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Sustainable Development of One of the Poorest Province of the European Union: Lublin Voivodeship, Poland – Attempt of Assessment

Rozwój zrównoważony jednego z najbiedniejszych regionów Unii Europejskiej, Województwa Lubelskiego – próba oceny

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Abstract
This paper presents the attempt of sustainable development assessment for one of the poorest regions of the European Union (EU), Lublin Voivodeship in Poland, during its first decade in the EU, i.e. 2004-2013. Our analyses, performed for all pillars of sustainability: social, economic and environmental-technical, were based on sustainable development indicators (SDIs). The set of 21 sustainable development indicators, based on freely available statistical data, was proposed in this paper. The SDIs for Lublin Voivodeship were compared to values for Poland and the European Union. The special attention was put to assessment of sustainable development diversification between urbanized and rural areas of Poland and Lublin province. Our analyses showed than both, Poland and Lublin Voivodeship, clearly developed during the last decade but their sustainable development is still endangered and slowed down by several causes. Moreover, the value of most tested sustainability indicators was significantly below the European mean.

Key words: sustainable development, sustainable development assessment, sustainable development indicators, regional diversification

Streszczenie
W artykule przedstawiono próbę oceny zrównoważonego rozwoju jednego z najbiedniejszych regionów Unii Europejskiej (UE), położonego w Polsce w województwie lubelskim, podczas jego pierwszej dekady w UE (lata 2004-2013). Przeprowadzone analizy, odnoszące się do wszystkich głównych filarów zrównoważonego rozwoju: społecznego, gospodarczego i środowiskowo-technicznego, oparto o wskaźniki zrównoważonego rozwoju (WZR). W pracy zaproponowano zestaw 21 wskaźników, opartych o ogólnodostępne dane statystyczne. WZR dla województwa lubelskiego zostały porównane z wartościami dla Polski i Unii Europejskiej. Szczególną uwagę położono na ocenę zróżnicowania stopnia rozwoju między obszarami zurbanizowanymi i wiejskimi w Polsce i na

Lubelszczyźnie. Nasze analizy wykazały, iż oba obszary, Polska i województwo lubelskie, wyraźnie rozwinęły się w ciągu ostatniej dekady, ale ich zrównoważony rozwój jest wciąż zagrożony, bądź jest spowalniany, przez szereg przyczyn. Ponadto wartości większości badanych wskaźników zrównoważonego rozwoju plasowały się wyraźnie poniżej średniej europejskiej.

Słowa kluczowe: zrównoważony rozwój, ocena zrównoważonego rozwoju, wskaźniki zrównoważonego rozwoju, zróżnicowanie regionalne

Introduction

The principle of sustainable development defined by *Our Common Future* report (WCED, 1987) and introduced in 1997 to Article No. 5 of the Constitution of Republic of Poland (Dziennik Ustaw No. 78, item 483, 1997) assumes the development meeting the needs of present and future generations. This idea means development of a current generation in which appropriate required living conditions and usage of natural resources do not affect the sustainability of natural system, thus, allowing the future generations to have their needs met. The concept of sustainable development is usually considered on three independent but linked areas: environmental (ecological), social and economic (e.g. Harris et al., 2001; Harding, 2006). According to Pawłowski (2009) these three basic pillars of sustainable development may be additionally supported by the moral, technical, legal and political aspects. The developed complicated and complex strategies of sustainable development, realized with respect to nature and the rule of intergenerational justice, should integrate the all above mentioned circles of sustainability.

The increasing popularity of sustainable development, as well as formulation and enactment (more or less successful) of strategies of sustainable development, resulted in necessity of quantified assessment of the natural environment, economics, law, social issues etc. in relation to demands of concept of sustainable development. As the effect of interdisciplinary collaboration, which was triggered by UN Agenda 21 plan (United Nations, 1992), a number of Sustainable Development Indicators (SDIs) were formulated, allowing to quantify and assess the actual condition of the natural environment as well as social, legal, political and economic affairs in relation to sustainability (e.g. Gilbert, 1996; Palme et al., 2005; United Nations, 2007, Palme and Tillman, 2008; Munitlak, Ivanovic et al., 2009). The scientific attempts of interdisciplinary assessment of sustainable development (of selected settlement, basin, region or country/countries and subcontinents) are usually based on from approx. 10 to several dozens of applied SDIs. The exemplary selected indicators of sustainable development frequently reported in the international literature are presented in Table 1.

The exemplary SDIs presented in Tab. 1 show that realization of sustainable development strategy may be monitored and/or controlled by analyses of changes in countable and measurable values of selected several indicators representing various characteristics of at all three areas of sustainability. In 2011 the exemplary set of SDIs for Poland for the period 2004-2009/10 (according to available data) was presented by the Polish governmental agency Central Statistical Office (GUS, 2011). The assessment was based on 76 indicators for four main areas of sustainability: social, economic, environmental and legal/political. All discussed indicators were related to data available for countries of European Union. However, in some cases the proposed indicators, especially in the field of environmental and technical sustainable development, may seem to be quite general. Moreover, the performed analyses for the whole country do not consider the spatial diversification of Poland's social and economic potential as well as environmental and technical conditions among all provinces of the country. In addition, the discussed

Table 1. Selected exemplary SDIs (modified after Kondratyev et al., 2002; Hezri and Hasan, 2004; Palme et al., 2005; Ioris et al., 2008; Munitlak, Ivanovic et al., 2009; Tsai, 2010)

Pillar of sustainable development	Selected SDIs
Environmental and technical	Emission of pollutants to water, air and soil, (e.g. methane, CO_2, BOD, COD, phosphorus, greenhouse gases, production wastes, toxins, heavy metals, oil derivatives), available resources (e.g. water, coal, gas, oil), availability of resources (e.g. population supplied in water), use of resources (e.g. water, coal, oil and gas), use of energy (conventional, renewable), roads and railways infrastructure, melioration, use of fertilizers, use of pesticides, reliability, volume of collected sewage, amount of deposed wastes, biodiversity of ecosystems, system stability (e. g. ecosystem of watershed or river).
Economic	Gross domestic product, gross domestic product per capita, income, income per capita, public debt, outside debt, inflation, industrial growth, arable land area, fallow land area.
Social, political and legal	Population, rural and municipal population, natural growth, mortality, infant mortality, length of life, poverty, illiteracy, unemployment, corruption, education, health care, parity, gender equality, political freedom, human rights, institutional readiness, social involvement.

sustainable development of Poland was not assessed according its differentiation between municipal and rural regions.

The United Nations guidelines (UN, 2007) described set of 50 indicators, without division along the pillars of sustainable development. The indicators developed by Commission on Sustainable Development, which were mainly used in the GUS's report of 2011, should be first applied to the analyses of sustainability at the national level. However, it is possible to introduce, beside the officially suggested, other indicators for the regional scale analyses, but they need to meet the several requirements. The adopted SDI should be representative, conceptually sound, understandable, clear and unambiguous, based on easily available data of known and proven quality, relevant to assessing sustainable development progress and finally limited in numbers but adoptable for future needs (UN, 2007).

