Agnieszka **ABRAMOWICZ**

ANALYSIS OF THE STATE OF DEVELOPMENT OF THE PROVINCE OF PODLASIE

Agnieszka **Abramowicz**, MSc – *Bialystok University of Technology*

Correspondence address:
Faculty Of Civil And Environmental Engineering
Wiejska Street 45 E, 15-351 Bialystok, Poland
e-mail: simran05@wp.pl

ABSTRACT: The article presents the applied method ratio analysis as the best tool for analyzing the development status of the province of Podlasie in relation to the selected comparative group. Based on the collected source data – selected indicators of sustainable development, described the state of development of the province of Podlasie comparing it with other territorial units. On the basis of the obtained results, the state of development of the podlaskie voivodship in relation to other voivodships was presented.

KEY WORDS: ratio analysis, status of development of the province

Introduction

Broadly understood development is desirable in every area of social, economic or spatial life. In order to make best use of the available means of stimulating growth, it is essential to determine the current state of development at any given time in order to plan further action in such a way as to bring the most rewarding benefits of short and long term. This was a prerequisite for the subject of an analysis of the state of development of the province of Podlasie, which focused on the analysis of the various development areas that are collectively understood as sustainable development.

The aim of the article is to present the results of the assessment of the development status of the podlaskie voivodeship as compared to other selected voivodships „eastern wall" using the indicator method as part of the audit of sustainable development. The relevant sustainability indicators were analyzed, which described the state of development of the analyzed territorial unit in two periods of time – 2004 and 2012, due to the availability of the most comprehensive data set and the willingness to examine the changes that have taken place since the accession of Poland to the European Union.

An overview of literature

Sustainable development, as defined in the Environmental Protection Act of 27 April 2001, is a „socio-economic development in which the process of integrating political, economic and social activities takes place, preserving the natural balance and the sustainability of basic natural processes to guarantee the ability to meet the basic needs of individual communities or citizens of both the present and future generations."

There are many methods and indicators of development that can be found in literature. In many ways they define this development with an emphasis on different levels, one more in the social sphere, the other economical and the other more in the environment, and thus each of them focuses on a few other qualities, factors and values through why they can be used depending on their needs.

Among the many methods available for assessing the quality of life or development, the method chosen for the analysis must take into account components of sustainability. The most appropriate and used method for evaluation, development analysis is 'Sustainability development audit', which enables one to analyze and solve a problem simultaneously for several spheres of development, namely: social, environmental and economic.

The most important features of a sustainable development audit include:
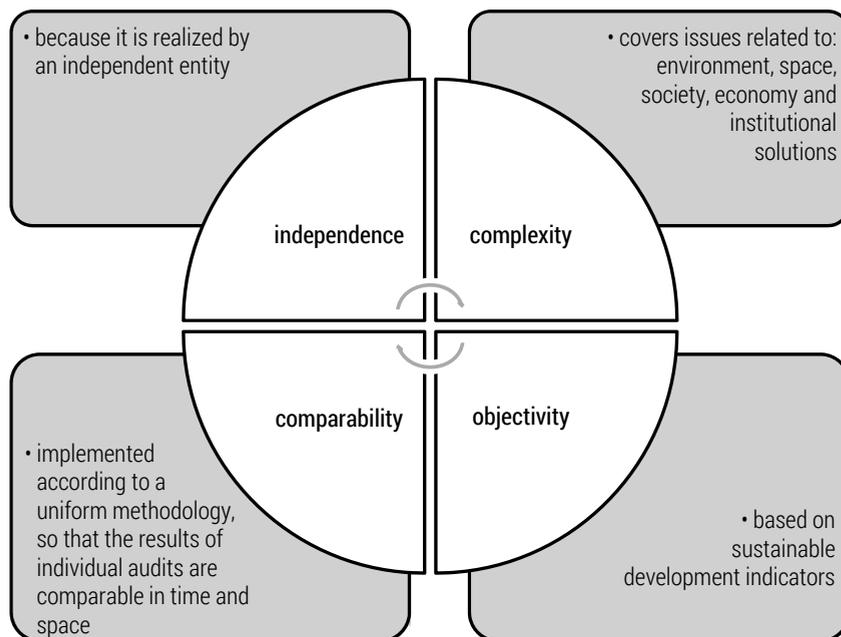
Figure 1. The features of a sustainable development audit

Source: (Fundacja Terra Humana (2003), Audyt zrównoważonego rozwoju powiatu otwockiego).

