DOI: 10.21005/oe2019.94.1.02

FOLIA POMERANAE UNIVERSITATIS TECHNOLOGIAE STETINENSIS
Folia Pomer. Univ. Technol. Stetin., Oeconomica 2019, 352(94)1, 17–28

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SUSTAINABLE DEVELOPMENT OF MUNICIPALITIES USING MAKÓW COUNTY AS AN EXAMPLE

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Summary. The article presents a synthetic analysis of the socio-economic development – with account taken of the environmental aspect – of Maków county municipalities, Mazowieckie voivodeship, Poland, in 2010 and 2018. There were 20 diagnostic features explored in the research, representing various fields from the areas of Economy, Society and Environment. The study was performed with the help of a multivariate comparative analysis, including a non-model standardization method using zero unitarization. The results of the research indicate that from 2010 to 2018 there was an increase in the overall level of social-economic development, with a simultaneous reduction of the pressure on the environment in most of the municipalities studied. However, the numerous different aspects of this phenomenon presented a varied nature.

Key words: sustainable development, municipality, county.
JEL Code: D04, H54, H72.

INTRODUCTION

The concept of „sustainable development" was coined in 1970s, when it became clear that economic development was leading to overconsumption of means of production (Bórawski 2013). In 1987, the World Commission on Environment and Development published a document titled "Our Common Future", which claimed that sustainable development "meets the needs of the present without compromising the ability of future generations to meet their own needs". The first moment that the term *sustainable development* entered official worldwide use was the Earth Summit 2002 (held by the UN in Johannesburg from 26/08 to 04/09/2002), the main objective of which was to discuss global sustainable development issues. The main subjects explored at the Summit were related to the distribution of the benefits of globalization and the reduction of poverty on the one hand, and overconsumption, international resources management and promotion of sustainable patterns of production and consumption on the other (Our Common Future 1987). Sustainable development is a path to improving the quality of life and creating its fully sustainable model, and that calls for integrated actions in the three key areas:

1. Economic development and even distribution of the benefits – the achievement of a responsible long-term growth shared be all nations and societies requires an integrated approach to the present interlinked global economic systems.

2. Protection of natural resources and the environment – in order to preserve our environmental legacy and natural resources for future generations it is necessary to develop economically reasonable solutions that will limit resource consumption, stop environmental contamination and save natural ecosystems.
3. Social development – all over the world people need jobs, food, education, energy, healthcare, water and sanitary systems to satisfy their needs of life. In response to these needs, the international community must endeavor not to disturb the rich texture of cultural and social diversity and to ensure that all society members have instruments allowing them to shape their future.

The most important document that introduces the sustainable development rule into Poland's legislation is the Constitution of the Republic of Poland of 2 April 1997 (Konstytucja Rzeczypospolitej Polskiej… 1997, no. 78, item 483). Article 5 of the Constitution holds: "*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.*" Article 3 of the Act on the Rules for Implementing Development Policies of 6 December 2006 points to the county and municipal authorities as being responsible for implementing the development policy on the local scale. Therefore, it can be concluded that county and municipal authorities are obliged to implement the sustainable development.

OBJECTIVE, SUBJECT-MATTER AND METHODS

Socio-economic development and its environmental impact are measurable phenomena while their levels are affected by various economic, social and environmental factors. Social development can be described as an increase in people's freedom (Sen 2002, p. 17) and the possibility to live in ways that are valuable to them (Sen 2002, p. 91). The most significant determinants of such development are health, education, prosperity and the quality of life. As for economic development considered as a process of increasing the volume of industrial and agricultural production, the employment rate and the level of revenue, it is determined by the degree of the workforce's education and skills, technological change and product quality improvement. The relationship and correlations between development and structural changes have been described by Szymla (2005), Metody oceny rozwoju… (2006), Stec (2011), Szewczuk (2011), Kukuła (2014) and others.

The objective of the study was to carry out a dynamic assessment of the sustainable development of Maków county by presenting the scope of changes to sustainable development indicators for Maków county municipalities between 2010 and 2018 using the selected synthetic measure construction method (Strahl 1978) and the non-model linear ordering method, resorting to zero unitarization (Bąk 2013) as a variable standardization method. Linear ordering methods help establish the order of units according to one aggregate feature which is a synthetic representative of many features describing the units being ordered.

