

Measuring and Monitoring Effects of Sustainable Development in the European Union

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Abstract

Sustainable development is considered as the central model of socio-economic development as well as an overarching principle of global environmental policy. Taking measures and effective policy in strategic areas require statistical information from various fields. An important tool in this context is monitoring the progress on implementation of sustainable development. The aim of the article is to analyze the conditions and principles for the measurement of sustainable development in the EU and to assess progress in implementing the European Strategy for Sustainable Development. On the basis of available statistical data it is possible not only to measure the progress and evaluate the effectiveness of policies and programs of the European Union, but also to support decision making at the political level in terms of economic, social and environmental developments.

Keywords: sustainable development, sustainable development strategy, indicator; measuring, progress monitoring

1. Introduction

Sustainable development is considered as a key global trend of environmental policy and socio-economic development (Redclift, 2005, p. 213). The decisive role in the development and dissemination of the concept of sustainable development played the “Brundtland’s Commission” at the World Commission on Environment and Development (WCED), which in 1987 published the report entitled “Our common future”. According to the report, the objective of sustainable development is to meet the needs of present and future generations in full compliance with the environment (Brundtland, 1987, p. 43). The Brundtland Report was also an important document that was used as the foundation of the United Nations Conference on Environment and Development (UNCED), which took place in 1992 in Rio de Janeiro. During this conference, a declaration on the implementation of sustainable development, the so called Declaration of the United Nations Conference on Environment and Development of 14 June 1992 was signed by 178 countries (UNCED, 1992). The declaration contains a postulate that all people, all societies and generations are entitled to a healthy and productive life and development in harmony with nature.

It is worth adding that since the UN Summit in 1992 in Rio de Janeiro, sustainable development has been considered as the central model of socio-economic development and as an overarching principle of global environmental policies and development policies (Gutowska, Śleszyński, Grodzińska-Jurczak, 2012). In general, this development

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goes beyond the narrow perspective of growth and also assumes knowledge of socio-economic, environmental and justice between the generations and within a generation (Janikowski, 2014).

Sustainable development is a multidimensional concept, covering the interdependence of economic governance, social and environmental, and the need to preserve resources for future generations. It is a vision of progress, with a primary objective to integrate environmental and economic development as well as socially equitable development. This development pays particular attention both to the inside generational equity (between rich and poor) and intergenerational justice (between present and future generations). This means that sustainable development refers to normative justice system between generations and its implementation requires the responsibility of all relevant actors (Famielec, 2009, pp. 39-41).

Development and implementation of framework that promote sustainable development, require a good understanding of the conditions of economic, social, ecological development, including the related synergies (Urbaniec et al., 2003, p. 101). Taking measures in this direction also requires coordinated set of participatory processes that enable the integration of short- and long-term economic, social and environmental goals (Borys, 2011, pp. 75-81). The important role is played by appropriate information used to monitor progress and to support political decisions (Czaja, 2009, pp. 191-193; Rametsteiner et al., 2011, p. 62; Bujanowicz-Haraś et al., 2015, p.72). Ensuring an adequate monitoring of sustainable development implementation is an important tool for the European Union (EU) and Member States.

The article aims at presenting conditions and principles for the measurement of sustainable development in the EU as well as at exploring the progress in implementing the EU Sustainable Development Strategy. Therefore, first, the strategic determinants of sustainable development and the principle of its measurement in the EU will be presented. Then, the progress achieved and evaluation of the effects on sustainable development in the EU with particular emphasis on Poland will be analyzed. The research analysis will be carried out based on a critical analysis of scientific literature and secondary materials elaborated mainly by Eurostat and the European Commission.

2. The strategic foundations for sustainable development in the EU

Sustainable development is a priority in the EU policy. A normative document constitutes the Lisbon Treaty, according to which one of the EU objectives is taking measures to ensure the sustainable development of Europe, especially through economic growth, a social market economy with a high level of competitiveness which aims at full employment and social progress, and a high level of protection and improvement of the environment. While the other treaties already referred to this issue, the Lisbon Treaty gives it a greater significance and strengthens EU action in this field. The activities undertaken in this direction are reflected in the EU's leading role on the international stage in preventing climate change and to promote an economy based on low carbon technologies, knowledge and resource-efficient economy.

The main document defining not only the specific objectives and actions, but also supporting an elaboration of appropriate standards is the EU Sustainable Development

Strategy, developed in 2001 (Commission of the European Communities, 2001), which was updated in 2006 and adopted as a renewed EU Sustainable Development Strategy. A premise for developing an EU strategy was the EU's commitment to sustainable development at the first Earth Summit in Rio de Janeiro in 1992. Its main purpose is to “identify and develop actions to enable the EU to achieve continuous improvement of quality of life both for current and for future generations, *via* creation of sustainable communities able to manage and use resources efficiently as well as to tap ecological and social innovation potential of the economy, ensuring prosperity, environmental protection and social cohesion” (Council of the European Union, 2006, p. 3). The Sustainable Development Strategy includes objectives of environmental protection, equity and social cohesion, economic prosperity and the implementation of commitments at the international level, taking into account broader and global dimension of current challenges (Urbaniec, 2011, p. 295). This strategy presents a consistent approach to deal with the challenges of sustainable development at the EU level, such as climate change and clean energy, sustainable transport, sustainable consumption and production, protection of natural resources and waste management, public health, social inclusion, demography and migration, challenges of global poverty and sustainable development (Council of the European Union, 2006, pp. 7-23). The renewed EU Strategy thus sets out the directions of the long-term vision of sustainability in which elements such as economic development, social cohesion and environmental protection are mutually reinforced. As a result of further EU action in this area, the Commission adopted an updated EU Sustainable Development Strategy in July 2009 (European Commission, 2009), which stressed that sustainable development was included over recent years in various areas of EU policy, in particular measures related to climate change and promoting low-carbon economy have been taken.

