FOSTERING SUSTAINABLE INDUSTRY, INNOVATION AND INFRASTRUCTURE AS A PART OF SUSTAINABLE DEVELOPMENT AGENDA IN THE EU COUNTRIES: SPATIAL ANALYSIS

Tomasz GRODZICKI
Nicolaus Copernicus University
Jurija Gagarina 13a, 87-100 Toruń, Poland
tomgro10@wp.pl, tg@doktorant.umk.pl

Abstract. *The EU has prepared a sustainable development package that is a part of the 2030 Agenda for Sustainable Development. The core of this agenda is sustainable development goals. One out of the seventeen sustainable development goals set by the EU is to promote inclusive and sustainable industrialization as a powerful driver for improving standards of living and ending poverty worldwide. This goal is measured by seven independent indicators including CO2 emissions, employment in medium and high technology manufacturing sectors, gross domestic expenditure on R&D, patent applications to the European Patent Office, R&D personnel, collective transport modes in total passenger land transport, and rail and inland waterways activity in total freight transport. The aim of this paper is to analyze industry, innovation, and infrastructure in the EU countries in order to find out: (1) which countries are leading in this field, (2) which countries need to work on these issues so that they can catch up with the leaders. The following methods are used in order to address the above-mentioned research questions: the taxonomic measure of development, linear ordering, spatial trend models, and spatial autocorrelation approach.*

Keywords: *EU countries; industry; innovation; infrastructure; sustainable development goals (SDGs).*

Introduction

The 17 Sustainable Development Goals and 169 related tasks are a continuation of the Millennium Development Goals. The aim of the Sustainable Development Goals and related tasks is to respect human rights for all people and to achieve gender equality and empower all women. The goals of Sustainable Development are interdependent and indivisible and provide a balance between the three aspects of sustainable development: economic, social and environmental.

United Nations (2015) imply that the 9th sustainable development goal (SDG 9) is to promote inclusive and sustainable industrialization as a powerful driver for improving standards of living and ending poverty worldwide. This goal aims to build a stable infrastructure, promote sustainable industrialization and support innovation. All these should be done by the following objectives: (1) by building a reliable, stable and sustainable infrastructure quality, including regional and cross-border infrastructure, supporting development of economic and human well-being. Ensure equal access of all people to infrastructure at an affordable price. Moreover, (2) sustainable and inclusive industrialization should be promoted and by 2030 significantly the aim is to increase the share of industry employment in generating GDP, taking into account national circumstances and doubling this share in the least developed countries. Nest step that

shall be taken is to (3) increase access to financial and affordable services loans and turn them into value chains and provide them with market share, particularly for small and medium-sized enterprises, including industrial ones, in especially developing countries. In addition, (4) SDG 9 intends to modernize infrastructure and industry to ensure its sustainable development, while increasing the efficiency of the use of resources: clean and environmentally friendly technologies and production processes, with the participation of all countries, according to their capabilities, until 2030. Innovation is based on the research, so the next goal is to (5) strengthen research and increase the technological level in all countries, especially in developing countries, and by 2030, foster innovation by a significant increase in the number of employees the research and development sector for every million people and through increasing public and private financing for development. The United Nations also aim to (6) facilitate the development of sustainable and stable infrastructure in countries developing by increasing financial, technological and technical support for African countries, the least developed countries, and developing countries. In addition to that, there is a need to (7) support national technological development, research and innovation in developing countries, including policies that aim for industrial diversification and an increase in the added value of commodities. Last but not least, there shall be (8) a significant increase in access to information and communication technologies and provide affordable and universal access to the internet in the least-developed countries by 2020.

In line with these goals, table 1 presents some facts and statistics prepared by the United Nations (n.d.) in order to better address the problem of this specific SDG.

Table 1. Facts and statistics about issues concerning SDG 9 (based on the United Nations, n.d.)