The sustainability development audit is based on certain principles based on such elements as:
- use of data available in the Central Statistical Office (GUS);
- develop a list of indicators on the basis of data available in GUS;
- use of the comparative method (with other comparable territorial units);
- analysis of change of indicators over time.

Research method – ratio analysis

The calculation procedure

Audit of sustainable development is based on a set of indicators that serve as diagnostic tools – information showing the situation of the current state of the environment, society and economy. What is more, it allows to assess the degree of progress of the work to implement the principles of sustainable development (Borys, 2005). A tool used to assess the state of development, is a ratio analysis, which is based on indicators of sustainable development.

Sustainable development indicators, in the form of 4 groups and with suggestions whether they are stimulators, destimulators, are located on the main website of the Central Statistical Office – www.wskaznikizrp.stat.gov.pl.

The first stage of comparisons, consisting in the construction of evaluation of indicators in a comparative group, is the transformation of specific values of indicators obtained from GUS into a uniform scale of scores in the range of 1 to 100.

Statistical analysis uses the following formulas:

for stimulating indicator:

$$O_p = [(W - W_{min})/(W_{max} - W_{min})] \times 100,$$

for destabilizing indicator:

$$O_r = [(W_{max} - W)/(W_{max} - W_{min})] \times 100,$$

$$\text{or } O_r = 100 - [[(W - W_{min})/(W_{max} - W_{min})]] \times 100.$$

By contrast, to calculate average values:

for stimulating indicator:

$$O_{p-śr.} = [(W_{śred.} - W_{min})/(W_{max} - W_{min})] \times 100,$$

for destabilizing indicator:

$$O_{r-śr.} = [(W_{max} - W_{śred.})/(W_{max} - W_{min})] \times 100.$$

where:
O_p or O_r – point rating of the W value for a given territorial unit,
$O_{p-śr.}$ or $O_{r-śr.}$ – a point-to-point assessment of the average value of indices for a comparable group of territorial units, which is dependent on the distribution of the indicator,
W –   value of the indicator,
W_{min} –   the minimum value of the indicator for a given sample,
W_{max} –   maximum value of the indicator for a given sample,
$W_{śred.}$ –   average value of the indicator for a given sample.

The second phase of comparison is to refer the unit value to the average level of indicators in a comparable group of territorial units using the formulas:
for stimulating indicators:

$$[(O_p/O_{p-śr.}) \times 100\%] - 100\%,$$

for destabilizing indicators:

$$[(O_r/O_{r-\text{śr.}}) \times 100\%] - 100\%.$$

Another important element which should be calculated is the variability of the sustainability index across the whole set of the compiled territorial units by calculating the coefficient of variation according to the formula:

$$Z = \frac{S(W)}{W_{\text{śred}}} \times 100\% \, , S(W) = \frac{1}{n} \sum_{i=1}^{n} (W - W_{\text{śred.}})^2,$$

where:
S (W) – standard deviation of indicator value,
n –   number of units in the comparative group.

The values of this indicator should be interpreted by assigning it to one of the three groups indicating the magnitude of the variation, ie:
• 0-0,3 – low variability,
• 0.3-0.6 – significant variation and,
• > 0.6 – strong variation.

The next step is to assess the dynamics of the indicator change in the form of medium-term growth rates, which tells of what percentage the phenomenon has increased or decreased over the period considered compared to the level of the reference period.