The recent history of Poland in the 20th and 21st century resulted in a huge differentiation of several country regions. Before gaining back its independence in 1918 Poland was for more than 100 years partitioned among three superpowers: Romanov's Russian Empire, German Reich (earlier Prussia) and Austro-Hungarian Empire. As the effect, the reborn Poland in 1918 was consisting of three parts of different legal and monetary systems, agriculture and industry development, roads and railroads infrastructure, metric systems, technical and environmental standards, numerous ethnical minorities etc. The year 1939 and the beginning of World War II brought end to the free Republic of Poland, which was partitioned between Nazi Germany and Soviet Union. As the outcome of the war of 1939-45 in the new *Yaltan* order Poland was left in the Soviet sphere of influence. The country borders were moved West, to the river Oder, while the huge eastern part of country was introduced to the Soviet Union. Incorporation into the Soviet bloc resulted in radical changes in country policy, economy and legal system, industry development (dispensable development of heavy industry), ownership of means of production as well as lack of personal and political freedom. The collapse of the Eastern bloc in 1989, caused by, inter alia, the Solidarity revolution, opened for Poland the road to free and sustainable growth but its underdevelopment in many areas should be first overcome. The entry of Poland to European Union in May 2004 seems to be a pivotal date in Poland's development, first proving the progress made since 1989, second opening the new opportunities for sustainable development. The unanswered question concerns the actual state of sustainable development in Poland and, specially, in its less developed and most diversified region, the Lublin province.

This paper presents the attempt of sustainable development assessment for one of the less developed regions of European Union, the Lublin Voivodeship, Poland. The performed analysis was related to development of the whole country and to the international level of the European Union. Additionally, the diversification of development between municipal/urbanized and rural regions of Lublin Voivodeship, as well as Poland, was discussed.

Materials and methods

Object description

Lublin Voivodeship, located in the southeastern Poland, in its current shape established on January 1, 1999, is third of biggest administrative regions in Poland, its area is equal to 25 122.49 km² while its population was, in the end of 2013, equal to 2156150 people, which was approx. 5.6% of Poland population (www.stat.gov.pl). The population density in Lublin Voivodeship is equal to approx. 85.8 residents per km^2. According to the administrative division the Lublin Voivodeship is divided into 24 counties (powiats) covering 4 city counties and 20 land counties, which are further divided into 213 rural communes (gminas). There are 42 cities and towns and 4 116 rural settlements in the province. The largest city in the voivodeship, its capital, Lublin with population of approx. 344 000 (www.stat.gov.pl) is 9th city in the country, according to population size. The next three largest towns of Lublin Voivodeship are Chełm, Zamość and Biała Podlaska with population between approx. 70 000 and 50 000 residents. Lublin Voivodeship is definitely a rural region, with rural population exceeding 53.7% of total number of province residents. Recently its gross domestic product per capita was reported as equal to 30 477 PLN (approx. 7256 Euro) makes Lublin Voivodeship the poorest region in the country and one of the poorest in EU.

After political and economic transformation of Poland during the last decade of the 20th century and collapse of several heavy industry enterprises in Lublin, the industrial production located in the province is very limited, achieving approx. 2.5% of the production in the country while sale of construction and assembly production reaches approx. 3.0%. Economic transformation also resulted in increased level of unemployment, of which the registered unemployment reached the range 11.2%-17.8% in period of 2004-2013. As the result, the considerable part of province residents is endangered by poverty, legal or relative, up to over 20% of the total population.

Methodology

Sustainable development assessment of Lublin Voivodeship was conducted for the time period of 2004-2013. The starting date was selected according to the pivotal date in last decade of Poland's history, i.e. joining the European Union during the largest single expansion of the EU on 1 May 2004. The analyses were based on sustainable development indicators method. The applied indicators were based on data

Table 2. SDIs applied to sustainable development assessment of EU, Poland and Lublin Voivodeship

Pillar of sustainable development	Sustainable development indicator	Unit	Definition
Economic	Gross Domestic Product per capita	Euro	Gross Domestic Product (market value of all goods and services produced in a year) divided by number of the population.
	Commune income per capita	Euro	Income of local administration per one resident.
	Mean gross salary	Euro	Mean salary before tax deduction.
	Monthly income per capita	Euro	Mean monthly income per one resident.
Social	Registered unemployment	%	Percentage of officially registered unemployment.
	Rural vs. total unemployment	%	Registered unemployment in rural regions related to total registered unemployment.
	Poverty threshold	%	Percentage of population living below the national legal and relative poverty threshold.
	Birth rate indicator	-	Difference between births and deaths related to 1000 inhabitants
	Infant mortality rate	‰	Relation of infant deaths to infants births per 1000 inhabitants
	Total fertility rate	-	Average number of children that would be born to a woman over her lifetime.
	Population per one hospital bed	-	Number of inhabitants related to number of available hospital beds.
	Patients per hospital bed	-	Number of treated patients related to number of available hospital beds.
	Net migration rate	-	Difference of officially registered immigrants and emigrants of an area divided per 1000 inhabitants.
Environmental and technical	Water use	m^3/m	Yearly water consumption per one inhabitant.
	Water supply network users	%	Number of inhabitants connected to water supply systems related to total population.
	Sanitary sewer users	%	Number of inhabitants connected to sanitary sewer systems related to total population.
	Water supply network density	km/100 km^2	Length of water supply network pipelines per 100 km^2.
	Sanitary sewer network density	km/100 km^2	Length of sanitary sewer network pipelines per 100 km^2.
	Waste water treatment plant users	%	Number of inhabitants connected to waste water treatment plants related to total population.
	Total wastes	kg/person	Total wastes mass related to one inhabitant
	Sorted vs. unsorted wastes	%	Relation of sorted domestic wastes to unsorted wastes.

published by Polish government executive statistical agency Central Statistical Office and freely available in Local Data Bank at www.stat.gov.pl. Data considering indicators of sustainable development for United Europe and its member countries were obtained from the EU statistical office Eurostat web page and several reports concerning indicators of sustainable development of the EU (GUS, 2011; Eurostat, 2013a, 2013b).

The performed attempt of Lublin Voivodeship's sustainable development assessment related to development of the whole country and the international level of the EU was conducted for the following areas of sustainability: social, economic and environmental – technical. In many specific cases the development of Lublin province was analyzed separately basing on the established indicators for both, urban and rural regions of the province. The special attention was paid to impact of the environmental engineering on sustainable development (Pawłowski, 2010).

Table 2 shows the indicators of sustainability applied to the presented study.