Another strategic document taking into account sustainability issues is the strategy “Europe 2020” adopted by the European Commission in 2010 (European Commission, 2010). The aim of this strategy is to support innovation and development of knowledge, resource efficiency, competitiveness and environmental protection and increase of employment, social and territorial cohesion. Sustainable development is one of three strategic priorities, next to the development of smart (based on knowledge and innovation) and inclusive growth (which consists in supporting economy with a high level of employment). It is implemented by means of various initiatives, presented in the table below.

Table 1. The Europe 2020 strategy’s key priorities, headline targets and flagship initiatives

Priorities	Main objectives	Flagship initiatives
Smart Growth	<ul style="list-style-type: none"> • 3 % of GDP to be invested in the research and development (R&D) sector • Reduce the rates of early school leaving to below 10 %, and at least 40 % of 30 to 34 year olds to have completed tertiary or equivalent education 	<ul style="list-style-type: none"> • Innovation Union • Youth on the move • A digital agenda for Europe
Sustainable Growth	<ul style="list-style-type: none"> • Reduce greenhouse gas emissions by 20 % compared to 1990 levels 	<ul style="list-style-type: none"> • Resource efficient Europe

	<ul style="list-style-type: none"> • Increase the share of renewables in final energy consumption to 20 % • 20 % increase in energy efficiency 	<ul style="list-style-type: none"> • An industrial policy for the globalisation era
Inclusive Growth	<ul style="list-style-type: none"> • 75 % of 20 to 64 year old men and women to be employed • Reduce poverty by lifting at least 20 million people out of the risk of poverty and social exclusion 	<ul style="list-style-type: none"> • An agenda for new skills and jobs • European platform against poverty and social exclusion

Source: (European Union, 2015, p. 34).

Sustainable development and, in particular protecting, conserving and improving the environment for present and future generations and overcoming consequences of climate change occupy an important place in the European political agenda. Measuring progress and evaluating the effectiveness of EU policies and programs require adequate information. For this purpose monitoring should be regularly conducted.

3. The measurement of sustainable development in the European Union

An effective policy in strategic areas requires statistical information from various fields. Reliable empirical and statistical data are necessary for measuring progress and assessing the effectiveness of EU policies and programs. An important role is played by monitoring, including monitoring of processes (e.g. quality and scope of participation, information systems), effects and possible changes in the baseline measurement.

The primary tools for monitoring progress in implementation of the EU Sustainable Development Strategy are indicators. The term "indicator" is defined as the aggregate measurement, connected with an issue or phenomenon, made on the basis of a series of observed facts. According to Eurostat, the statistical indicator shows statistical data for a specific time, place or other relevant characteristics, adjusted in at least one dimension (usually size), so as to enable comparisons (Regulation (EU) No 99/2013, p. 20). Generally, the term "indicator" is used interchangeably with the term "measure" (Urbaniec, 2015). For the development of sustainable development indicators and its measurement at the EU level is responsible the Eurostat (European Union, 2013, p. 20). In order to ensure methodological consistency and comparability between countries, the calculation of indicators based on raw data from the national statistics is implemented in Eurostat (Regulation (EU) No 99/2013, p. 12). Therefore, in some cases there may be differences between the rates as calculated and made available by individual countries and those presented in the Eurostat database.

The indicators are used to determine objectives and monitor their implementation as a positive target states in a given timeframe. As a result, they allow the direct analysis and assessment of the strategic areas of the EU policy and global policy. The indicators do not always reflect all aspects of the development and change, however, they contribute to their explanations and comparing at a certain time. Countries and regions thereby support the decision making process. The primary role of sustainable development is its operationalization for the monitoring of strategy implementation by identifying a set of measures. A system development of sustainable development indicators is a relatively

complex issue, because it is associated with a wide range of phenomena, the requirements of simplicity and ease of indicators' applicability (Preisner, Pindór, 1999, pp. 9-12; Spangenberg, 2002, p. 105; Urbaniec, 2015, p. 124).

To measure the progress in this area, which is an integral part of the EU Sustainable Development Strategy, is based on a set of sustainable development indicators developed by the European Commission in cooperation with Member States, EFTA (European Free Trade Association) and EU candidate countries. Monitoring the EU Sustainable Development Strategy is carried out on the principles and development objectives for each dimension (Borys, 2014, pp. 3-21). Considering the category of “dimension” indicators of sustainable development relate to (European Union, 2009, p. 33):

- social dimension – indicators of improving life quality of society,
- economic dimension – indicators related to an effective socio-economic development,
- environmental dimension – indicators taking into account protection and rational shaping of the natural environment,
- global and institutional dimension – indicators covering the challenges of global partnership and good governance.

All these dimensions provide for an integrated approach to sustainable development. Order basis for developing an integrated system creates strategic objectives in social, economic, environmental (ecological) and institutional as well as political area.

Within these dimensions themes relating to specific objectives and priorities for sustainable development have been developed (United Nations, 2008, p. 20). The general process for building a set of sustainable development indicators illustrates a multi-level pyramid shown in the figure below, including indicators of the main objectives (level 1), the operational objectives (level 2) and activities (level 3), which are complemented by context indicators, relating to specific areas, but do not monitor directly objectives of the Strategy.