Differences in the values of the individual indicators observed between the analyzed years were treated as marking the development of those municipalities. The study incorporated 10 municipalities, including 8 rural ones, 1 rural-urban municipality and 1 urban municipality.

The data were retrieved from the Local Data Bank of Statistics Poland for 2010 and 2018. The variables (indicators) were singled out form the "Sustainable Development Indicators for Poland 2015" kit including 101 indicators recommended for inclusion in the country's sustainable development monitoring system. They were selected using formal, substantive and statistical criteria, with the formal ones including such statistical feature properties as data measurability and completeness ensuring the comparability of the years 2010 and 2018. The preliminary set of diagnostic features comprised 30 indicators divided into three thematic areas: Economy, Society and Environment.

Subsequently, these features were subjected to statistical verification in order to remove variables demonstrating little variability. All the features displayed a variability index V of more than 10%. Further on, the excessively correlated features (with a correlation index exceeding 80%) X1, X3, X4, X8, X10, X13, X16, X18, X22, and X28 were removed too, which rendered a final set of 20 features, including 15 stimulants (the higher the value the higher level of development) and 5 destimulants (the lower the value the higher level of development).

Table 1. Final set of diagnostic features for Maków county municipalities

Symbol	Indicator	S/D
Economy component		
X2	Municipality's own revenue per capita	Stimulant
X5	Financing and co-financing under EU programmes and projects in PLN thous.	Stimulant
X6	Employed persons per 1,000 inhabitants	Stimulant
X7	Expenditure per capita on Culture and national heritage protection	Stimulant
X9	Unemployed persons in the municipality, persons	Destimulant
Society component		
X11	Internal migration balance	Stimulant
X12	Share of unemployed persons registered according to their education in the working-age population: Tertiary education	Destimulant
X14	Rate of natural increase per 1,000 of people	Stimulant
X15	Children in pre-schools per 1,000 children aged 3–5	Stimulant
X17	Population density – population per 1 square km	Stimulant
X19	Expenditure on Section 926 – physical education in PLN thous.	Stimulant
X20	Council members with tertiary educational background	Stimulant
Environment component		
X21	Total water from water-line systems per 1 user [m^3]	Destimulant
X23	Share of users of water-line systems in total population (%)	Stimulant
X24	Woodland area in %	Destimulant
X25	Dwellings delivered	Stimulant
X26	Consumption of water for the purposes of national economy and population during one year per capita	Destimulant
X27	Mixed municipal waste collected during one year per capita in kg	Stimulant
X29	Collection and removal of sewage – septic tanks in pcs	Stimulant
X30	Expenditure of Section 900 – municipal services management and environmental protection in PLN thous.	Stimulant

Source: developed by the author.

Eventually, the Economy component comprised 5 indicators, the Social component included 7 indicators and the Environment component comprised 8 indicators. The indicator values were retrieved from the Local Data Bank of Statistics Poland (GUS 2019).

Table 2 presents values for the Economy component indicators with regard to the economic development and employment areas, for 10 Maków county municipalities. Values of the variables X for the years 2010 and 2018 are compared. The table also includes descriptive statistics in the form of the average value, the variability index, the minimum and maximum values, the median and the range for each Xi series.

Table 2. Indicator values for the Economy component in 2010 and 2018

Municipality	X2		X5		X6		X7		X9	
	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018
Maków Maz. urban municipality	1,217	1,989	2742	7,051	254	276	80	134	1,109	636
Czerwonka rural municipality	1,107	1,726	91	164	29	42	412	66	275	193
Karniewo rural municipality	521	1,316	194	1,874	48	64	52	210	452	312
Krasnosielc rural municipality	430	945	371	396	57	70	79	117	711	483
Młynarze rural municipality	1,173	1,840	267	16	83	113	59	205	143	104
Płoniawy-B. rural municipality	707	1,741	908	36	48	93	32	60	596	405
Różan urban-rural municipality	3,069	4,286	7	0	135	164	243	268	474	290
Rzewnie rural municipality	1,046	1,574	447	210	43	69	55	105	231	172
Sypniewo rural municipality	639	1,296	380	0	60	61	51	113	291	169
Szelków rural municipality	565	1,364	212	2,613	47	57	296	201	380	255
Average	1,047	1,808	562	1,236	80	101	136	148	466	302
V %	73	51	143	181	84	70	97	47	61	54
Minimum	430	945	7	0	29	42	32	60	143	104
Maximum	3,069	4,286	2,742	7,051	254	276	412	268	1,109	636
Median	876	1,650	319	188	53	70	69	125	416	273
Range	2,639	3,341	2,735	7,051	225	234	380	207	966	532

Source: developed by the author based on studies of data from the Local Data Bank of Statistics Poland.