Sustainable development analyses

Economic development

The most frequently used economic indicator describing standards of living of a country or a region is Gross Domestic Product (GDP) per capita. According to EU data the real GDP per capita for EU mainly increased, excluding slight decrease and limited growth after world crisis period in 2008 year,

from 19 600 Euro in 2000 to 26 600 Euro in 2013. The GPD per capita in Euro zone reached even higher level.

In 2013, according to actual Eurostat data, GDP per capita of Poland was equal to 10300 Euro, which makes it 38.7 % of EU and 33.9% of Euro zone GDP per capita. Only two countries in the EU present significantly lower indicators. Bulgaria with GDP per capita equal to 21.1% of EU and 19.0 of Euro zones GDP as well as Romania with 27.1% and 22.7% respectively. The similar level of the discussed SDI to values for Poland is presented by Hungary (37.9% and 34.2%), while Latvia (43.6% and 36.9%) and Lithuania (44.4% and 38.0%) present slightly higher indicators. The available Polish data, presented by GUS for the Lublin Voivodeship (of population comparable to Latvia and Lithuania) shows the real GDP per capita for year 2012 equal to 7019 Euro per person. This value is 70.3% of GDP per capita of Poland and 26.4% of indicator for the EU. The historical development of analyzed SDI for Lublin Voivodeship, Poland, EU and its Euro zone in the period of 2004-2012 may be observed in Fig. 1.

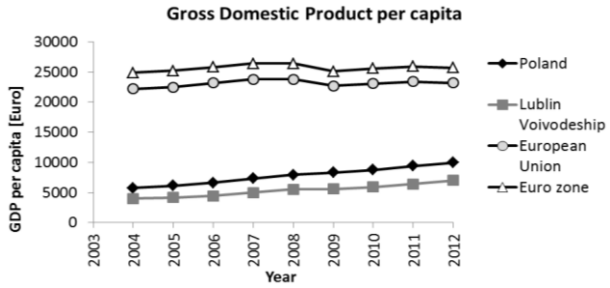

Figure 1. GDP per capita for Lublin province, Poland, European Union and Euro zone in period of 2004-2012 (developed after data by GUS and Eurostat)

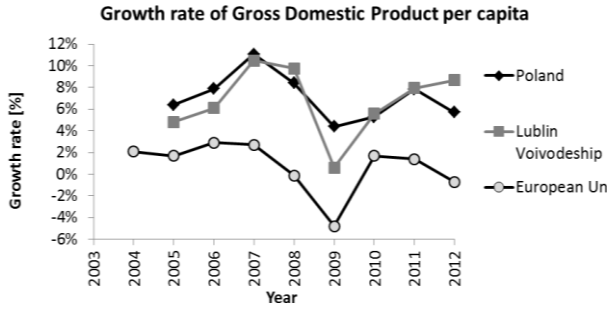

Figure 2. Growth rate of GDP per capita for Lublin Voivodeship, Poland and European Union in period of 2004-2013 (developed after data by GUS and Eurostat)

Fig. 1 and Fig. 2 show that economics of Poland and Lublin Voivodeship were not significantly affected by the world crisis in 2008, which clearly hit European economics in 2009. The growth rate of GDP per capita for Lublin province and Poland were slowed down by the crisis but the negative values were not reached. According to Polish data, the lowest value observed, growth rate of 0.6%, was noted in Lublin Voivodeship in 2009, at the same time the value for European Union reached the level -4.8%.

However, despite the fact, that analyses of growth rate of gross domestic product per capita suggests that economy of Lublin Voivodeship developed for the tested period slightly slower that in the rest of the country, but at the satisfactory level (even exceeding the GDP growth at the end of 2013), the real level of life may be assessed by application of another two indicators, i.e. mean gross salary and monthly income per capita. Mean gross salary for inhabitants of Lublin Voivodeship was permanently lower than the mean value for the country during the considered period of time and rested in rather steady level of the range from 87% to 90 % of mean salary for Poland. Its value varied for Lublin Voivodeship between 499 Euro in 2004 and 831 Euro in 2013, while for Poland these values were 574 in 2004 and 923 in 2013, respectively. Although, monthly income per capita for residents of Lublin province was constantly decreasing its value in relation to country's mean value – from 92% in 2004 (161 Euro vs. 175) to 85% in 2013 (252 Euro vs. 304 Euro).

Economic development of the region may be also assessed according to changes in local governments' incomes per capita. The clear increase of communes incomes per capita for the considered period is visible, starting from 449 Euro in 2004 to 892 Euro in 2013 for Poland, including cities and from 379 Euro in 2004 to 738 Euro in 2013 in rural areas. For the same period the same values for Lublin Voivodeship (including cities) increased from 389 Euro to 810 and from 350 to 702 Euro for rural areas. Thus, a huge difference between incomes of communes, including cities and rural ones, in the scale of the whole country is visible. The incomes per capita of rural local governments were equal to approx. 82-85% of communal incomes including cities. Despite the fact that incomes of communes including cities were lower in Lublin Voivodeship during the period of the analysis, reaching the value of 82-91% of Poland's incomes, reaching even in some period of time the level comparable to country's rural communes income, the difference between municipal and rural communes incomes located in Lublin province were in the range of 87-92%.

The brief analyses of sustainable development of Lublin Voivodeship and Poland, related to level represented by states of the European Union, showed that both, Poland and Lublin province developed significantly during the considered period of time. However, despite the fact that GDP per capita showed weaker reaction of Polish economy to the world crisis started in 2008, the quality of life in Poland may be affected by the low value of gross product. Additionally, all tested economical SDIs for Lublin Voivodeship showed considerable differences between the region, especially its rural part, and the whole country. The development of the Lublin province's economy similar in rate to the development of Poland's economy is not enough to fill the gap in all applied development indicators.

Social development

Generally, social development may be assessed by means of several indicators, connected also to quality of live understood as well-being of societies or individuals. The selected SDIs describing quality of live were already used in description of the actual progress of economic development for EU, Poland and Lublin Voivodeship, so the total registered unemployment rate, directly connected to economy and creating social problems affecting quality of life, will be discussed as the first.

According to data reported by Eurostat the actual total registered unemployment rate for Poland equal 10.3% is close to the mean value for European Union (10.8%). However, official data presented by Polish GUS for year 2013 show the registered unemployment rate for Poland as 13.4%. Nonetheless, there are numerous countries in EU of registered unemployment higher than observed in Poland, e.g. starting from Spain, Greece with 26.1% and 27.5% in 2013, respectively, to Croatia, Cyprus, Portugal and Slovakia of unemployment in range of 14.2%-17.3%. On the other hand, there are the countries with the lowest rate of registered unemployment, such as Austria (4.9%) and Germany (5.2%). Fig. 3 presents the development of registered unemployment in EU, Poland and the Lublin Voivodeship for 2004-2013. It shows, that in 2004 the registered unemployment in Poland and Lublin Voivodeship was approx. two times higher than in the countries of European Union. Then, the observed indicators of unemployment for Poland decreased significantly until the year of 2008. Since 2008, the increased world and European crisis resulted in nearly parallel increase of registered unemployment in all the discussed regions: The EU, Poland and Lublin Voivodeship. However the value for discussed SDI is still significantly higher in Poland than the mean value for European Union by approx. 30%.