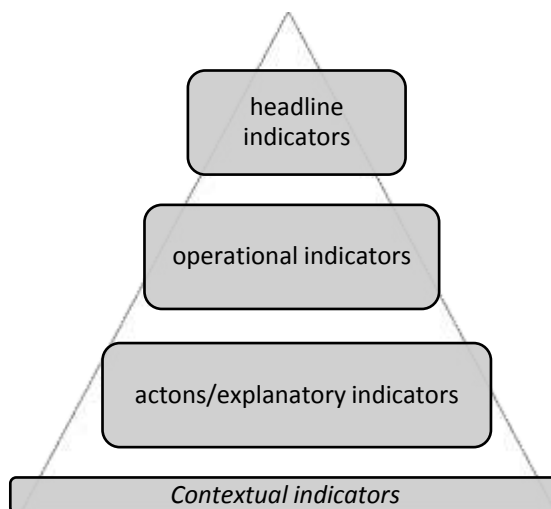


Figure 1. The indicator pyramid of the EU SDI framework

Source: Own elaboration based on (European Union, 2013, p. 22).

Different levels of sustainable development indicators constitute the response to different needs of users (European Union, 2015, p. 15):

- *Headline indicators* - have a high communicative and educational value, and also allow monitoring of the overall objectives associated with the key challenges of the sustainable development strategy,
- *Operational indicators* - refer to the operational objectives of the strategy,
- *Actions / explanatory indicators* - concerns the activities and are useful for progress assessing in achieving the objectives of the strategy.

The set of sustainable development indicators also includes contextual indicators, which admittedly not directly monitor the strategy's objectives, however, provide additional information on issues directly related to sustainable development and can be useful for analytical purposes (Spangenberg, 2002, p. 106; Ziolkowska, Ziolkowski, 2010, p. 373). Currently, a set of sustainable development indicators is so flexible that it has been supplemented with new indicators, depending on changes in priorities for sustainable development or the occurrence of new problems.

At present, the set of indicators includes ten thematic areas related to economic social and environmental aspects, as well as institutional issues and global partnership (see Tab. 2). It should be emphasized that these themes also relate to the main objective of the EU Sustainable Development Strategy, namely the achievement of a prosperous economy, based on the principles of sustainable development, as well as a leading principle of good governance.

Table2. Themes and headline indicators of the SDI framework

<i>Dimensions</i>	<i>Themes of the SDI framework</i>	<i>Headline indicators</i>
economic	Socioeconomic development	Real GDP per capita, growth rate and totals
	Sustainable consumption and production	Resource productivity
social	Social inclusion	Persons at-risk-of-poverty or social exclusion
	Demographic changes	Employment rate of older workers
	Public health	Healthy life years and life expectancy at birth, by sex
environmental	Climate change and energy	Greenhouse gas emissions
		Primary energy consumption
	Sustainable transport	Energy consumption of transport relative to GDP
	Natural resources	Common bird index
global and institutional	Global partnership	Official development assistance as share of gross national income
	Good governance	<i>No headline indicator</i>

Source: Own elaboration based on (European Union, 2015, p. 9);
<http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

So far, over 100 indicators have been developed, including ten indicators were identified as headline indicators. Main indicators depict a general outline of EU progress towards sustainable development in terms of objectives and tasks set out in the strategy (United Nations, 2008, pp. 36-37). Further specification of the headline indicators includes operational indicators and supplementary (*explanatory*) indicators that due to the limited scope of the article have not been further explored.

It should also be noted that the results of the monitoring of the EU Sustainable Development Strategy are published by Eurostat every two years in the form of a report, showing the degree of achievement of the objectives of the Strategy and EU socio-economic situation, monitored by indicators of sustainable development for the ten thematic areas. Examples of results of the sustainable development monitoring are presented in the following chapter.

4. The effects of the measurement and progress assessment in monitoring of the European Sustainable Development Strategy exemplified by Poland

The European system of sustainable development indicators can be assessed in relation to various aspects. Based on the Eurostat methodology, the structure of sustainable development indicators allows the assessment of actions undertaken to promote sustainable development and of achieved progress in this regard. Overall evaluation of the results of monitoring can be done according to thematic areas based on headline indicators. Therefore, in the further part the degree of implementation of the European Strategy for Sustainable Development in the EU with special emphasis on Poland will be analyzed, based on key indicators relating to economic, social, environmental, institutional and political dimensions since 2005.

The economic dimension of sustainable development is monitored by two headline indicators, which is the size of real GDP per capita and resource productivity. By analyzing the indicator of real GDP per capita Poland has a leading position against the background of the EU average. The high level of this indicator in the years 2007-2014 has also been achieved in Bulgaria, Lithuania, Romania and Slovakia (European Union, 2015, p. 45). After a period of economic crisis, admittedly in recent years, real GDP per capita in the EU has been increasing, but the recovery of the European economy is very slow and uneven (see Figure 2).

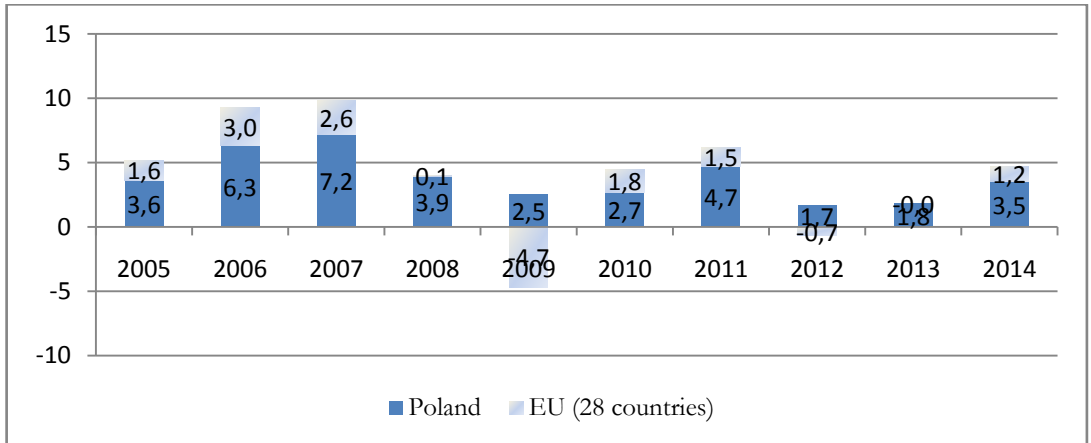


Figure 2. Real GDP per capita, growth rate and totals - Percentage change on previous year, EUR per inhabitant