Between 2010 and 2018, the indicator denoted as X2 – *Municipality's own revenue per capita* grew by an average of 72.68%, with the consumer price index increasing by 113.35% in the same period in Poland (Roczne wskaźniki cen towarów… 2019). The largest growth was observed – ordered from the lowest to the highest – for Karniewo, Płoniawy Bramura and Szelków municipalities. X5 represented *Financing and co-financing under EU programmes and projects in PLN thous.* Here, the lowest ranking municipalities were Różan and Sypniewo, and the highest ranking ones were Maków Mazowiecki urban municipality and Szelków rural municipality. X6 – *Employed persons per 1,000 population* grew by an average of 26.25%. X7 – *Expenditure per 1 municipality inhabitant on Culture and national heritage protection* grew by an average of 8.82%, whereas Czerwonka and Szelków municipalities demonstrated a drop in the expenses incurred. X9 – *Unemployed persons in the municipality*, classified as a destimulant, had an average decrease of 54.30%. A drop in the unemployment rate between 2010 and 2018 was observed for all the municipalities. Importantly, the value of the range in respect of X2, X5 and X6 increased from 2010 to 2018, which indicated uneven development.

Table 3 shows the values for seven social component indicators for the same municipalities and temporal scope with regard to the areas of population changes, access to labor market, and education. One variable, namely X12 – *Share of unemployed persons registered according to their education in the working-age population: Tertiary education*, was classified as a destimulant, with all the others classified as stimulants.

Table 3. Indicator values for the Society component in 2010 and 2018

Municipality	X11		X12		X14		X15		X17		X19		X20	
	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018
Maków Maz.	−7.4	−27	13.9	11.1	0.1	−4.8	734	1,072	993	952	566	752	6	5
Czerwonka	−3.0	−27	14.4	11.8	−1.5	−6.4	116	416	24	24	31	27	0	3
Karniewo	−0.6	−38	11.1	9.8	−0.9	0.4	565	694	42	40	51	247	5	3
Krasnosielc	0.6	−28	14.5	12.4	2.4	−2.2	593	610	40	38	94	179	9	7
Młynarze	7.9	−15	10.3	9.6	−5.1	0	685	872	23	24	1	0	2	3
Płoniawy-B.	−5.6	−31	14.2	12.0	−3.6	−9.6	665	638	43	40	5	285	5	3
Różan	−2.0	−15	12.9	11.0	−0.7	−0.7	652	626	54	52	1,276	469	7	9
Rzewnie	−6.1	−10	10.0	11.0	−3.3	−1.9	271	821	24	24	2	0	1	2
Sypniewo	−4.0	−26	10.6	8.4	0.3	−1.5	663	692	27	26	29	676	3	6
Szelków	−3.9	−12	13.3	11.7	−2.4	−5.4	345	523	33	32	17	99	2	5
Average	−2.4	−22.9	12.5	10.9	−1.5	−3.2	529	696	130	125	207	298	4	4.6
V %	182	40	15	12	150	101	40	27	233	232	199	88	72	48
Minimum	−7.4	−38	10	8.4	−5.1	−9.6	116	416	23	24	1,086	0	0	2
Maximum	7.9	−10	14.5	12.4	2.4	0.4	734	1,072	993	952	1,277	752	9	9
Median	−3.5	−26.5	13.1	11.1	−1.2	−2	622	665	36.5	35	30	257	4	4
Range	15.3	28	4.5	4	7.5	10	618	656	970	928	1 28	752	9	7

Source: developed by the author based on studies of data from the Local Data Bank of Statistics Poland.