The full assessment of unemployment in Poland and Lublin Voivodeship should be supported by the analysis of unemployment diversification. According to official data for year 2011, over 60% of population in Poland was living in the urbanized areas. In the scale of the whole country for the period of consideration the registered unemployment in rural areas was in range of 42%-44% so its roughly corresponds to percentage of rural population in Poland, 38-39% of total population. The registered unemployed residing in rural settlements of Lublin Voivodeship during considered time period were in range 53-55%, higher than in case of the whole country, but again roughly corresponding to the share of rural population in Lublin province (approx. 53% of residents).

Another indicator of sustainable development connected to social matters and directly resulting from the economic conditions is number of people at risk of poverty and social exclusion (AROPE). According to EU regulations (1177/2003, 1553/2005, 1791/2006) AROPE is defined by share of people who are: i) at risk of poverty, meaning below the poverty threshold; ii) in a situation of severe material deprivation and iii) living in a household with very low work intensity. The EU poverty threshold for risk of poverty is understood as persons with an equivalised disposable income below the risk-of-poverty threshold, which is set at 60 % of the national median equivalised disposable income.

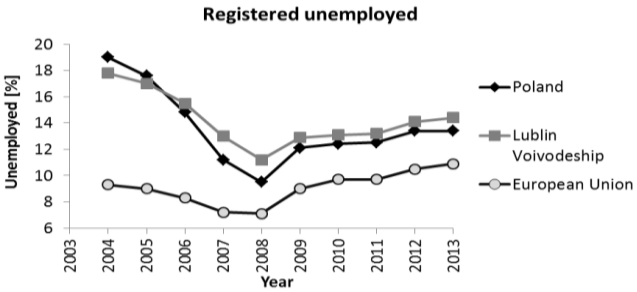

Figure 3. Registered unemployment for EU, Poland and the Lublin Voivodeship in 2004-2013 (developed after data by GUS and Eurostat)

According to Eurostat mean share of people at risk and social exclusion in 2013 was equal to 24.5%, while the highest values observed for Bulgaria and Romania reached the values of 48.0% and 40.4% respectively. The lowest values of ARPOE was in 2013 observed in the Netherlands, Sweden and Czech Republic equal to 15.9%, 16.4% and 14.6%, respectively. During the same time European indicator of people at risk and social exclusion in Poland was equal to 25.8%, slightly above the average value. The level comparable to presented by Poland was in 2013 achieved by several countries such as United Kingdom, Spain and Portugal. However, it is worth to note, that, according to Eurostat data, number of people endangered by poverty and social exclusion in Poland decreased significantly in the period 2004-2013. In year 2005 noted value of ARPOE indicator for Poland was equal 45.3%, then, in 2008 reached the level of 30.5%, just to decrease to 27.8% - 27.2% between 2009-2011.

The inner Polish statistics, presented by GUS, are based on several thresholds of poverty of which the legal, relative and minimum of existence thresholds are commonly used. According to Polish regulations, the legal poverty threshold determines the percentage of persons living in households of expenses lower than the one allowing to obtain the financial support from the social help (due to the binding Polish law). The relative poverty threshold determines the percentage of people living in households of expenses lower than 50% of mean expenses of the total number of households in the country. The last poverty threshold used in Poland determines the share of people whose incomes allow only to secure the basic needs necessary for biological survival of human being.

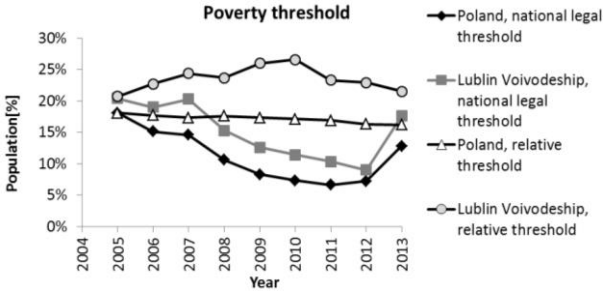

Figure 4. People endangered by various types of poverty in Poland and Lublin Voivodeship in the period 2005-2013 (developed after data presented by GUS)

Fig. 4 shows the time variable development of percentage of Poland and Lublin Voivodeship residents endangered by various types of poverty threshold. During the whole analyzed time period, the poverty indicators for Lublin province were higher than the mean values for Poland. Additionally, it's worth to mention than during the last three years for which the official data are available (2011, 2012 and 2013) the studied indicators for Lublin Voivodeship belonged to the group of the highest in the country reaching the following values: legal poverty threshold indicator 10.3%, 9.0% and 17.6%, relative poverty indicator 23.3%, 22.9% and 21.5% and minimal existence indicator 11.0%, 8.5% and 9.4%, respectively. Fig. 4 shows also that time varied curve, presenting percentage of people endangered by reaching the legal poverty threshold, has similar shape and decreasing tendency for both, Poland and Lublin Voivodeship. The only difference is the indicator value, higher for Lublin province by approx. from 13% to 56%. In case of the other studied indicator the higher differentiation between the values for Poland and Lublin province may be observed because not only the higher values but in the increasing trends for Lublin Voivodeship.

Social sustainable development may be assessed also by application of indicators related to generally understood health of the population. One of the most worldwide popular and commonly applied indicator is the birth rate. According to EU data, the mean birth indicator for EU in 2012 was equal to 0.3, while the value reported by Eurostat for Poland was equal to 0.0. Meanwhile, the lowest values of the birth rate in EU were noted in Cyprus and Malta, -3.4 and -2.4, respectively. The highest birth hate was observed in Lithuania reaching 2.9 (similar values of approx. 2.8 were noted in Latvia and Bulgaria). Thus, the birth rate indicator for Poland does not differ significantly from the European mean.

Fig. 5 presents comparison of the birth rate for the EU, Poland and Lublin Voivodeship based on data allowed by Eurostat and Polish GUS for the selected period of analysis. It's clearly visible that through the whole analyzed time the birth rate indicator for the Lublin province was significantly lower than for the whole country and the EU mean and had the negative value for the studied decade. Recently, according to GUS data, the discussed indicator for Poland is equal to -0.46 and for Lublin Voivodeship -1.44.