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

The second indicator illustrating the main economic development is resource productivity, ie. the ratio of GDP and the total amount of materials directly used in its production. This indicator has improved significantly due to the overall decline in material consumption and GDP growth. Generally an improvement of resource efficiency is observed, while Poland has value below the EU average (see Figure 3).

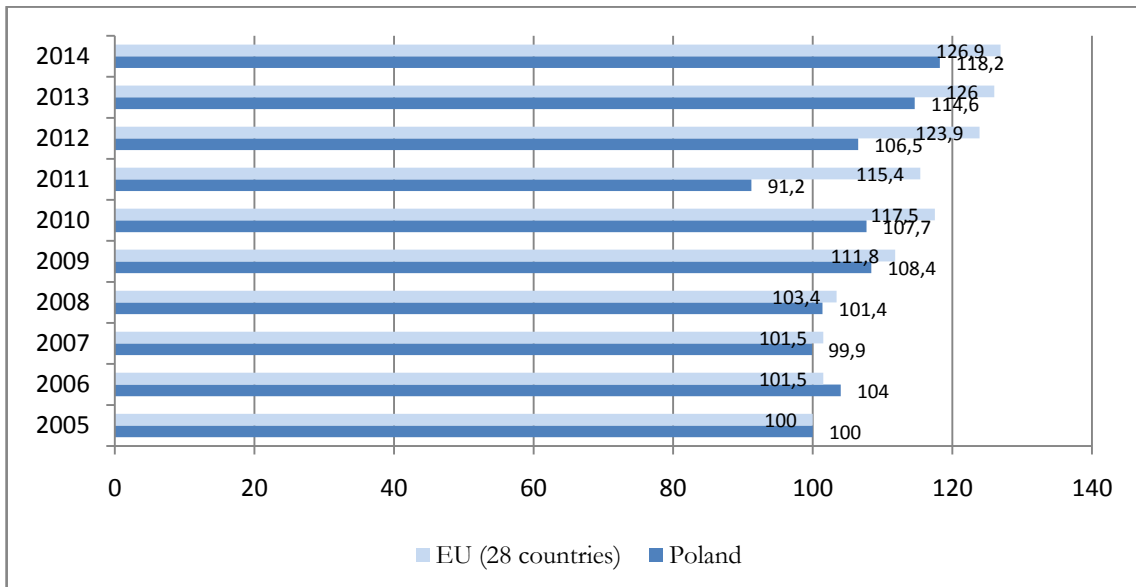


Figure 3. Resource productivity (Index: 2005 = 100)

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

In the social dimension of sustainable development what is measured is the relation to the three thematic areas, including social inclusion, demographic change, public health. Headline indicator monitoring the social inclusion is the indicator of people at risk of poverty or social exclusion. In 2005 and 2013, nearly 2.7 million people were lifted out of poverty or social exclusion, but activities in this area are assessed as insufficient to keep the EU on track towards the Europe 2020 poverty reduction target (European Union, 2015, p. 9). In 2013, almost one quarter of people in the EU were at risk of poverty or social exclusion, including Poland, which in the short term shows clearly negative trend (see Figure 4).

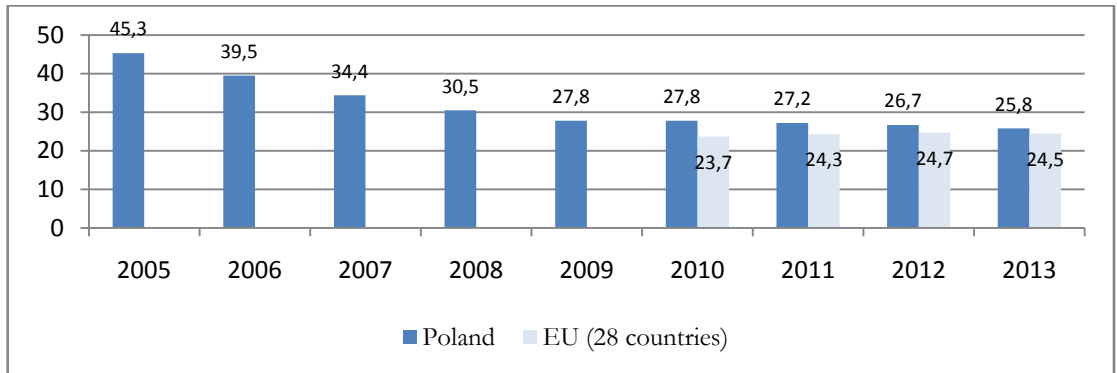


Figure 4. People at risk of poverty or social exclusion (percentage of total population)¹

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

Positive changes in the EU are, however, visible as far as other social goals are concerned, e.g. demographic change. The measurement of sustainability in relation to demographic change is made on the basis of the headline indicator for the employment rate of older workers. As can be seen from the figure below, there was a steady growth both in Poland and in the EU. As a result, in 2013 the EU reached the target of 50% employment for older workers, which was originally set for 2010 (European Union, 2015, p. 9).

