0.08 entity per capita.

Sustainability of economic development of the voivodship

As concerns environmental impact, five indicators were analysed to allow evaluation of the pressure on the environment as compared to the other

voivodships in the country. The studies showed that only W_4 indicator – industrial waste generated in a year (in Mg) reached the level exceeding the average (from 120.04 to 120.46%). The other indicators for the years covered did not exceed the average for the remaining voivodships. The lowest value was recorded for the W_5 indicator – wastewater drained through the sewers network (in dm^3), which did not even reach 40%. Also the W_3 indicator – consumption of gas per capita (in m^3) scored low not exceeding 60%, and additionally as of 2004 it gradually decreased to reach slightly below 51% in 2007. Insufficient equipment of the voivodship area with environment protection infrastructure, particularly sewers and gas network, continues to be a problem (tab. 1).

Table 1

Indicator-based evaluation – deviation from the average [%] during the years 2003–2007

Symbol	Character of indicator*	Name	Year				
			2003	2004	2005	2006	2007
1	2	3	4	5	6	7	8
Environmental impact							
W_1	D	electric power consumption (in kWh) per capita	83.70	83.00	53.98	83.36	85.05
W_2	D	water consumption (in m^3) per capita	94.36	89.01	98.85	97.33	101.05
W_3	S	gas consumption (in m^3) per capita	54.05	57.93	56.52	54.93	50.72
W_4	D	industrial waste generated in a year (in Mg) per 1 enterprise generating waste	120.10	120.04	120.82	120.50	120.46
W_5	S	wastewater drained by sewers network (in dm^3)	38.42	38.38	39.34	38.68	36.76
Employment							
W_6	D	share of employed under conditions involving work environment risks in the total number of employed (in %)	121.54	120.61	118.35	120.50	120.79
W_7	S	employment ratio in age group 15-64 years (in %)	29.59	22.50	12.07	25.98	52.56
W_8	D	demographic burden ratio (in %)	98.92	104.50	109.77	118.99	124.87
W_9	S	share of employment in market services sector in the total number of employed (in %)	134.90	119.46	110.69	120.97	109.07
W_{10}	S	share of employed in the industrial sector in the total number of employed (in %)	82.04	111.13	115.60	96.18	118.41

cont. Table 1

1	2	3	4	5	6	7	8
Investment outlays							
W_{11}	S	investment outlays per capita (in PLN)	37.82	31.79	65.09	74.41	55.52
W_{12}	S	outlays on innovation in industry (in PLN M)	14.58	8.41	21.32	24.98	10.79
Entrepreneurship							
W_{13}	S	share of private sector economic entities in the total number of economic entities (in %)	0	0	0	0	0
W_{14}	S	entities registered with the REGON register per 10.000 of population	40.11	39.97	42.27	42.63	44.46
W_{15}	S	entities newly registered with the REGON register per 10.000 of population	92.56	107.80	111.95	98.32	88.64
W_{16}	D	entities removed from the REGON register per 10.000 of population	4.64	65.15	92.33	105.39	110.98
Agriculture							
W_{17}	S	purchases of agricultural products per 1 ha of agricultural land (in kg)	213.44	164.31	143.52	177.99	161.47
W_{18}	S	consumption of mineral fertilizers per 1 ha of agricultural land (in kg NPK)	68.64	64.69	63.74	105.14	110.43
W_{19}	D	share of agricultural production in total production (in %)	81.32	74.07	64.20	73.56	66.67
Accessibility of products, services and infrastructure							
W_{20}	S	number of beds in collective accommodation facilities per 1000 residents	166.93	167.47	190.55	193.92	199.48
W_{21}	S	number of cars per 1000 residents	0	0	0	4.8	0
W_{22}	S	length of operating gas network (in km)	20.07	16.02	17.45	17.40	18.10
W_{23}	S	length of hardened surface public roads (in km)	64.27	62.61	62.21	59.51	58.23
W_{24}	S	length of operating railway lines per 100 km^2 of voivodship area (in km)	56.76	46.5	45.07	45.31	43.88
W_{25}	S	length of operating sewers network per 100 km^2 of voivodship area (in km)	49.28	38.67	37.76	32.93	32.92

* D-de-stimulating factor, S-stimulating factor
Source: own work based on the BDR data.

This is also confirmed by the results of studies in the areas of investment outlays as well as accessibility of products, services and infrastructure. Indicators W_{11} and W_{12} concerning investment outlays showed low scores and the W_{12} indicator did not exceed even 20% during three out of five years covered. This caused the lowest score for the entire area of investment outlays and the last, 16th position in the country in 2007 (tab. 2).

Table 2

Level of Warmińsko-Mazurskie voivodship economic development sustainability during the years 2003–2007

Areas	Score of Warmińsko-Mazurskie voivodship economic development sustainability as compared to other voivodships [%]					position in the country in 2007
	year					
	2003	2004	2005	2006	2007	
Environmental impact	95.28	94.90	90.85	99.11	96.53	12
Employment	93.40	95.65	93.54	96.09	105.14	11
Investment outlays	30.32	25.55	40.48	44.28	22.10	16
Entrepreneurship	34.33	53.23	59.14	61.59	61.02	16
Agriculture	121.14	101.02	90.48	118.90	112.85	8
Accessibility of products, services and infrastructure	59.55	55.21	58.84	58.98	58.77	14
Economic development sustainability	72.78	72.18	73.25	78.88	77.30	13
Dynamics of score changes	100	99.17	100.64	108.37	106.21	

Source: own work based on the BDR data.