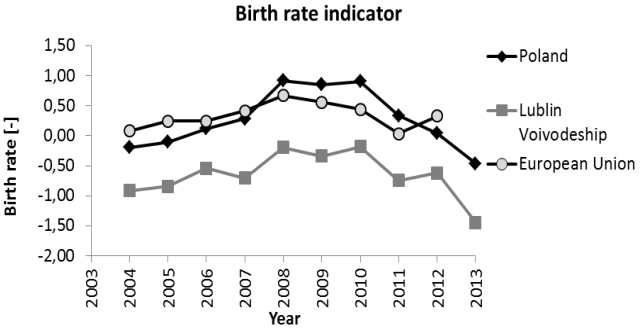

Figure 5. Birth rate indicator for EU, Poland and Lublin Voivodeship, based on GUS and Eurostat data

Another social SDI connected to population's health is the infant mortality rate, which was commonly used in the past to assess the capability of health care system and popularly understood quality of life. Actual, the mean infant mortality rate per 1000 births for all EU countries, presented by Eurostat, is at the level of 3.8, while for Poland 4.6. The lowest mortality rates in 2012 were observed in Slovenia (1.6), Finland (2.4), Luxembourg (2.5) and Sweden (2.6). On the other hand, the highest infant mortality values were noted in Romania (9.0), Bulgaria (7,8) and Latvia (6.3). The level similar to represented by Poland was reported for Hungary and the United Kingdom. There are no significant differences between infant mortality rates reported by Polish GUS for Poland and Lublin province. The reported values are similar and the decreasing tendency, providing for improvement in public health care, is visible. The infant mortality rate in Poland for the considered period decreased from 6.8 to 4.56, while in Lublin Voivodeship from 7.93 to 4.56.

The another SDI allowing to assess the social sustainable development and connected to public health and society wealth may be the total fertility rate. In EU in 2013 it was equal to 1.58, for Poland even less, 1.3. The lowest value in European Union, equal to 1.28 was reported for Portugal, while the highest values, 2.01, were noted for Fance and Ireland. If we add, that in the UK and Sweden, total fertility rate is at level of 1.92 and 1.91, respectively, it becomes visible that the top fertility rates were noted in countries of significant immigration, registered and unregistered.

Fig. 6 shows changes of total fertility rate for Poland and Lublin Voivodeship and for the European Union in the period of 2004-2013. It's visible, that after few opening years of the studied decade the level of discussed SDI became the same. Changes of fertility rate in Poland and Lublin province are corresponding to changes in some economic SDIs, such as gross rate of GDP per capita or registered unemployment.

Additionally, the total fertility rate in Poland and Lublin region was lower than the mean EU value for the whole considered period.

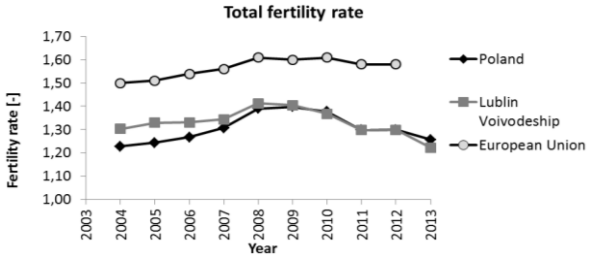

Figure 6. Total fertility rate for EU, Poland and Lublin Voivodeship, developed after GUS and Eurostat data

Public health care, affecting social sustainable development, may be assessed by its accessibility, quantified by the number of hospital beds available for the population of a country or region.

The mean value of population per one hospital bed, according to calculations based on Eurostat reports, was in 2011 equal to 225. For the same year this SDI for Poland, according to Eurostat, was equal to 153, while the lowest value of 122 was noted for Germany and the highest, 370, for Sweden. The similar population per one bed to the one reported for Poland were in 2011 observed in Bulgaria (155), France (157) and Belgium (158).

The Polish governmental statistical agency, GUS, presents slightly different data concerning the discussed SDI. According to this source, actually, the population per one hospital bed reached in 2013 level of 205, while this indicator for Lublin Voivodeship was equal to 187. The historical development of the concerned SDI is presented in Fig. 7. The difference between indicator for the whole country and for the Lublin province remains nearly constant through the analyzed period, but the accessibility of public health care in Lublin region was easier, because of lower population per one hospital bad. However the number of patients treated, related to one hospital bed, was in the last decade similar or slightly lower in Lublin Voivodeship then in the whole country. In 2004 – 35 people were treated one bed in Lublin region, 37 in the whole state of Poland. After nearly a decade, in 2011, 42 people were treated on one bed in Lublin Voivodeship and 44 was the mean value for Poland. Thus, the public health care in Lublin province may be assessed as slightly less effective than the mean values representing the whole country. Both SDIs, for Lublin region and for Poland showed mostly lower values during the considered period than the reported EU mean.

Finally, social sustainable development may be also assessed by analysis of net migration rate SDI. However it should be remembered, that usually presented data concern only the official registered migration, which in any cases may be significantly lower than the unofficial, unregistered migration. The mean migration rate for EU in 2013 reached the level of 3.3, while for Poland -0.5 migrants per 1000 inhabitants. The above means, than people are still migrating to the countries of European Union, but inhabitants of Poland are leaving their country. The highest positive migration rate was in 2013 noted for Italy, 19.7, the lowest negative equal to -13.9 was reported for Cyprus. Net migration rate observed for Poland had the lever comparable to Czech Republic, Bulgaria and Romania.

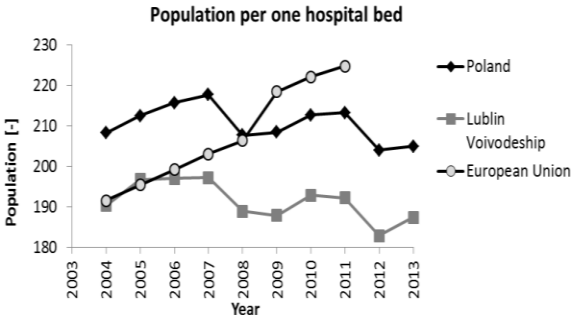

Figure 7. Population per one hospital bed in EU, Poland and Lublin Voivodeship, developed after GUS and Eurostat data

Fig. 8 presents the historical net migration rate SDI for the period of 2004-2013 for Poland and Lublin Voivodeship. Both presented curves are quite similar, in most cases net migration rate, for both, Poland and Lublin region are negative, however, the discussed SDI had greater values for Lublin Voivodeship. During the same decade, the net migration rate for the EU, reported by Eurostat, was clearly higher, reaching only positive values (see Fig. 8).