¹ Data for the EU-28 available since 2010. The earlier years comprise the average EU-18 thus were not presented in the picture.

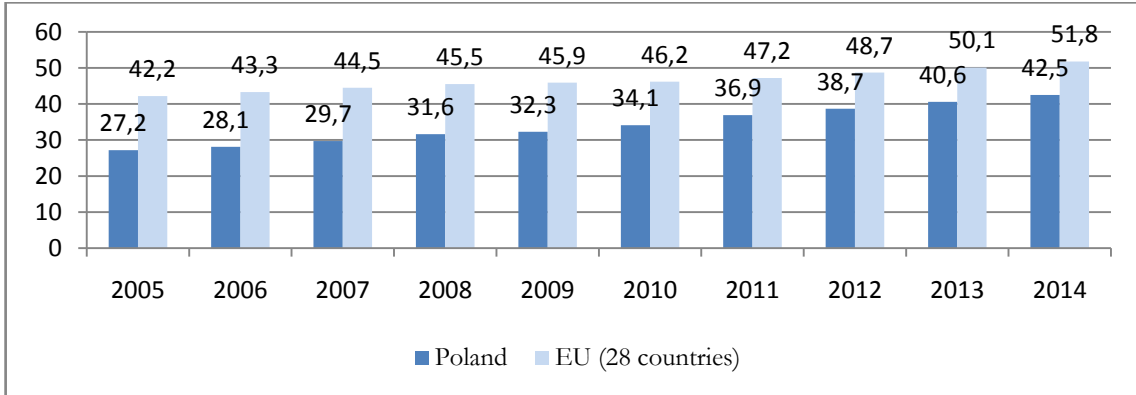


Figure 5. Employment rate of older workers (in %)

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

In the social dimension, the measurement of sustainable development includes public health, which is monitored using the headline indicator on “Healthy life years and life expectancy at birth, by sex”. It is clear that the average life expectancy for men and women, not only in the EU but also in Poland has been increasing in recent years, partly reflecting a positive developments in the field of public health (see Figure 6 and Figure 7).

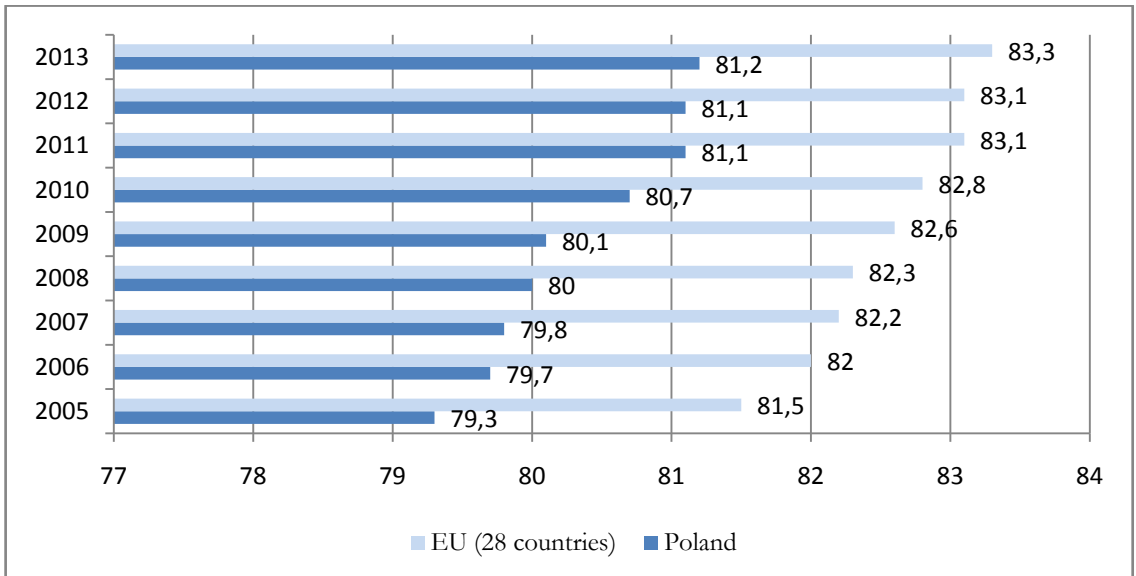


Figure 6. Life expectancy at birth, by sex: females

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

In addition, monitoring results also show that a girl born in the EU in 2013 can expect that she will live on average 83.3 years, and the boy - 77.8 years. This represents an

increase of 1.8 years for women and 2.6 years for males since 2005 (see Figure 6 and Figure 7).