The first step is to calculate the geometric mean „g" according to the following formula:

$$g = \sqrt[n-1]{\frac{i_n}{1}} \text{ or } g = \sqrt{\frac{W_{2001}}{W_{2000}} \times \frac{W_{2002}}{W_{2001}} \times \frac{W_{2003}}{W_{2002}}},$$

where:
g –   geometric mean value,
n –   test period,
in /1 –   single period.

The second step is to calculate the medium-term rate of change in the periods studied as the difference according to the following formula:

$$\overline{T_n} = g - 1,$$

or as a percentage value:

$$\overline{T_n}[\%] = (g \times 100) - 100,$$

The level of change in the value of the indicator is visualized by calculating the level of change of the phenomenon of the period studied compared to the base according to the following formula:

$$D(\%x) = [W_{br.}/W_x] \times 100\%,$$

where:
$D(\%x)$ – level of the phenomenon of the period in question compared to year x,
$W_{br.}$ –   value of the indicator in the period under review,
W_x –   value of index in year x.

At a later stage, the whole area of sustainability indicators is assessed as the sum of the value of the individual indicators of the analyzed area divided by the number of indicators that have been assessed. This evaluation is made according to formula:

$$O_D = \frac{W_1 + W_2 + ... + W_n}{n} = \frac{1}{n}\sum_{i=1}^{n} W_i,$$

where:
O_D –   assessment of the area of order,
W_n –   value of the indicator for a given year,
n –   number of years included in the analysis.

The last computational step is the evaluation of order, determined on the basis of the evaluations of particular domains of the order according to the following formula:

$$O_{ZR} = \frac{1}{N}\sum_{i=1}^{r} O_D n_i),$$

where:
O_{ZR} –   evaluation of order,
N –   sum of the numerals of indices in all r-domains of order,
O_D –   evaluation of a specific field,
r –   number of domains in the order,
n_i –   the number of indicators included in the field evaluation.

The evaluation of the phenomenon – radar charts

In order to present the results of the analysis in the most readable and transparent way are used radar charts. They represent the value ratio of the individual indicators for the surveyed territorial unit to the average value. It is significant that they do not indicate specific numerical values, but they express this relationship in relation to the average value of the indicator.
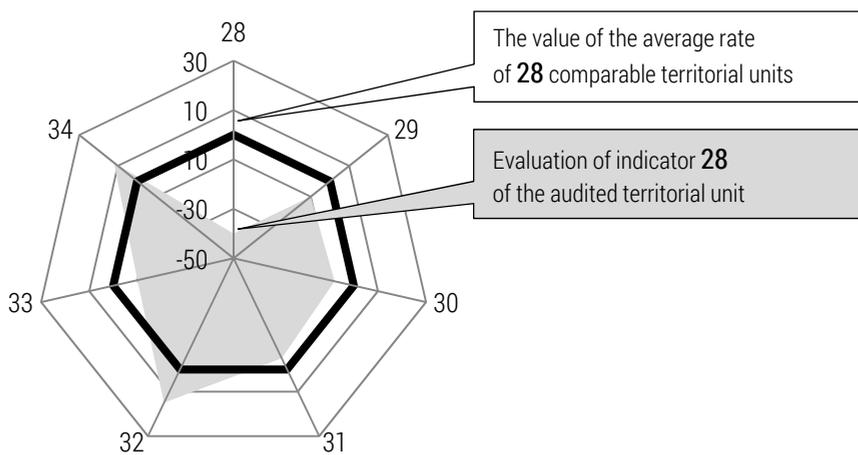
Figure 2. An example of radar chart

Source: author's own work based on UNDP Organizacja Narodów Zjednoczonych ds. Rozwoju. (2004). Audyt zrównoważonego rozwoju Gminy Miejskiej Ostrów Wielkopolski, Warszawa.

The dynamics of the phenomenon – bar charts

The second method of presenting the results of the indicator analysis is the bar graphs, which illustrate the dynamics of changes in the value of indicator data over time. On the bar chart, the reference point is the value of the index in the baseline year and shows the change dynamics over several years.