In many developing countries there is a lack of basic road infrastructure, sanitary and water systems, electricity and information and communication technology.
Around 2.6 billion people in developing countries do not have 24-hour access to electricity.
2.5 billion people are deprived of basic sanitation and almost 800 million people have no access to water, of which hundreds of millions live in sub-Saharan Africa and South Asia.
About 1 - 1.5 million people in the world do not have access to reliable telephone services.
Good infrastructure is associated with achieving social, economic and political goals.
Poor quality infrastructure leads to a lack of access to markets, labor, information, and training, and is a major barrier to business development.
Poorly developed infrastructure limits access to health care and education.
In many African countries, especially those with lower income, insufficient infrastructure reduces the productivity of enterprises by around 40%.
Manufacturing plants are an important employer - in 2009, they employed about 470 million people, i.e. about 16% of the world's workforce estimated at 2.9 billion people. It is estimated that in 2013 over half a billion people worked in such enterprises.
The effect of multiplication of jobs as a result of industrialization has a positive impact on society. Each workplace in manufacturing plants creates 2.2 jobs in other sectors.
The most important for the early phase of industrialization are small and medium-sized enterprises that carry out production and processing activities, which usually create the most jobs. They create 90% of global business and employ 50-60% of the workforce.

Available national statistics show that 2.3 million people currently work in the renewable energy sector. Given that the data on this subject are not complete, this figure is very undervalued. It is predicted that due to the growing interest in alternative energy sources by 2030, 20 million jobs will be created in the renewable energy sector.
Least developed countries have enormous economic potential in the production of food and beverages (agricultural industry), textiles and clothing. It is also good for the future of a generation that will benefit from sustainable employment and greater productivity.
Middle-income countries can benefit from industry and metal processing, which offers a whole range of products sought after in international markets.
In developing countries, only less than 30% of agricultural production is subject to industrialization. In turn, in high-income countries, this percentage is 98%. This illustrates how great opportunities for developing countries are created by agricultural business.

Many of the above-mentioned facts do not apply to Europe, however, it is of great importance that SDGs should be applicable in every country. It means that Europe may not have the same problems as African countries but Europe needs to work on every single SDGs as others because there is always room for improvement. Improving its performance in SDGs, Europe can also improve the performance of others in a direct (by directly helping weaker countries) or indirect way (by showing an example to follow).

Therefore, this paper is to analyze the EU countries in terms of their performance in SDG 9. It is interesting to see if the EU countries improved their level of SDG 9 measures and which countries are leading in this field. Although, European countries are in a comfortable position in comparison to some underdeveloped countries, e.g. in Africa, Asia, and South America, because they do not need to focus on addressing some burning issues like i.e. problems with water or electricity, they can still improve their performance in SDGs so that they can help those in needs (World Bank, 2017). However, one should remember that it is very problematic to achieve a sustainable way of an economic system in Europe in time of omnipresent phenomena of globalization (Barry et al., 2004).

Walz et al. (2017) clearly indicate that achieving sustainable development goals requires innovation. They also add that green innovation is of great importance in the sustainable development concept. The role of innovation in the prevention of global ecological catastrophe has been embedded in the North-South economic development from the very beginning. According to the Environmental hypothesis of the Kuznets Curve (EKC), environmental pressure is growing faster than income in the first stage of economic development. Then, there is a second stage, in which environmental pressure continues to grow, but slower than GDP. After reaching a certain level of income, the pressure on the environment decreases in spite of constant income growth.

Sarangi (2017) implies that science, technology, innovation and Capacity Building Technology are at the core of social, economic and environmental development. It is essential that there are a knowledge and technology transfers from developed to developing countries. This ensures an access to technology since many technologies are initially developed in developed countries. Technology transfer includes a complex process of sharing knowledge and adapting technologies so they can meet local conditions. Therefore, there is a need to implement scientific and technological knowledge in national development plans and strategies so that innovation can be fully

exploited. Thus, Gusmão Caiado, et al. (2018) underline that SDGs are to create more inclusive and equal nations all over the World. This may be done by i.e. encouraging co-creative practices in order to stimulate collaboration in innovative sustainable practices, especially in such a transfer of innovation between developed and developing countries.