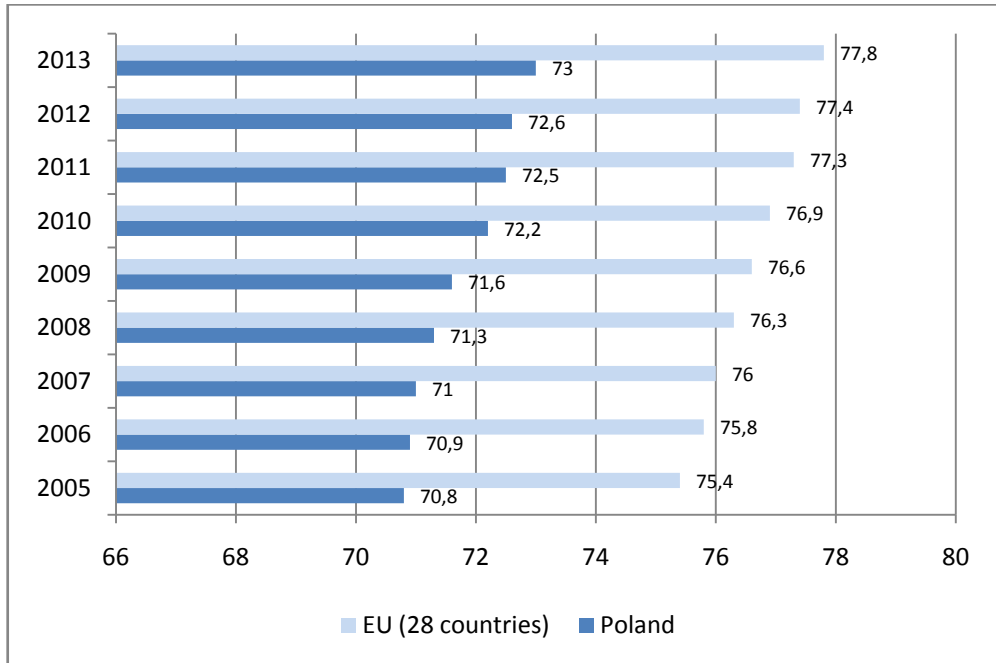


Figure 7. Life expectancy at birth, by sex: males

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

As for the environmental dimension of sustainable development, the main indicators also show diversified results. Clearly favorable changes in the area of climate change and energy were observed for one of the two headline indicators, namely greenhouse gas emissions, the size of which has steadily decreased over the long term. If this trend continues, the EU can quickly achieve its strategic goal for reducing emissions by 20% compared to 1990 levels. In 2012, it was lacking two percentage points to achieve this EU objective (European Union, 2015, p. 10). The impact of a favorable trend in this area had heavily influenced the transformation of the energy sector, in particular through an increase in energy efficiency and a partial transition from oil and coal to gas and renewable energy sources. Moreover, the recent economic crisis and the related decline in energy production and consumption contributed to this trend. The economic recovery may increase greenhouse gas emissions in the coming years. Poland achieved in this regard a slight improvement, but since 2010 has shown a higher greenhouse gas emissions than the EU average (see Figure 8).

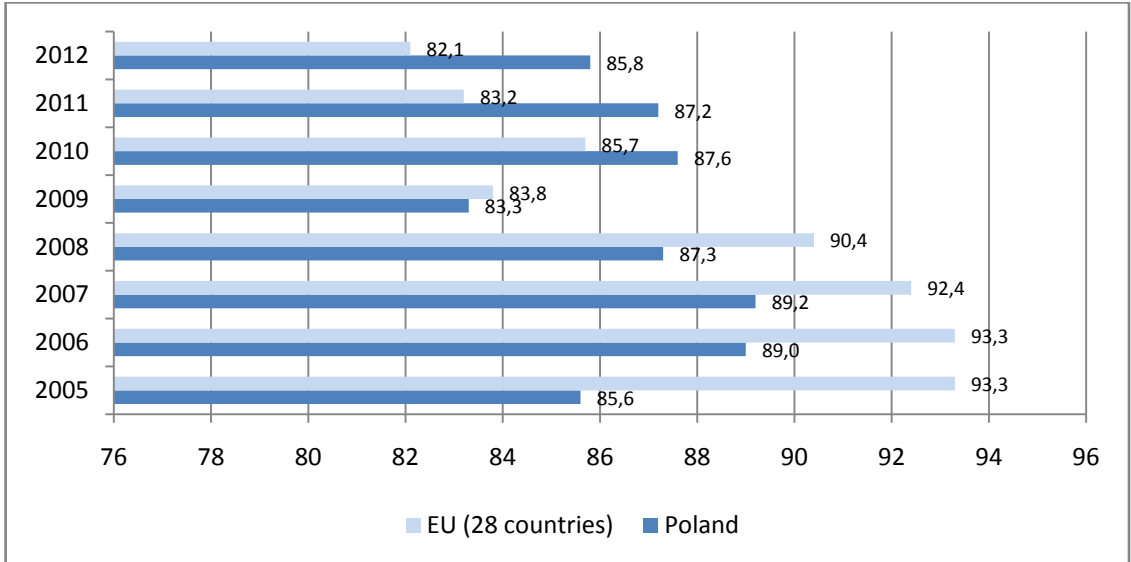


Figure 8. Greenhouse gas emissions (in CO2 equivalent) indexed to 1990

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

The second headline indicator, illustrating the area of the climate change and energy, is the primary energy consumption. Although the EU's primary energy consumption has been reduced to a lesser or greater degree since 2008 as a result of effective policies on energy efficiency and the weak economic situation in the EU, however, in Poland it is noted an increase in energy consumption (see Figure 9).