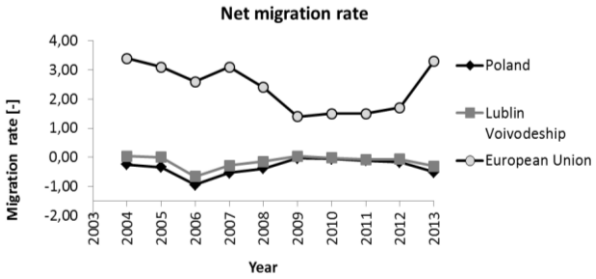

Figure 8. Net migration rate for EU, Poland and Lublin Voivodeship, developed after GUS and Eurostat data

The presented above attempt of assessment of social sustainable development of Poland and Lublin Voivodeship showed some progress since the date of entry to European Union, e.g. in public health care, despite the temporal changes related to economic and political situation in and outside of the country.

The presented data also shows, that Lublin region, in most cases, develops slower than the mean values for the rest of the country. However, there are visible areas where the social sustainable development of Poland and Lublin Voivodeship is endangered. Relatively high and constantly slightly increasing registered unemployment, high and constant rural unemployment, significant numbers of inhabitants endangered by poverty, decreasing birth rate, negative

value of net migration rate suggest, that Poland and its poorest region, Lublin Voivodeship are not so attractive for their residents as they should be.

Environmental and technical development

Usually the environmental and technical development is assessed by several SDIs connected do quality of environment, its pollution, available resources and their quality. However, in this paper we would like to propose the alternative set of easily available and understandable indicators, focused mainly on interactions between environment, technical infrastructure of environmental engineering and quality of life and health of population (see Tab. 2).

In our opinion, there is no quality of life and development of population without access to fresh water resources. The mean yearly water use for several countries of EU, reported by Eurostat, was in 2011 at the level of 69 m^3 per inhabitant, while water use in Poland was equal to 40 m^3 per inhabitant. The highest water use per one resident in 2011 was reported in Cyprus reaching over 158 m^3 per resident and Latvia, 120 m^3 per resident, the lowest in Lithuania and Estonia, approx. 33 and 36 m^3 per resident, respectively. The level reported of tap water use for Poland was noted only for Romania. The neighborhood EU countries of Poland showed grater water use, i.ge. Czech Republic 47 m^3 and Germany 50 m^3.

To better understand structure and amounts of consumed fresh water by households residents the another SDI should be introduced: population, in percentage, connected to water supply pipelines.

The mean value of inhabitants connected to organized water supply systems in the European Union was in 2011 equal to 92.3%. The highest possible values, i.e. 100%, were reported for the seven countries, including e.g. Belgium, Spain and the Netherlands. The population connected to water supply over 90% was reported in eight EU countries. On the other hand, 57% of population were connected to water supply pipelines in Romania. The mean population of member countries of EU during the decade between 2004 and 2013 was in the level of 91.0%-92.3%.

The precise info describing yearly water use in Poland and Lublin Voivodeship, with differentiation on municipal and rural areas, is presented in Fig. 9 and Fig. 10. Generally, we may state that yearly water use for whole country of Poland was at the nearly constant level, in the range of 31-32 m^3 per inhabitant, more than twice lower than the mean value for the EU. It is visible that in both, Poland and Lublin Voivodeship, water use in the cities was significantly higher during the whole period of analysis then tap water consumption in the rural areas. Fig. 10 shows also the constant decrease of water use in the cities and increase in the rural areas, both for Poland and Lublin region. However, the tap water consumption in cities of Lublin Voivodeship was at comparable level to the mean consumption for the whole country. Additionally, tap water use in the rural areas of Lublin was the lowest of analyzed values, for the whole period concerned.

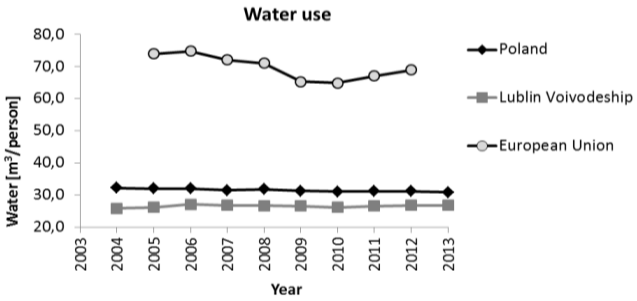

Figure 9. Water use per inhabitant in EU, Poland and Lublin Voivodeship, developed after GUS and Eurostat data

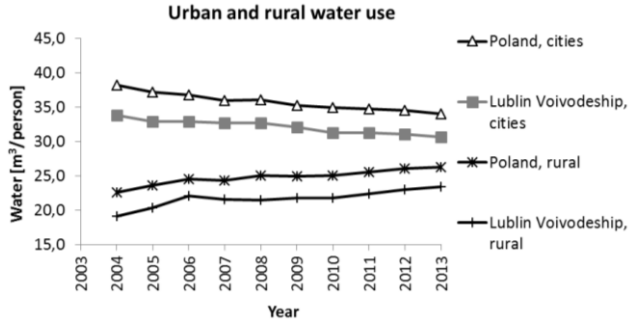

Figure 10. Water use per inhabitant in cities and rural Poland, 2004-2013, combined after GUS data

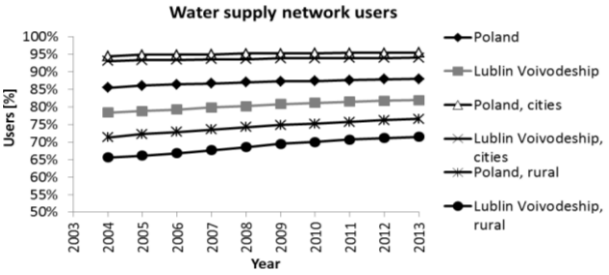

Figure 11. Water supply pipelines users in Poland and Lublin Voivodeship, based on GUS data

To better understand these information we need to introduce the data concerning various types of water supply users in Poland – see Fig. 11. The historical data presented in this Fig. show, that the mean population of Poland connected to water supply pipelines increased slightly since 2004, from 85.5% to 88%. The number of water supply network in the cites was nearly unchanged, both in Poland and Lublin Voivodeship, during the whole discussed decade, at the level of 94-95%. The greatest changes were reported for rural settlement in Poland and Lublin Voivodeship, the clear increase of connected population, from 71 to 77% and from 66 to 72%, respectively. However, the part of rural population connected to water supply systems in Lublin province is lower than in the rest of the country. The rest of the population use the local water sources, such as

dug or drilled wells, providing water of unknown and uncontrolled quality.

Water consumption always results in domestic and municipal sewage generation and discharge, so the environmental and technical sustainable development should be also assessed by share of population connected to sanitary sewers (as allowing to limit the danger of environmental pollution triggered by uncontrolled wastewater discharge). According to Eurostat data, the mean value of urban population connected to sanitary systems was in 2011 equal to approx. 82%, while in Poland this value reached the level 87%. The similar level was reported for Belgium (89%), Sweden (87%) and Czech Republic (83%). The highest values were noted in Spain and the Netherlands, 99%, the lowest in Croatia, 53%, Slovakia (62%) and Slovenia (63%). Unfortunately, no separate data for rural populations were available in Eurostat.