Data and methodology of the research

The research concerns the situation of SDG 9 in EU countries. Data for this research are available in Eurostat (2018), however, due to the fact that some of the indicators are measured only from 2008, this paper focuses only for the period starting from 2008 and ending in 2016. SDG 9 is measured using seven indicators listed in table 2.

Table 2. Facts and statistics about issues concerning SDG 9

gross domestic expenditure on R&D by sector (S)
employment in high- and medium-high technology manufacturing sectors and knowledge-intensive service sectors (S)
R&D personnel by sector (S)
patent applications to the European Patent Office (S)
share of collective transport modes in total passenger land transport by vehicle (S)
share of rail and inland waterways activity in total freight transport (S)
average CO2 emissions per km from new passenger cars (D)

Note: (S) – stimulant, (D) – factors with opposite effects to stimulant

Statistical Office of the European Communities (2016, p.80) also proposes the eco-innovation index as 'more holistic approach to measuring innovativeness of EU countries.' However, it is omitted for the need of this paper, since the focus is to present official indicators set by the United Nations which are then approved by the European Commission and applied by Eurostat.

Patent applications indicator is excluded in this research because the data are only available up to 2014, whereas for all the others (except for transport modes where data are available until 2015) the data are available for at least until 2016. It should be noted that some of the missing data in indicators of SDG 9 (for some countries in some years) are estimated by Eurostat and some estimation is done for the need of this paper using estimating missing data methods, including trend models and cluster analysis.

In order to measure their performance in this SDG, the following methods are used: the taxonomic measure of development (TMD), linear ordering, spatial trend models (Schabenberger & Gotway, 2005, p.235), spatial autocorrelation approach (Moran, 1950; Schabenberger & Gotway 2005, p.21) and panel data models (Baltagi, 2008). The taxonomic measure of development is used in order to find out which EU countries are leading in the performance of fulfilling SDG 9.

Initially, we have to choose a set of diagnostic variables and determine their character. Due to the initial heterogeneity of variables, there is a need to make them comparable using normalization procedure. In this research, 0-1 scaling standardization is applied (Sobczyk, 2006, p.83). Then, standardized variables are used to designate the so-called Hellwig's development pattern (Hellwig, 1968). After this, the distance of each point (country, in this case) from the development pattern is determined using a Euclidean distance (Pluta, 1977, p.21). The next step is to normalize synthetic measure for EU

countries for the period of 2008-2016. The synthetic measure is determined in line with Pluta (1977, p.25) and it is named in this paper as SDG 9. It should be noted that Croatia is excluded from this analysis due to the lack of complete dataset for the analyzed period. Malta and Cyprus are also excluded, partially because of incomplete data (not to this extent as in the case of Croatia), because they do not have neighbors since they are islands. Using the above mentioned spatial methods, there is a common border criterion that a country needs to have in order to proceed with the analysis, which Malta and Cyprus do not have. Table 3 shows the explanation (categories) of sections used in maps in figures 1 and 3.

Table 3. Category of countries according to SDG 9

Category	Section
The highest score of SDG 9 / GDP	>Median+Q
Medium score of SDG 9 / GDP	[Median, Mendian+Q)
Low score of SDG 9 / GDP	[Median-Q, Median)
The lowest score of SDG 9 /GDP	<Median-Q

All calculations and figures are made using the following software Gretl, R-Cran, Python and MS Excel.