Indicator W_{25} – length of operating sewers network per 100 km^2 of the voivodship area scored equally low and the level gradually decreased during the years covered from almost 50% in 2003 to around 33% in 2007. This indicates the increasing disparity between Warmińsko-Mazurskie voivodship and the national average as concerns development of environment protection infrastructure.

In the field of entrepreneurship, two of the four indicators selected showed very low levels during all the years covered. The W_{13} indicator – share of private sector economic entities in the total number of economic entities (in %) assumed the lowest level among all the voivodships in the country in Warmińsko-Mazurskie voivodship over the entire period covered. As a consequence, the score generated was the lowest of all possible at 0%. On the other hand W_{14} indicator – entities registered with the REGON register per 10,000 of population scored around 40% for all the years covered while it still increased

slightly as of 2004. This resulted from the fact that during the period covered the number of entities newly registered with the REGON register per 10,000 residents (W_{15}) increased slightly while the number of entities removed from the register (W_{16}) decreased. As a consequence the higher scores, in some cases exceeding the national average resulted. It is worth noticing that W_{16} indicator – entities removed from the REGON register per 10,000 of population improved significantly, from 4.64% in 2003 to 110.98% in 2007.

In the area of employment five indicators were evaluated. Four among them assumed the level frequently exceeding 100%. Those were the indicators: W_6 – share of employed under conditions involving work environment risks in the total number of employed (in %), W_8 – demographic burden ratio (in %), W_9 – share of employment in market services sector in the total number of employed (in %) and W_{10} – share of employed in the industrial sector in the total number of employed (in %). The scores fluctuated year to year. Only the demographic burden ratio W_8 increased systematically while the indicator W_7 – employment ratio in age group 15–64 years (in %) received very low scores during the years 2003–2006 at under 30% while in 2007 it was slightly lower than 53%. This, however, did not influence the evaluation of employment in any significant way. During the years covered it was near the average and in 2007 exceeded it slightly.

In the field of agriculture three indicators were evaluated and all of them scored over 60%. Indicator W_{17} purchases of agricultural products per 1 ha of agricultural land scored the highest at over 200% in 2003. The score, however, fluctuated across the years covered and during the last year covered it reached over 167%. The share of agricultural production in total production (in %) – indicator W_{19} also decreased. On the other hand, indicator W_{18} consumption of mineral fertilizers per 1 ha of agricultural land (in kg NPK) increased and during the years 2006 and 2007 it exceeded the average for the remaining voivodships. The score for agriculture as a whole was the highest and during almost all the years covered (with the exception of 2005) exceeded 100%.

Accessibility of products, services and infrastructure was assessed on the base of six stimulating factors. Only the W_{20} indicator – number of beds in collective accommodation facilities per 1000 residents – received systematically increasing high scores. That was caused by the tourist values of the voivodship and the opportunities for tourism development that force establishing adequate infrastructure. The remaining indicators scored much worse. The W_{21} indicator showing the number of cars per 1000 residents was the lowest scoring one.

Conclusion

Among the areas covered by the study, only agriculture was characterized by higher scores than the average for the remaining voivodships in the country over the period covered. This resulted mainly from the high level of purchased products per 1 ha of agricultural land and the increase in consumption of mineral fertilizers per 1 ha of agricultural land. The evaluation of the impact of business entities and households on the environment produced lower scores during all the years covered than the average for the remaining voivodships of the country (although it neared it) and it ranged within 90,85%–99,11%, mainly as a consequence of poorly developing environment protection infrastructure (gas and sewers networks). The general evaluation in the field of employment produced similar results. The demographic burden indicator had major influence on the score below the average. In the area of accessibility of products, services and infrastructure the scores increased as of 2004 although during the covered years it never exceeded 59% as compared to the remaining voivodships. The low level of saturation with gas and sewers networks in the voivodship was the key problem in that field. This is also confirmed by the low score in the environmental impact field. Warmińsko-Mazurskie voivodship achieved the lowest scores in comparison to the national average in the fields of entrepreneurship and investment outlays. In the enterprise field the voivodship scored the lowest in the country, mainly as a result of the low share of private sector business entities and the number of entities registered with the REGON system per 10,000 residents. The investment outlays per capita and the outlays on innovations in industry increased from 2003 until 2006. Year 2007 was characterized by the decrease of that score. That score, however, compared to the national average was very low during the entire period covered. The overall score of economic development sustainability was below the average as compared to the remaining voivodships of Poland assuming the values of from 72,18% to 78,88% during the years covered. The dynamics of those changes over the tears covered confirms, however, the increase of the total score of economic sustainability. Slightly better results were obtained in the studies on sustainable development in social and environmental aspects (ŁAGUNA, WITKOWSKA-DĄBROWSKA 2008).

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