X11 – *Internal migration balance* (the difference between permanent immigration to and permanent emigration from the given administrative unit in the given period), which in 2010 was negative in Krasnosielc and Młynarze municipalities, in 2018 was negative in all the municipalities and, on average, almost ten times as high in absolute values. This indicates a continued depopulation trend in all Maków county municipalities. *Share of unemployed persons registered according to their education in the working-age population: Tertiary education* (the indicator named X12), dropped by 14% from 2010 to 2018, although the value of X9 (*unemployed persons in the municipality*) decreased by 35% in the same temporal scope. This shows that the labor market was in demand of low-qualified workers. The values of X14 – *Rate of natural increase per 1,000 people* were positive only in Krasnosielc, Sypniewo and Maków Mazowiecki municipalities. In 2018, however, they were negative, except Młynarze municipality, whose value was zero. The 31.67% increase of the indicator X15 meant that the number of places in preschools grew and, thus, the lifestyles of mothers raising children changed as they now wished to return to work earlier. X17 – *Population density – population per 1 km*^{2} fell in connection with the indicators X11 and X14. The average values of X19 increased by 44%, although some municipalities demonstrated large increases and others large drops. The *average share of council members with tertiary educational background* (X20) increased by 15%.

Table 4 comprises the values of 8 Environment component indicators, including five stimulants and three destimulants. X21 – *Total water from water-line systems per 1 user [m*^{3}*]* grew by an average of 52%, although Młynarze municipality demonstrated a growth of 330%, Płoniawy B. a growth of 201%, while Krasnosielc municipality showed a value that dropped by 56%. This indicator was classified as a destimulant, meaning that a decreasing value was desired.

The indicator X23 – *% of users of water-line systems in total population* i san indicator (a stimulant) the average value of which for all the municipalities grew by 70% in 2018 as compared to 2010. The highest increase was observed for Młynarze (82%) and Krasnosielc (81%) municipalities. *Woodland area* (the indicator X24) grew by an average of 5%. The *number of dwellings* (X25) *delivered* fell by 6% from 2010 to 2018.

Table 4. Indicator values for the Environment component in 2010 and 2018

Municipality	X21		X23		X24		X25		X26		X27		X29		X30	
	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018
Maków Maz.	30.7	31.7	95.9	96.1	9.3	9.2	90	11	53.4	67.6	240	259	183	173	817	19008
Czerwonka	42.3	44.5	74.5	92.2	41.3	42.0	4	6	72.5	81.7	48.9	78.6	720	577	923	606
Karniewo	51.5	66.6	70.9	81.5	7.1	7.3	1	9	38.0	56.5	31.3	118.6	832	878	1472	1249
Krasnosielc	69.1	38.9	53.8	97.5	29.1	31.2	11	7	182.6	175	47.4	94.9	1350	1350	540	1097
Młynarze	18.6	61.3	40.7	74.1	27.7	33.1	2	3	8.1	49.7	108.9	106	429	430	99	335
Płoniawy-B.	41.4	83.3	73.9	78	25.0	25.3	6	9	31.4	73.7	60.0	86.6	1290	1260	1063	1781
Różan	32.5	38.2	87.2	99.8	28.8	29.2	12	9	30.8	43.9	181.6	260	525	367	2395	6989
Rzewnie	35.5	54.3	45.2	52.4	25.3	25.2	6	15	37.4	52.9	60.0	93.8	770	786	270	485
Sypniewo	71.2	104.7	55.9	59.8	22.9	25.4	4	5	554.9	550	80.7	93.7	693	600	197	684
Szelków	31.8	36.1	56.9	96.1	24.0	25.3	7	8	21.0	36.6	27.8	85.6	750	770	326	917
Average	42.4	55.9	65.4	82.7	24.1	25.3	14.3	8.2	103.0	119	88.7	128	754	719	810	3316
V %	40	42	18	20	41	41	188	41	161	132	79	55	47	52	87	176
Minimum	18.6	31.7	40.7	52.4	7.1	7.3	1	3	8.1	36.6	27.8	78.6	183	173	993	336
Maximum	71.2	104	95.9	99.8	41.3	42	90	15	554.9	550	240.1	260	1350	1350	2395	19,008
Median	38.4	49.4	63.9	86.8	25.1	25.3	6	8.5	37.7	62.1	60	94.4	735	685	679	1007
Range	52.6	73	55.2	47.4	34.2	34.7	89	12	547	513	212	181	1167	1177	2296	18673

Source: developed by the author based on studies of data from the Local Data Bank of Statistics Poland.