The graph shows the percentage increase or decrease of the sustainability index.
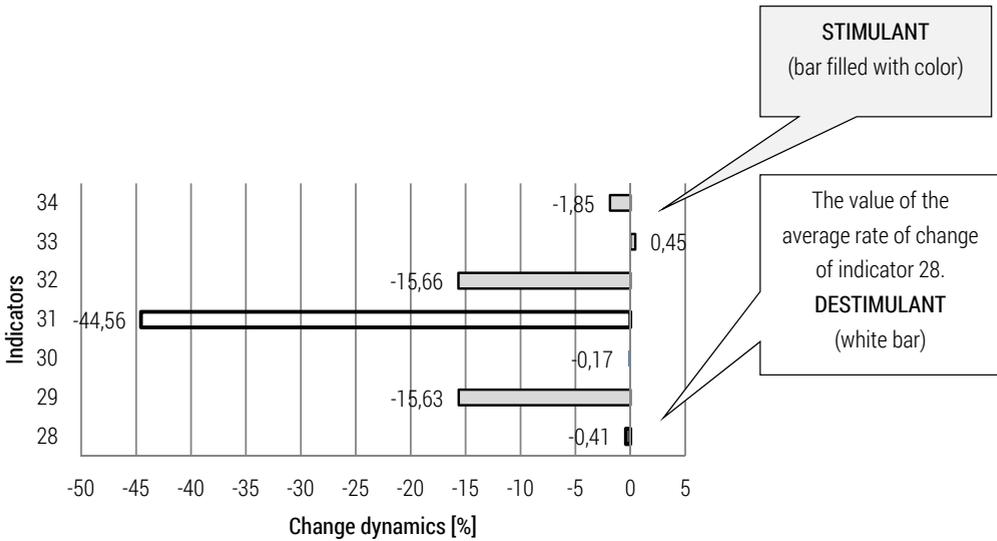
Figure 3. An example of a bar chart

Source: UNDP Organizacja Narodów Zjednoczonych ds. Rozwoju. (2004). Audyt zrównoważonego rozwoju Gminy Miejskiej Ostrów Wielkopolski, Warszawa.

The course 'analysis of the state of development'

The analysis of the development status of the odlaskie voivodship was carried out in accordance with the algorithm, presented in figure 4, which includes the following stages:
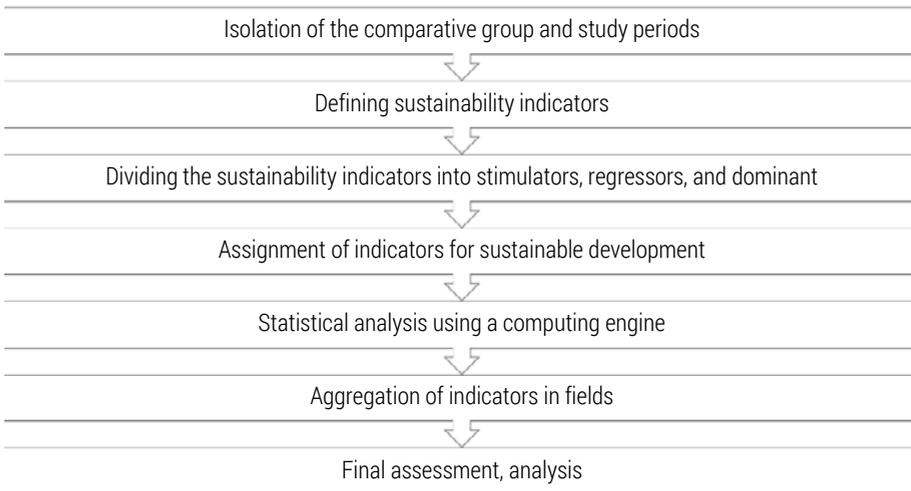
Figure 4. Procedure for carrying out analysis of development status

Source: author's own work.