Research results and findings

Table 4 presents the rankings of SDG 9 in EU countries for the period of 2008-2016. It is clearly seen that DE has been a leader in terms of SDG 9 throughout the analyzed period. Second and third positions are taken either by DK or FR depending on the year in the research period. It can be easily observed that the best performing countries (top 10 – the first 10 records in table 2) in this measure are the so-called the old EU member states. The first country from the new EU member states is the Czech Republic that is placed on the eleventh position in 2016. However, the Czech Republic is the only country from the new member states that managed to be above the EU 28 average in 2016 in SDG 9 indicator. It does mean that the Czech Republic is performing very well in this indicator while all the other new member states are lagging behind the EU 28 average.

Table 4. Rankings of SDG 9: innovation, industry, and infrastructure for the EU countries in the period of 2008-2016

Rank	2008	2009	2010	2011	2012	2013	2014	2015	2016
1	DE	DE	DE	DE	DE	DE	DE	DE	DE
2	DK	DK	DK	DK	DK	DK	DK	DK	DK
3	DK	DK	DK	DK	DK	DK	DK	DK	DK
4	BE	BE	BE	BE	SE	SE	BE	AT	AT
5	AT	AT	AT	SE	BE	BE	AT	SE	SE
6	FI	FI	SE	AT	AT	AT	SE	BE	BE
7	IT	SE	FI	NL	NL	NL	NL	NL	NL
8	SE	UK	UK	FI	FI	FI	FI	FI	FI
9	UK	IT	IT	UK	UK	UK	UK	UK	UK
10	LU	LU	LU	IT	IT	IT	IE	IE	IE
11	EU28	EU28	NL	EU28	EU28	CZ	IT	EU28	CZ

Rank	2008	2009	2010	2011	2012	2013	2014	2015	2016
12	NL	NL	EU28	LU	CZ	EU28	CZ	CZ	IT
13	CZ	IE	IE	IE	LU	LU	EU28	IT	EU28
14	HU	HU	CZ	CZ	IE	IE	LU	LU	LU
15	ES	ES	HU	HU	SI	HU	SI	SI	SI
16	IE	CZ	ES	ES	HU	SI	HU	HU	HU
17	SI	SI	SI	SI	ES	ES	ES	ES	ES
18	SK	SK	SK	SK	GR	GR	GR	GR	GR
19	PL	PL	PL	GR	SK	SK	SK	SK	SK
20	GR	EE	GR	EE	EE	EE	PL	EE	PT
21	PT	PT	PT	PT	PL	PT	EE	PL	EE
22	EE	GR	EE	PL	PT	PL	PT	PT	PL
23	RO	RO	LV	LV	LV	LV	LV	BG	BG
24	BG	BG	BG	BG	BG	BG	BG	LV	LV
25	LV	LV	RO	RO	RO	RO	LT	LT	LT
26	LT	LT	LT	LT	LT	LT	RO	RO	RO

Figure 1 illustrates the spatial differentiation of taxonomic measure of development for SDG 9 in the years 2008 and 2016 in EU countries. The best performing countries are marked with the darkest blue color. In 2008, the best performing countries in this measure are Scandinavian countries and western EU countries, on average. While the central and eastern EU countries are the ones with the lowest score in SDG 9. In 2016, the situation, on average, seems similar to the year 2008, however, there are some changes in individual countries. Countries that managed to improve their situation (compare to median measure) in this measure are Ireland, the Netherlands, Slovenia, and Sweden. In turn, the following countries worsened their position: Spain, Italy, Poland, Hungary, and Finland.