X26 – *Consumption of water for the purposes of national economy* grew by 15%, although the opposite should have been expected (a destimulant). X30 – *Expenditure on Section 900 – Municipal services management and environmental protection in PLN thous*. grew from an average of PLN 810 thous. in 2010 to an average of PLN 3,316 thous. in 2018. The selected simple features were standardized through the unitarization process using the following formulae (Kukuła 1999):

$$Z_{ij} = \frac{X_{ij} - min_{ij}\{X_{ij}\}}{max_i\{X_{ij}\} - min_i\{X_{ij}\}}$$ for the stimulants

$$Z_{ij} = \frac{max\{X_{ij}\} - X_{ij}}{max_i\{X_{ij}\} - min_i\{X_{ij}\}}$$ for the destimulants

where:

Zij – standardized indicator *ij;*

Xij – subsequent value of the indicator Xn for the years 2010 and 2018;

mini{*Xij*} – minimum value of the sequence of numbers of the indicator Xn for the years 2010 and 2018;

maxi{Xij} – maximum of the sequence of numbers of the indicator Xn for the years 2010 and 2018.

Further on, values of the synthetic measures of each indicator X were determined for the years 2010 and 2018 using the non-model method that consisted in averaging the standardized values of simple features (Wysocki and Lira 2003) according to the formula:

$$q_i = \frac{\sum_{j=1}^{n} Z_{ij}}{m}$$

where:

i = 1,2,…*n*); the values of the synthetic feature q_i are within the range (0,1)

Based on a sum of synthetic measure values, Maków county municipalities were ranked by assigning each of them with a relevant rank – i.e. a subsequent number, starting from 1 for the best-developed unit, for each area and for all of them together, for the years 2010 and 2018.

Table 5. Synthetic measures for Maków county municipalities for individual areas for 2010 and their places in the development ranking

Municipality	Economy		Society		Environment		Total average	
	synthetic measure	ranking	synthetic measure	ranking	synthetic measure	ranking	synthetic measure	ranking
Maków Maz.	0.48502	2	0.76018	1	0.64600	1	0.630401	1
Czerwonka	0.43010	3	0.10048	10	0.36684	6	0.299139	6
Karniewo	0.18418	9	0.37923	5	0.42320	4	0.328868	5
Krasnosielc	0.15853	10	0.57245	3	0.41553	5	0.382173	3
Młynarze	0.33763	4	0.22859	7	0.32081	9	0.295674	7
Płoniawy-B.	0.20994	8	0.33250	6	0.50669	3	0.349710	5
Różan	0.53680	1	0.65343	2	0.61992	2	0.603384	2
Rzewnie	0.28520	6	0.12048	9	0.34627	7	0.250653	10
Sypniewo	0.25021	7	0.39236	4	0.15252	10	0.265029	9
Szelków	0.33078	5	0.19543	8	0.32567	8	0.283961	8

Source: developed by the author based on studies of data from the Local Data Bank of Statistics Poland.

The analysis of the synthetic measure "Total average" indicated that in 2010 the highest level of sustainable development among all Maków county municipalities was demonstrated by Maków Mazowiecki urban municipality, followed by Różan urban-rural municipality and Krasnosielc rural municipality. As for the Economy area, the best-scoring municipalities were, in descending order, Różan, Maków Mazowiecki and Czerwonka. In the Society area, the best were, again in descending order, Maków Mazowiecki, Różan and Krasnosielc municipalities. In the Environment area, the best results were achieved by Maków Mazowiecki, followed by Różan and Płoniawy Bramura municipalities.

Table 6 presents how the synthetic measure of development for 2018 changed when compared to 2010.

Table 6. Synthetic measures for Maków county municipalities for individual areas for 2018 and their places in the development ranking

Municipality	Economy			Society			Environment			Total average		
	synthetic measure	ranking	18/10%	synthetic measure	ranking	18/10%	synthetic measure	ranking	18/10%	synthetic measure	ranking	18/10%
Maków Maz. urban municipality	0.53307	2	110	0.78241	1	103	0.72070	1	112	0.67873	1	108
Czerwonka rural municipality	0.22346	8	52	0.16431	10	164	0.30398	8	83	0.23058	10	77
Karniewo rural municipality	0.36049	5	196	0.38239	5	101	0.46606	5	110	0.40298	3	123
Krasnosielc rural municipality	0.14705	10	93	0.40148	4	70	0.43901	6	106	0.32918	7	86
Młynarze rural municipality	0.45487	3	134	0.35999	6	157	0.26853	9	84	0.36079	4	122
Płoniawy-B. rural municipality	0.17909	9	85	0.17572	9	53	0.49458	4	98	0.28313	9	81
Różan urban--rural municipality	0.63435	1	118	0.57365	2	88	0.60139	2	97	0.60313	2	100
Rzewnie rural municipality	0.28394	6	100	0.27803	7	231	0.51623	3	149	0.35940	5	143
Sypniewo rural municipality	0.26360	7	105	0.54129	3	138	0.12632	10	83	0.31040	8	117
Szelków rural municipality	0.39107	4	118	0.23020	8	118	0.39875	7	122	0.34001	6	120

Source: developed by the author based on studies of data from the Local Data Bank of Statistics Poland.