Choosing the voivodeships for analysis, the similarity resulting from the natural, economic and historical conditions was followed. It is still said about the division of Poland into „Poland A" and „Poland B", so for comparison with the podlaskie voivodeship, in order to be reliable, the voivodeships were selected from the eastern wall, namely:

• lubelskie,
• podkarpackie,
• świętokrzyskie,
• and warmińsko-mazurskie.

The analysis was carried out for selected sustainable development indicators for the years 2004 and 2012, as they reflect the state of development at the time of Poland's accession to the European Union and the state of affairs after several years of EU funds being affected.

Of the nearly 80 available indicators, 24 indicators were selected for the analysis, available on the GUS website: http://wskaznikizrp.stat.gov.pl/, due to their importance for sustainable development. Their names, numbering, assigning to 1 of 3 orders and information whether it is a destimulant or stimulant, are presented in the following table 1.

Table 1. The analyzed indicators of sustainable development

Number of indicators	Indicator name	Stimulant / Destimulant
ECONOMIC ORDER → 6		
1. (1.1.; 1.2.)	Gross Domestic Product per capita (current prices)	S
2.	Investment expenditure by sectors per capita (current prices)	S
3. (3.1.; 3.2.; 3.3)	Employment rate by age	S
4. (4.1.; 4.2.)	Employment rate by sex	S
5.	Natural persons conducting economic activity per 100 people of working age	S
6.	Expenditures on research and development in relation to GDP	S
SOCIAL ORDER → 11		
7. (7.1.; 7.2.; 7.3.)	Consumption of household media per capita per year	D
8.	Number of passenger cars per 1000 population	D
9.	Average monthly disposable income per person in the household	S
10. (10.1.; 10.2.; 10.3.)	Unemployment rate (LFS)	D
11.	Employment rate of people with disabilities	S
12.	The fertility rate	S

13.	Natural increase per 1000 population	S
14. (14.1.; 14.2.; 14.3.)	Demographic burden indicators	D
15.	Average monthly gross pension from the non-agricultural social security system in relation to the average gross monthly salary	S
16.	Average life expectancy at birth at birth	S
17.	Victims of traffic accidents per 100 thousand. registered vehicles	D
ENVIRONMENTAL ORDER → 7		
18.	Emissions of carbon dioxide from plants that are particularly burdensome	D
19.	Share of legally protected areas in total area	S
20.	Groundwater exploitation resources – increase or decrease compared to the previous year	S
21.	Share of area of agricultural land in total area	S
22.	woodiness	S
23.	The share of municipal and industrial waste water purified in general wastewater requiring treatment	S
24. (24.1.; 24.2.)	Emission of air pollutants from plants that are particularly burdensome	D

Source: author's own work based on *Wskaźniki zrównoważonego rozwoju Polski* (2011). Główny Urząd Statystyczny, Katowice.

Results of the research

The calculations show that some indicators did not show the desired direction of change, that is, the stimulants attained a negative dynamics of change, while the positive ones were positive in the analyzed years. In the general assessment, they did not cause significant negative impacts, but nevertheless this gives us an idea of why their values behave contrary to the sustainable development of this requirement.

For example, indicator 1.2., Ie the share of GDP generated by the Podlaskie Voivodeship in the country's GDP, which indicates that it decreased in 2012 by about [-] 1.43% compared to 2004.

The same applies to the indicator 5. "Natural persons conducting economic activity per 100 people of working age", which as a stimulant should achieve a positive change in value, this value decreased by [-] 2.48%. Indicators of the social order 7.1.- 8. also, despite the desired direction of changes in value, recorded positive changes, contrary to the recommendations of the Central Statistical Office (GUS). Another indicator that has reached the oppo-

site of the recommendations for change in value is the indicator 11. Employ-ment rate of people with disabilities".

This is a small change [-] 1.01%, but it does not change the fact that less and less disabled people are employed in the Podlaskie Voivodeship despite numerous facilities and support methods.