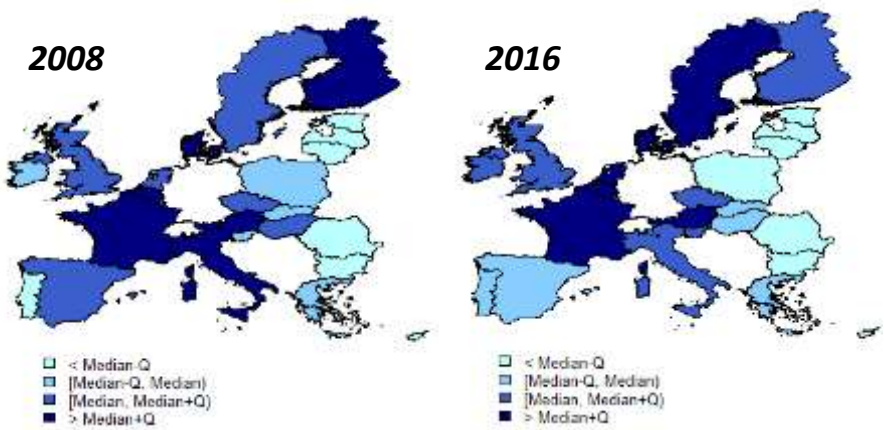

Figure 1. A taxonomic measure of development for SDG 9 in the years 2008 and 2016 in EU countries

Note: White color in the above maps represent Germany that is the so-called outlier with the highest value of the variable.
Source: own elaboration.

Figure 2 presents the trend surfaces of the TMD of SDG 9 for the 2008 and 2016. It shows the supposition of the presence of the second-degree spatial trend. It would mean that on average, Scandinavian and western EU countries score the highest in SDG 9 while central and eastern EU countries are worse off.

2008 **2016**

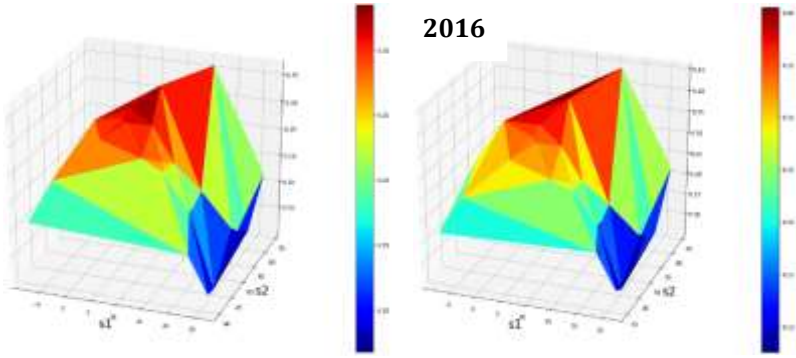

Figure 2. Trend surfaces of taxonomic measure of development for SDG 9 across EU countries in the years 2008 and 2016

In order to find out about the spatial structure of SDG 9 in EU countries, the degree of spatial trend and Moran's test for spatial autocorrelation are applied, and the results are presented in table 5. There is indeed, a second-degree spatial trend for SDG 9 so it confirms the preassumption from figure 2 in the period of 2008 - 2016. The results form Moran's test imply that there is no spatial autocorrelation since the p-value for Moran's I statistics in every year is greater than the level of significance, which is 0.05. Therefore, it can be noted that the after taking into account the spatial trend, countries with similar values of the examined measure do not form clusters.

Table 5. Results of spatial trend and autocorrelation in the synthetic measure of SDG 9

Year	The degree of spatial trend	Moran's I	p-value
2008	2	-0.2464	0.1419
2009	2	-0.2599	0.1259
2010	2	-0.2838	0.1037
2011	2	-0.2582	0.1299
2012	2	-0.2619	0.1254
2013	2	-0.2890	0.0998
2014	2	-0.3497	0.0548
2015	2	-0.3290	0.0678
2016	2	-0.3268	0.0687

Analyzing innovation, industry, and infrastructure in EU countries, one should note that meeting the goal set by the United Nations may be related to how rich a particular country is. Therefore, intuitively, the next procedure checks whether GDP *per capita* has something to do with SDG 9. Therefore, the following research hypothesis is constructed: EU countries that are doing better, on average, in meeting SDG 9: industry, innovation, and infrastructure; at the same time, they are richer than the others in terms of GDP *per capita*.