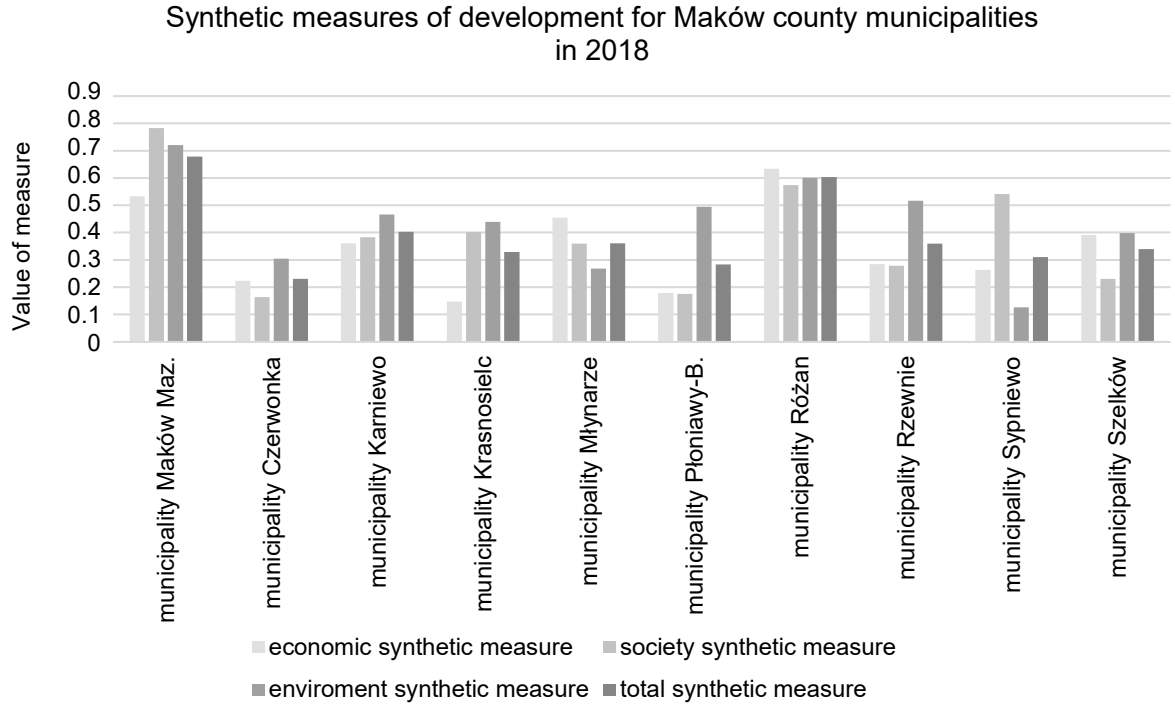

Fig. 1. Synthetic measures of development for Maków county municipalities in 2018
Source: developed by the author.

The ranked values of the synthetic measure “Total average” for the year 2018 rendered a list of municipalities ordered from the highest to the lowest, with the highest-scoring being Maków Mazowiecki, Różan and Karniewo, and with Czerwonka, Płoniawy Bramura and Sypniewo classified on the other end of the spectrum. Maków Mazowiecki municipality, heading the ranking in 2010, also came first in 2018, with the synthetic measure “Total average” having grown by 8%, and with the synthetic measures for the Economy, Society and Environment component areas having grown by 10%, 3% and 12%, respectively.