The next indicators that do not show the desired changes from a sustain-able development point of view are: 13. „Natural increase per 1000 popula-tion", 14.1. and 14.3. referring to the demographic burden. Unfortunately, the 13 indicator over the years 2004 and 2012 has shown a negative dynamics of change, which is quite high, [-] 18.09%, what is a disturbing phenomenon resulting from the change of the family model, pursuit of a professional career and only later, establishing a family. Indicators 14.1. with [+] 2.37% and 14.3. [+] 15.92% increase in value is also not optimistic because they indicate that the number of people in working age per 100 working-age and pre-working age population is increasing, thus indicating an aging population, which together with decreasing natural growth do not create an optimistic scenario of demographic changes in the podlaskie voivodeship.

In comparison to earlier indicators, the decline in the value of index 15. "Average monthly gross social contributions other than agricultural to aver-age wages" of [-] 0.93%, instead of growth, is not optimistic, as it seems that overall economic growth, should results in an improvement in the financial situation of all social groups.

Of the group of environmental indicators, only one indicator showed a change in value in the undesirable direction, namely the index of 21. „Share of agricultural area in total area", obtaining [-] 0.98% lower value in 2012 than in 2004. This may be due to the demand for land for investment, obtained at the expense of agricultural land.

As can be seen from the above list of indicators that did not change in the desired direction, there are 10, which is about 1/3 of all analyzed indicators. Also remember that some indicators have different variants and their num-bering is the same as for example 1, which is broken down into indicators 1.1. and 1.2.

From the presented graph (figure 5) and analyzes, it can be concluded that in 2004, the economic order [+] 43% and the environment order [+] 23% of podlaskie voivodeship outperformed average growth in the compar-ative group. Growth below the average of social order [-] 12%, was worse off with respect to the averaged value of the assessment of the order.

Evaluation of individualn orders – 2004
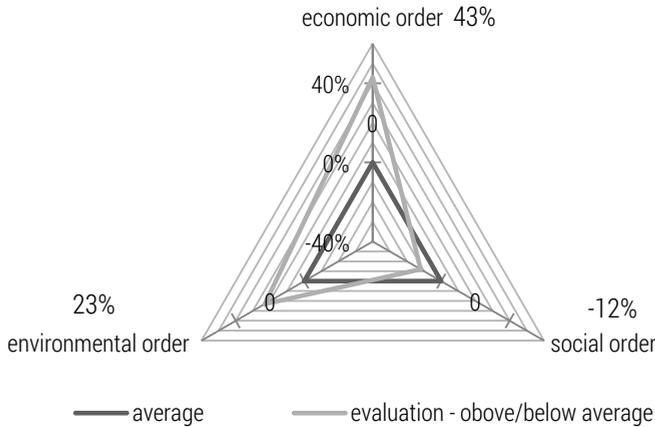
Figure 5. Evaluation of individual orders – 2004

Source: author's own work based on the author's ratio analysis, state of development of the region of Podlasie.

Evaluation of individualn orders – 2012
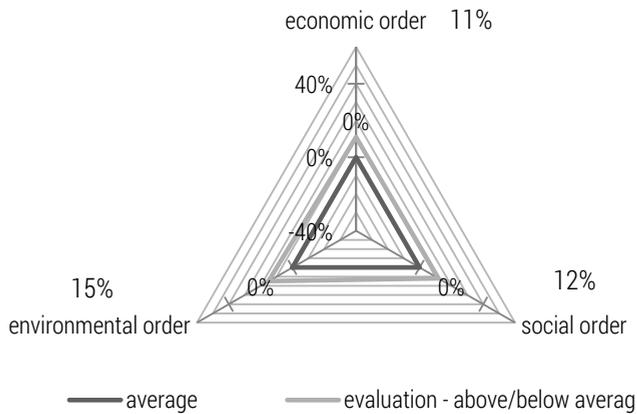
Figure 6. Evaluation of individual orders – 2012

Source: author's own work based on the author's ratio analysis, state of development of the region of Podlasie.