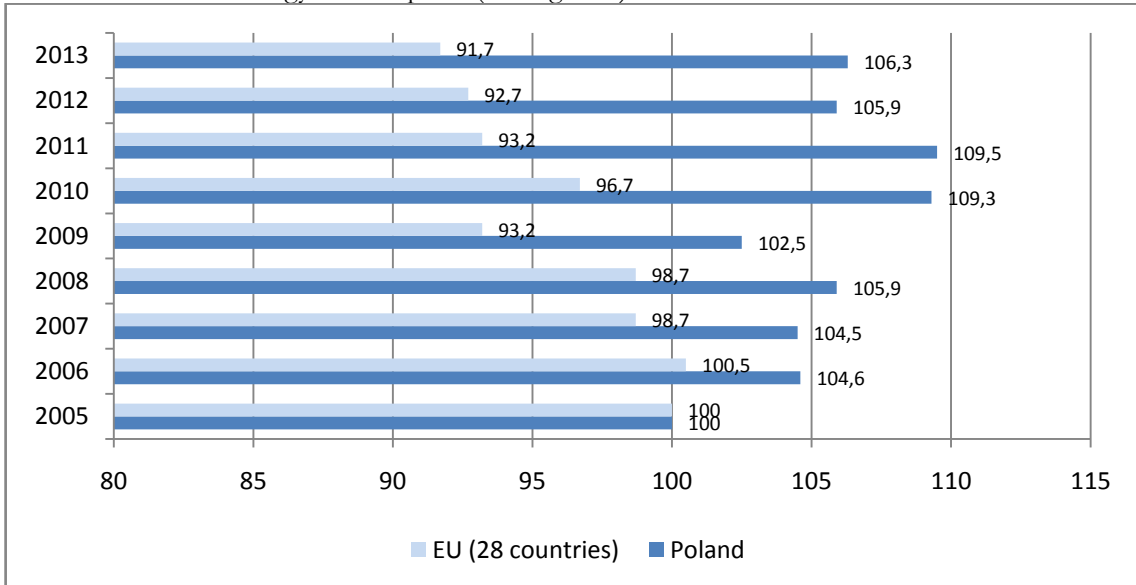


Figure 9. Primary energy consumption (index: 2005 = 100)

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

Similar trends are evident in the headline indicator in the area of sustainable transport, i.e. energy consumption of transport relative to GDP. This indicator reflects a moderately unfavorable long-term trend, but clearly a favorable trend in short-term. Overall, the EU can be seen in a gradual decline in this indicator, which does not necessarily reflect a better performance in terms of environmental protection. In Poland, energy consumption in transport is at a level above the EU average, but a slight decrease can be observed only from 2011 (see Figure 10).

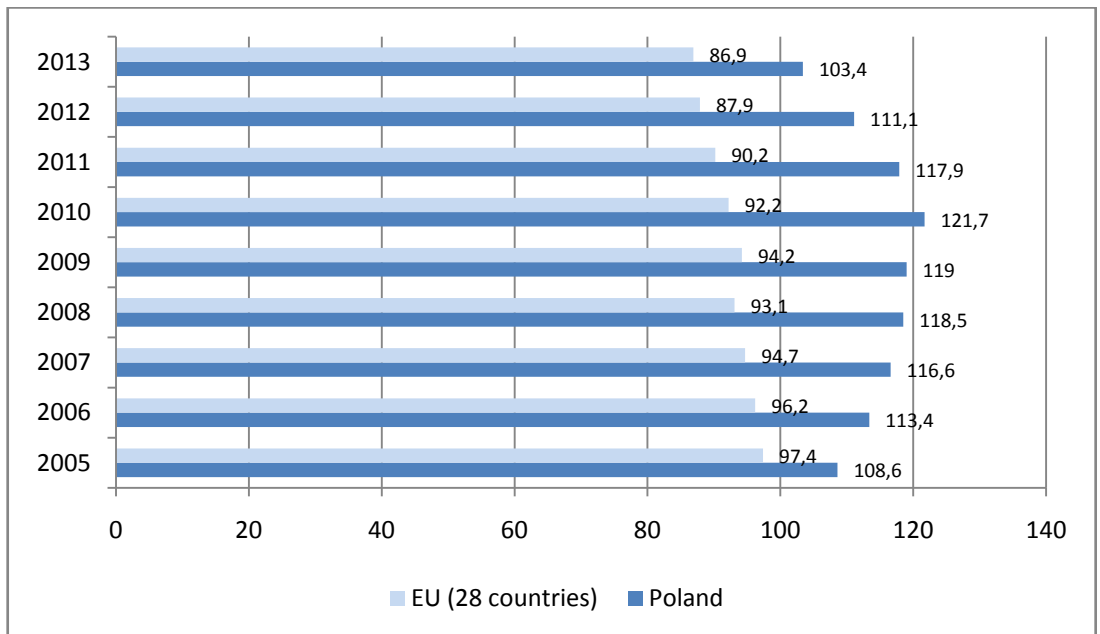


Figure 10. Energy consumption of transport relative to GDP (2000 = 100)

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

In the area of natural resources, the monitoring progress indicator is the headline indicator for the occurrence of common species of birds. This indicator shows deterioration of the situation over the long term (see Figure 11). In general, biodiversity in the EU is constantly under pressure due to the conversion of land, which are increasingly used in agriculture, infrastructure and human settlements. Data on this indicator are available only in an aggregate form for the whole EU without reference to individual countries.

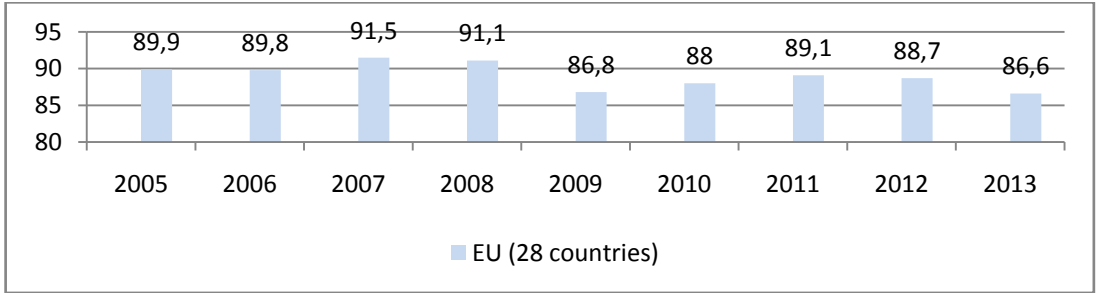


Figure 11. Common bird index (167 species) (1990 = 100)

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

With regard to commitments to the global partnership, the headline indicator concerns official development assistance as a share of gross national income (GNI). The share of gross national income spent by the EU on official development assistance ranges from 2005 at a constant level, while the EU's objective was to achieve a level of 0.7% of GNI in 2015. To some extent this is related to the economic downturn in the EU since the beginning of the economic and financial crisis in 2008. However, the EU is the biggest donor in the world, and its share of official development assistance for low-income countries has increased significantly in the long term (European Union, 2015, p. 10). Poland participates in this regard only to a small extent, far below the EU average (see Figure 12).