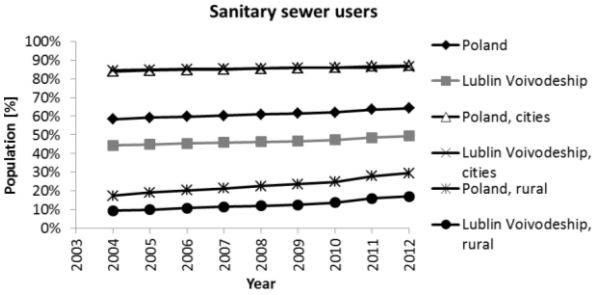

Figure 12. Sanitary sewers users in Poland and Lublin Voivodeship in the period of 2004-2013

The precise data concerning different types of sanitary sewer users in Poland and Lublin Voivodeship are presented in Fig. 12. The total population of Poland inhabitants connected to sanitary wastewaters systems increased in the period of our analysis, from 58% to 65%. In Lublin Voivodeship this value was in range 44%-50%. The urban population using sanitary sewer also slightly increased and was in range of 84%-87.4% and 84.4%-86.7% for Poland and Lublin region, respectively. The greatest increase in percentage of people connected to organized sanitation systems was observed in the rural areas, from 17.3% to 30.9% for Poland and from 9.3% to 17.7% for Lublin Voivodeship. The quoted numbers show that the majority of rural population of Poland has no connection to organized wastewater collection systems. The generated wastewaters are transported to wastewater treatment plants by septic cars or managed in various types of mostly uncontrolled septic tanks and domestic sewage treatment plants, usually limited to drainage systems. The available GUS data show, that in 2013 there were 2256572 septic tanks noted in Poland and 178114 tanks in Lublin Voivodeship. The 154944 and 18458 operating domestic sewage treatment plants of various efficiently were reported in Poland and Lublin region in 2013, respectively.

To better understand diversification of water use and water and wastewater systems in urbanized and rural areas of Poland and Lublin Voivodeship, the density of discussed system should be presented. Fig. 13, Fig. 14 and Fig. 15 present total, urbanized and rural density of discussed systems, respectively.

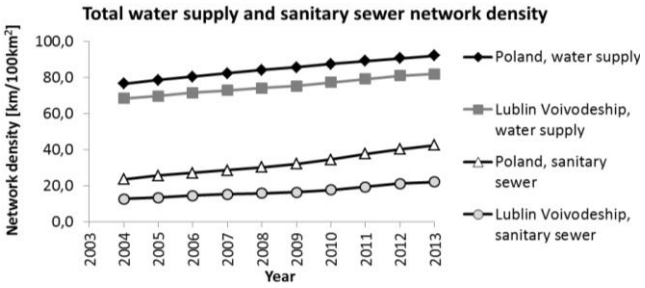

Figure 13. Total water supply and sanitary sewer network density in Poland and Lublin Voivodeship, based on GUS data

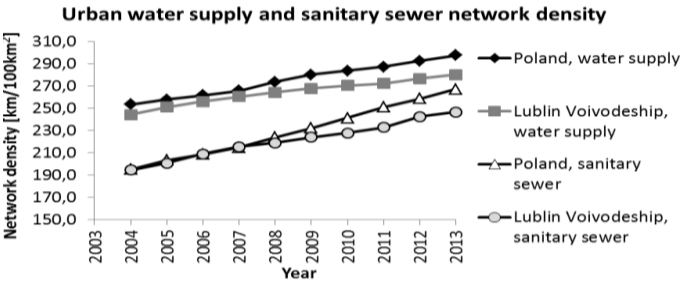

Figure 14. Urban water supply and sanitary sewer network density in Poland and Lublin Voivodeship, based on GUS data

Data presented in Fig. 14 show, that during the last decade, since entrance of Poland to the EU, the density of both studied environmental engineering system increased, especially the sanitary wastewater collection system. However, the density of sanitary sewer is clearly several times lower than density of water supply system. Additionally, density of both systems are significantly lower in Lublin Voivodeship than in the whole country.

Fig. 14 shows the clear increase of both systems density in urbanized areas during the last decade. It's visible that the greatest increase was reported for density of urban sanitary wastewater system in Poland, from the density of approx. 195 to 267 km per 100 km^2 of urbanized area. The same value for Lublin Voivodeship was presented as increasing from 195 to 247 km per 100 km^2, so the observed development was slower.

Fig. 15 shows, that density of both studied systems, water supply and wastewater sewer, however increasing since 2004, is significantly lower in rural conditions then in urbanized areas. The density of water supply increased from approx. 64 and 61 km per 100 km^2 to 76 and 74 km per 100 km^2 for Poland and Lublin Voivodeship, respectively. Definitely the worse situation is visible in case of rural sanitary sewer systems. Their density in Poland increased

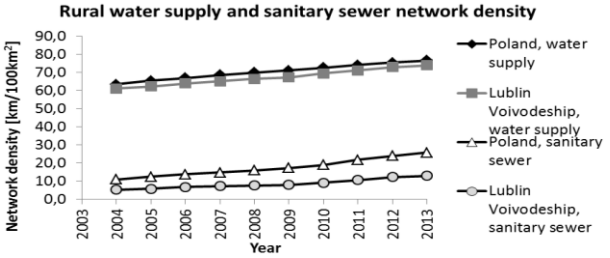

Figure 15. Rural water supply and sanitary sewer network density in Poland and Lublin Voivodeship, based on GUS data

since 2004 from approx. 11 to 26 km per 100 km^2. During the same period in Lublin Voivodeship the increase of sanitary sewage density from 5.4 to 13 km per 100 km^2 was observed. Thus, the density of rural sewage system in Lublin province is twice lower than mean value for the rest of country.

The final elements of sewage removal systems are wastewater treatment plants (WWTPs). Unfortunately, data concerning population of EU countries available in Eurostat is limited to only 16 states. The mean share of population connected to WWTPs was in 2011 equal to 87%. The reported values varied between 100% (e.g. Denmark, Germany, the Netherlands and Finland) and 39% (Croatia) or 42% (Romania). According to GUS data, actually, 70.3% of residents of Poland are connected to WWTPs. The share of Poland's population connected to wastewater treatment plants increased from 59% to 79.4% during the period 2004-2013. At the same time number of Lublin Voivodeship residents using WWTPs increased from 50.6% to 55.5%. Fig. 16 presents data concerning diversification of population connected to WWTP in urbanized and rural areas of Poland and Lublin Voivodeship.