However, over the years, the situation has changed, as shown in figure 6. Economic and environmental development has remained above the average in the comparative group and amounted to [+] 11%, [+] 15%, respectively, but improvement in the social order improved and from [-] 12% (2004)

relative to the average in 2012 was already [+] 12%. This may be due to an increase in the activity of various environments in the sphere of social development of the society of the podlaskie voivodeship, investing in the social sphere, which is the basis for proper functioning of both economy and the environment.

Accordingly, it can be stated that the podlaskie voivodship, in comparison with the lubelskie, podkarpackie, świętokrzyskie and warmińsko-mazurskie voivodships, performs well because it shows development above average.

Moreover, it can be stated that the podlaskie voivodship is developing in a sustainable manner and therefore realizes the assumptions of sustainable development.

Conclusions

On the basis of a review of literature, the calculations made under the indicator analysis can be formulated as follows:

- The Sustainability audits formula, with the indicator analysis tool, identifies areas with favorable development situations and where changes are in the wrong direction, thus providing a multi-faceted analysis and noting the value of individual sustainability indicators.
- Complementary to the calculations are very helpful and readable in the radar and bar graph readings.
- As a result of the application of such methodology – indicator analysis, it was possible to comprehensively and multifacetly diagnose the development status of podlaskie voivodeship in relation to the selected comparative group by establishing relations, and examining the differences between the values of the indicators set over two years and in different categories.
- Choosing the right set of sustainable development indicators can serve as a tool for integrating the development of a given territorial unit or area and highlighting the potential and vulnerabilities of different categories of local life, and it is certainly a comprehensive information for the actors and institutions involved. Development processes as well as information or chosen, planned direction of development is realized in a timely manner and pace. Therefore, sustainable development audits as a tool for assessing development are widely used because of their comprehensiveness, independence and objectivity.

Literature

Adamczyk R. (2007), *Zastosowanie audytu zrównoważonego rozwoju w procesach zarządzania rozwojem lokalnym*, Warsztaty doktoranckie 2006. Zarządzanie – Finanse – Ekonomia

Bank Danych Lokalnych GUS, www.stat.gov.pl [20-04-2017]

Borys T. (2005), *Wskaźniki zrównoważonego rozwoju*, Warszawa-Białystok

Fundacja Terra Humana (2003), *Audyt zrównoważonego rozwoju powiatu otwockiego*, Warszawa

Konstytucja Rzeczypospolitej Polskiej z dn. 2 kwietnia 1997 r., Dz.U. z 2009 r. nr 114 poz. 946

Prognoza oddziaływania na środowisko. Projekt strategii rozwoju województwa lubelskiego na lata 2014-2020 (z perspektywą do 2030 r.) (2013), Lublin

Puza A. (2007), *Audyt zrównoważonego rozwoju Gminy i Miasta Bisztynek*, Bisztynek

Rogala P. (2003), *Audyt lokalny jako nawy instrument zarządzania zrównoważonym rozwojem*, in: T. Borys (ed.), *Zarządzanie zrównoważonym rozwojem Agenda 21 w Polsce – 10 lat po Rio*, Białystok

Rogala P., Chmielewski W. (2003), *Audyt zrównoważonego rozwoju*, Kalisz

Rogala P., Rycharski T. (2006), *Zastosowanie analizy wskaźnikowej*, „Ekonomia Społeczna" No. 13

Strategia rozwoju województwa podlaskiego do 2020 roku (2006), Białystok

Strategia rozwoju województwa świętokrzyskiego do roku 2020 (2006), Kielce

UNDP Organizacja Narodów Zjednoczonych ds. Rozwoju (2004), *Audyt zrównoważonego rozwoju Gminy Miejskiej Ostrów Wielkopolski*, Warszawa

Ustawa o planowaniu i zagospodarowaniu przestrzennym (2003), Dz.U. z 2015 r. poz. 22

Ustawa Prawo Ochrony Środowiska (2001), Dz.U. nr 62 poz. 627 z późn. zm.

Ustawa o zasadach prowadzenia polityki rozwoju (2006), Dz.U. z 2015 r. poz. 349, 1240, 1358

Wskaźniki zrównoważonego rozwoju Polski (2011), Katowice