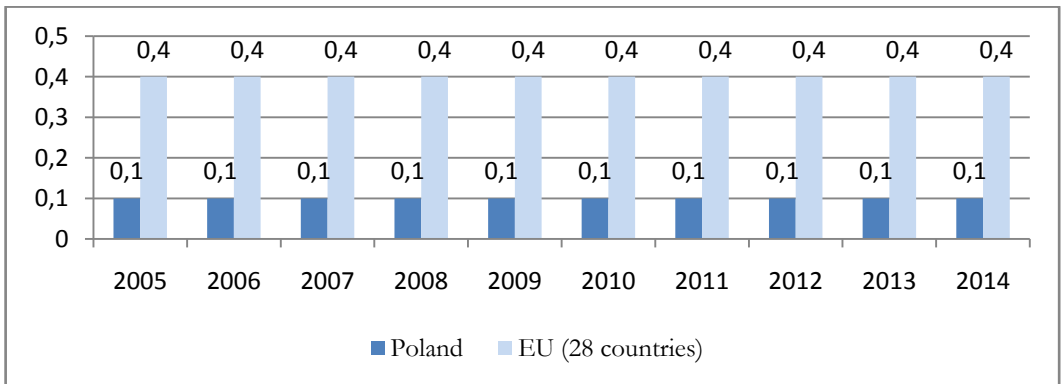


Figure 12. Official development assistance as share of gross national income (in %)

Source: Own elaboration based on: <http://ec.europa.eu/eurostat/web/sdi/indicators> (20.08.2015).

The last thematic area of sustainable development monitoring system for a good governance has no headline indicator because no indicator is considered strong enough and important for the policy to be able to provide a broad overview of the concept of good governance.

It must be concluded that, based on the analysis of headline indicators of sustainable development in relation to specific themes, the EU has achieved significant progress especially in terms of employment of older people and greenhouse gas emissions. It has already allowed to achieve or come close to achieving strategic goals. These indicators

represent the area of demographic change (social dimension), as well as the area of climate change and energy (environmental dimension). Favorable development trends can be seen included in terms of resource productivity, life expectancy, primary energy consumption and energy consumption in transport in relation to GDP. However, unfavorable situation or lack of progress occurs in relation to the fight against poverty or social exclusion, protection of natural resources and global partnership. Compared to the EU average, Poland shows better results only in the range of socio-economic development. The vast predominance in the economic area can attest to the priority of these issues for the Polish development policy. However, it can be assumed that the dominant importance of this dimension is not conducive to an integrated approach to implementation of sustainable development both in Poland and the EU.

Conclusions

The article presents the strategic considerations of sustainability measurement system and the analysis of results and assessment of progress in the implementation of the European sustainable development strategy with a special focus on Poland. The growing importance of sustainability, and therefore indicators to monitor progress in this regard, allow the creation of an effective system of measurement. The advantage of the European system of indicators is that it is based on the Sustainable Development Strategy, which sets out medium- and long-term socio-economic objectives and directions of measures consistent with the principle of sustainable development, taking into account social, economic and ecological cohesion. This enforces change in perceiving the issues of sustained development towards a complete integration at political level in particular Member States.

Due to the fact that decisions on economic, social and environmental development should be undertaken on the basis of a reliable evaluation of the existing conditions and the forecast of economic results as well as environmental and social impacts, there are needed appropriate indicators. They are based on the progress, development limits and its sustainability, as well as adjustment of policies, programs and sectoral development planning to be monitored. Sustainable development indicators constitute an essential tool for monitoring EU Sustainable Development Strategy, which illustrates in a measurable manner state and changes in the implementation of the new development paradigm. In assessing the European measurement system it must be stated that the current indicator system is so flexible that it allows changes in priorities and objectives. This system consists of a thematic framework providing a clear and simple structure of communication and supporting decision-making process at the political level.

In addition, the analysis of effects in relation to specific dimensions of sustainable development in the EU shows that progress is varied depending on the country and the analysis. On the basis of the headline indicators it can be concluded that positive effects have been achieved primarily in the environmental dimension (mainly through the reduction of greenhouse gas emissions and a gradual reduction in primary energy consumption), and only partly in the social and economic dimension. However, progress towards the social dimension of sustainable development is varied in relation to particular areas. Less positive trend is observed in development of social inclusion as

opposed to demographic changes measured by the headline indicator on the employment rate of older workers. Compared to the EU average Poland has achieved positive results mainly in the economic dimension, but in the short term favorable trends are also in the area of social inclusion and public health, and partly in the area concerning climate change and energy.

This article contributes to the existing literature on the measurement and monitoring of sustainable development through application of indicators of sustainable development. Based on the statistical data presented with respect to the headline indicators, it is necessary to further analyze the progress in the sustainable development implementation in the EU, including Poland. Future research should involve assessment of progress based on operational indicators that will allow a more detailed analysis and assessment of decision-making at the political level.

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