Table 7. Synthetic measures for Maków county municipalities for 2010 and 2018 divided into the component areas, expanded by descriptive statistics

Municipality	Synthetic measures for 2010				Synthetic measures for 2018			
	economy	society	environment	total	economy	society	environment	total
Maków Maz.	0.485021	0.760178	0.646004	0.630401	0.533068	0.782411	0.720704	0.678728
Czerwonka	0.430097	0.100477	0.366841	0.299139	0.223459	0.164307	0.303977	0.230581
Karniewo	0.184177	0.379231	0.423196	0.328868	0.360492	0.382387	0.466061	0.402980
Krasnosielc	0.158535	0.572455	0.41553	0.382173	0.147049	0.401484	0.439013	0.329182
Młynarze	0.337627	0.228587	0.320808	0.295674	0.453866	0.359988	0.268528	0.360794
Płoniawy-B.	0.209942	0.332497	0.50669	0.34971	0.179095	0.175717	0.494583	0.283132
Różan	0.5368	0.653434	0.619917	0.603384	0.634349	0.573651	0.601394	0.603131
Rzewnie	0.285204	0.120480	0.346275	0.250653	0.283937	0.278030	0.516228	0.359398
Sypniewo	0.25021	0.392363	0.152516	0.265029	0.263597	0.541292	0.126325	0.310404
Szelków	0.330785	0.195428	0.325671	0.283961	0.391066	0.230199	0.398753	0.340006
Average	0.320840	0.373510	0.412340	0.368900	0.347000	0.388950	0.433560	0.389830
Median	0.307990	0.355860	0.391190	0.347800	0.322210	0.371190	0.452540	0.349700
Minimum	0.158530	0.100480	0.152520	0.174400	0.147050	0.164310	0.126320	0.230580
Maximum	0.536800	0.760180	0.646000	0.630400	0.634350	0.782410	0.720700	0.678730
1st quartile	0.220009	0.203717	0.330822	0.287262	0.233493	0.242157	0.327671	0.315099
3rd quartile	0.406980	0.527432	0.485816	0.444645	0.438166	0.506340	0.510817	0.392434

Source: developed by the author based on studies of data from the Local Data Bank of Statistics Poland.

The municipalities were classified on the basis of quartiles, i.e.: the boundaries of the first class were determined by the minimum and the first quartile, those of the second class – by the first quartile and the median (second quartile), those of the third class – by the median and the third quartile, and those of the fourth class – by the third quartile and the maximum.

Table 8. Development classes of Maków county municipalities in the studied years

Development classes; 1 – lowest	The municipalities in 2010	The municipalities in 2018
1st class [minimum – 1st quartile]	Rzewnie rural municipality Szelków rural municipality Sypniewo rural municipality	Sypniewo rural municipality Płoniawy-Bram. rural municipality Czerwonka rural municipality
2nd class [1st quartile – median]	Młynarze rural municipality Czerwonka rural municipality	Szelków rural municipality Krasnosielc rural municipality
3rd class [median – 3rd quartile]	Karniewo rural municipality Płoniawy-Bram. rural municipality	Młynarze rural municipality gm. w. Rzewnie rural municipality
4th class [3rd quartile – maximum]	Maków Maz. urban municipality Różan urban-rural municipality Krasnosielc rural municipality	Maków Maz. urban municipality Różan urban-rural municipality Karniewo rural municipality

Source: developed by the author based on studies of data from the Local Data Bank of Statistics Poland.

As the comparison shows, the most substantial developmental progress was achieved by Rzewnie municipality, which had advanced from the 1st (weakest) to the 3rd class. This resulted from, in particular, its growth within the Environment area – where it advanced from the 2nd class in 2010 to the 4th class in 2018. A progress by one class was observed by Szelków and Młynarze municipalities. Drops in the ranking were noted for Krasnosielc municipality (which in 2010 was in the 4th (best) class only to fall to the 2nd class in 2018), Płoniawy municipality (which fell from the 3rd to the 1st class) and Czerwonka municipality (which fell from the 2nd to the 1st class).

Table 9. Development classes of Maków county municipalities divided into the component areas in the studied years

Development classes	2010			2018		
	economy	society	environment	economy	society	environment
1st class	Krasnosielc Karniewo Płoniawy-B.	Szelków Sypniewo Rzewnie	Sypniewo Młynarze Szelków	Krasnosielc Płoniawy-B. Czerwonka	Czerwonka Płoniawy-B Szelków	Sypniewo Młynarze Czerwonka
2nd class	Sypniewo Rzewnie	Różan Płoniawy-B.	Rzewnie Czerwonka	Sypniewo Rzewnie	Rzewnie Młynarze	Szelków Krasnosielc
3rd class	Szelków Młynarze	Młynarze Krasnosielc	Krasnosielc Karniewo	Karniewo Szelków	Karniewo Krasnosielc	Karniewo Płoniawy-B.
4th class	Czerwonka Maków Maz. Różan	Karniewo Czerwonka Maków Maz.	Płoniawy-B. Różan Maków Maz.	Młynarze Maków Maz. Różan	Sypniewo Różan Maków Maz.	Rzewnie Różan Maków Maz.