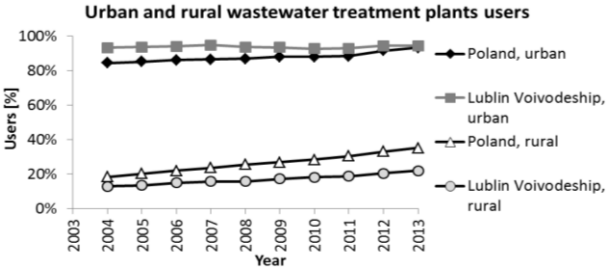

Figure 16. Residents of urbanized and rural areas of Poland and Lublin Voivodeship connected to WWTP

Fig. 17 shows that in both cases, Poland and Lublin region, the huge diversification of population connected to wastewater treatment plants. Despite the fact, that since 2004 number of rural inhabitants of Poland and Lublin Voivodeship connected to WWTPs increased to 35.3% and 22%, respectively, these numbers are several times lower in comparison to residents of urbanized areas.

Residence of population, in urbanized and rural areas, always results in generation of wastes, which are required to be collected and treated to reduce the anthropogenic threat to the environment. The total municipal wastes per capita generated and collected in 2012, according to Eurostat data, varied between 688 kg/person in Denmark and 271 kg/person in Romania. The mean value of total wastes generated in the EU countries was equal to 487 kg/person. The amount reported in Eurostat for Poland reached the level of 314 kg/person. The interesting phenomenon may be noticed here, the lesser developed country (e.g. lower economical SDIs discussed earlier) the lower total waster per capita reported in the survey. The group of countries with the total wastes reported as comparable or lower than in Poland covered Czech Republic, Estonia, Latvia, Romania, and Slovakia, thus, all belonging to the late Eastern Soviet bloc. The above may be connected to the higher consumption triggered by higher standards of life or more efficient system of wastes collection and treatment in developed countries of Western Europe.

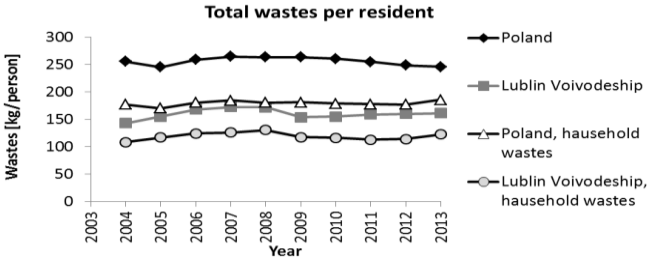

Figure 17. Total wastes per capita for Poland and Lublin Voivodeship in 2004-2013

Fig. 17 presents historical survey based on GUS data of total wastes per capita generated in Poland and Lublin Voivodeship, with additionally presented wastes generated in households. It shows, that during the last decade, despite the small deviations, level of total wastes generated in Poland and Lublin Voivodeship was constant and was at the level of approx. 250 kg/person and 160 kg per person respectively. The amount of wasters collected from households was clearly lower, the level of 180 kg/person and 120 kg/person for Poland and Lublin region, respectively. However, the relation of sorted versus unsorted wastes for Poland and Lublin Voivodeship shows the clear increase of sorted wastes share resulting from the recent changes in law, wastes management and increased environmental awareness of the Polish society. In 2004, the percentage of sorted wastes, including household wastes, in Poland and Lublin province was at the level of approx. 2-2.5%, nowadays, according to GUS data, this share reached the level of 13-13.5% in 2013.

However, problem of wastes collection and treatment is not fully solved in Poland and Lublin Voivodeship. According to data reported by GUS, in 2013, there were 431 and 56 operating municipal landfill cells in Poland and Lublin Voivodeship, respectively. On the other hand, the number of reported uncontrolled wild garbage dumps of various

scale was significant, reaching the level of 2791 dumps in Poland and 303 in Lublin Voivodeship. The share of landfilled wastes to the total mixed wastes collected in 2013 was equal to 67% for Poland and 75.8% for Lublin Voivodeship.

The brief analysis of presented selected SDIs for environmental and technical development for Poland and Lublin Voivodeship showed, that during the last decade, the country and the region developed. However, the ratio of this development may be unsatisfactory. A very huge diversification between urbanized and rural areas of Poland and Lublin Voivodeship is visible, especially in the field of water use and supply, wastewater removal and connections to wastewater treatment plants. Additionally, it's clearly visible, than in case of most of the discussed sustainable indicators development of Lublin region was slower than the development of the rest of the country.

Conclusions

This paper presented the brief attempt of sustainable development assessment of one of less developed province of Poland, Lublin Voivodeship, since the entrance of Poland to the European Union in 2004. Our studies were based on a very popular methodology of sustainable development indicators. The special set of 21 SDIs was selected to present and quantify the sustainable development of the studied area and compare it to the actual state of development of the whole country to study the possible diversification in three main circles of the sustainable development: economic, social and environmental-technical. Additionally, the differences between development of urbanized and rural areas of Lublin region and Poland were considered. When it was possible, the discussed data were compared to the most actual data concerning SDIs for the United Europe and its member states. The selected indicators differed slightly from the ones commonly used, their choice was reliant on ease of data availability and was mentioned to underline the quality of life and interactions between the society and the environment.

The main outcome of our analyses is that both, Lublin Voivodeship and Poland showed development since entrance to the European Union in 2004 in all studied fields of sustainability. However, there is still a visible and significant gap between level of development presented by the leading member countries of European Union or the mean level of the EU countries and Poland or Lublin Voivodeship. Additionally, in most cases the applied quantifiable indicators showed slower development of Lublin region, than the rest of the country. Finally, the significant differences between most values of the tested SDIs for urbanized and rural areas of Lublin province and Poland confirm the diversification of sustainable development of studied areas.

The clear orientation of Lublin province towards the sustainable development is visible. The sustainability indicators show significant progress since 2004, even in several aspects, like growth rate of GDP per capita, public health care, reaching or exceeding the mean values for the rest of the country. But there were many threats for the sustainable development of the Lublin Voivodeship identified during our analyses, in all aspects of sustainability.

The main and, in our opinion, most important factors threating the sustainable development of Lublin Voivodeship are:

- Low value of most applied economic indicators, including GDP per capita, mean gross salary, monthly income per capita representing low economical capabilities of the region and limiting several activities, including purchasing power reflecting the economical underdevelopment of the region, especially its rural areas;
- High registered unemployment, especially in rural areas, significant number of population endangered by poverty, for both national and relative thresholds, low, negative value of the birth rate, low fertility rate and negative rate of registered migration rate clearly show the limits for sustainable development, low quality of life and uncertainty of the society resulting from the limited perspectives for the future;
- Low tap water use, especially in rural areas, low numbers of population connected to water supply and wastewater removal networks, reduced density of water supply systems and totally undeveloped wastewater systems in rural areas, low number of rural inhabitants with access to wastewater treatment plants, sewage management based mainly on septic tanks, low amount of total mixed wastes collected show the huge threats to environmental and technical sustainable development in the aspect of the environmental engineering triggering significant danger to the natural environment, public health and quality of life.

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