Source: developed by the author based on studies of data from the Local Data Bank of Statistics Poland.

The most substantial drop with regard to the individual component areas was observed for Czerwonka municipality – from the 4th to the 1st class in the Economy area, from the 4th to the 1st class in the Society area, and from the 2nd to the 1st class in the Environment area. The highest growth was noted for Sypniewo municipality – from the 1st to the 4th class in the Society area.

In order to examine the correlations between the obtained synthetic measures (the general one and the ones derived for the particular areas), the following correlation matrix was calculated.

Table 10. Linear correlation coefficients for observations from the sample of 1–10
Critical value (with a 5% two-sided critical region) = 0.6319 for n = 10

Total	Economy	Society	Environment	
1.0000	0.8353	0.8436	0.7431	Total
	1.0000	0.6138	0.4448	Economy
		1.0000	0.3792	Society
			1.0000	Environment

Source. Calculated using the gretl 2017e-git software.

The coefficients thus calculated indicated the existence of a significant correlation between the general synthetic measure of sustainable development of municipalities on the one hand, and the level of development of the Society area (a correlation coefficient of 0.8436), the characteristic of the Economy area (a correlation coefficient of 0.8353), and the characteristic of the Environment area (a correlation coefficient of 0.7431).

SUMMARY AND CONCLUSIONS

The paper offers an analysis of the sustainable development of Maków county municipalities between 2010 and 2018, considering the areas of Society, Economy and Environment. The study proposes a proprietary approach to analyzing the level of sustainable development in these municipalities, the originality of which consists in its selection of the diagnostic variables and the choice of the synthetic measure. The authors are aware of the fact that had they decided to select the indicators based on substantive criteria instead of statistical ones, the resultant ranking would have been different to the one presented herein.

The results of the study allowed for the conclusion that the general level of development grew between 2010 and 2018 by 5.678% – with the highest growth observed for Rzewnie municipality (43.39%). Four municipalities were found to have reduced their general levels of development during the same period. The top places in the synthetic measure ranking were occupied in 2010 by Maków Maz. urban municipality, Różan urban-rural municipality and Krasnosielc rural municipality, and in 2018 by Maków Maz. urban municipality, Różan urban-rural municipality (both of which retained their places) and Karniewo municipality (which replaced Krasnosielc municipality). The observed growth in the range between the municipalities' levels of sustainable development was a negative aspect. The synthetic measure range grew from 0.37975 in 2010 to 0.44815 in 2018, which resulted from the differences observed in the Economy and Environment areas. The decrease in the synthetic measure range identified for the Society area should be regarded as positive.

In the Economy, Society and Environment areas, the highest synthetic measure values in both the studied years were demonstrated by Maków Maz. and Różan municipalities. Characteristically, these are an urban municipality and an urban-rural municipality, with all the others being rural.

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ZRÓWNOWAŻONY ROZWÓJ GMIN NA PRZYKŁADZIE POWIATU MAKOWSKIEGO

Streszczenie. W artykule przeprowadzono syntetyczną analizę rozwoju społeczno-gospodarczego z uwzględnieniem środowiska gmin powiatu makowskiego (województwo mazowieckie) w latach 2010 i 2018. W badaniach uwzględniono 20 cech diagnostycznych reprezentujących dziedziny z badanych obszarów: gospodarczego, społecznego i środowiskowego. Metodą wykorzystaną w badaniach była wielowymiarowa analiza porównawcza z uwzględnieniem metody bezwzorcowej wykorzystującej unitaryzację zerowaną. Wyniki przeprowadzonych badań wskazują, że w 2018 r. w stosunku do 2010 r. nastąpił wzrost ogólnego poziomu rozwoju społeczno-gospodarczego z równoczesnym zmniejszeniem presji na środowisko w większości gmin. Jednakże jest to zjawisko zróżnicowane w wielu aspektach.

Słowa kluczowe: zrównoważony rozwój, gmina, powiat.