$$GDP_{i,t} = \theta_{00} + \theta_{10}s_{1i,t} + \theta_{01}s_{2i,t} + \theta_{20}s_{1i,t}^2 + \theta_{11}s_{1i,t}s_{2i,t} + \theta_{02}s_{2i,t}^2 + \alpha SDG9_{i,t} + \beta SDG9_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where:

$s_{1i,t}$,$s_{2i,t}$- coordinates of locations of the spatial units

GDP - Gross Domestic Product per capita
SDG9 - level of innovation, industry, and infrastructure SDG 9 measured with the use of a taxonomic measure of development

Figure 3 presents the spatial differentiation of GDP *per capita* in EU countries the years 2008 and 2016. The general tendency seems to be similar to SDG 9 in figure 1, on average, Scandinavian and western EU countries are richer than central and eastern European countries.

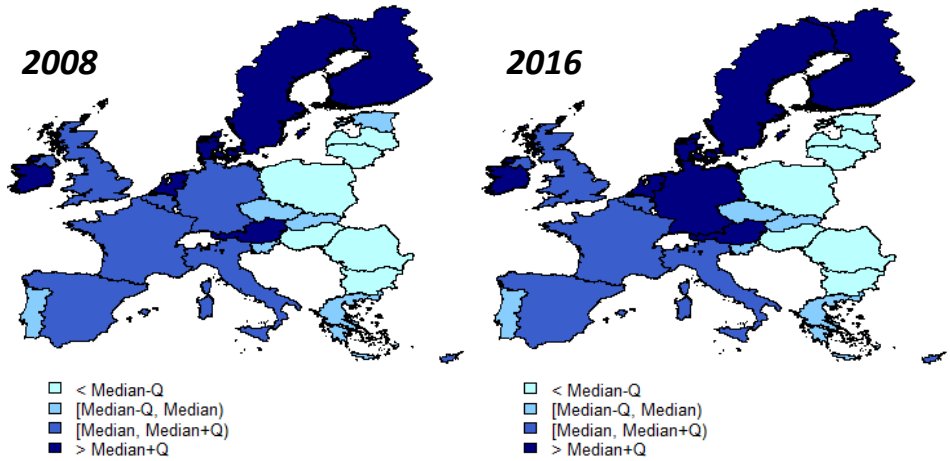

Figure 3. Spatial differentiation of GDP per capita in the years 2008 and 2016 in the EU countries

Figure 4 presents trend surfaces for GDP per capita across EU countries in the years 2008 and 2016. Figure 4 indicates the supposition of the presence of the second-degree spatial trend. In this case, there is also a similarity between GDP per capita and SDG 9 spatial distributions (this can be seen not only on the maps but also in the adjusting trend surfaces).

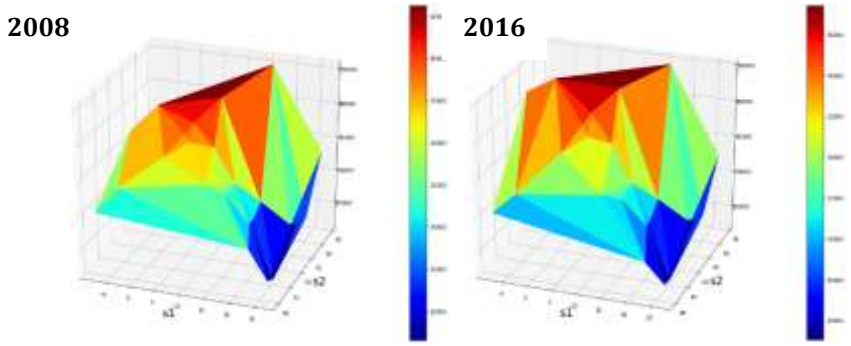

Figure 4. Trend surfaces for GDP per capita across the EU countries in the years 2008 and 2016

The results from panel data model are included in tables 6 and 7. After excluding statistically insignificant variables (which p-value is greater than 0.05) we do have the model that implies that the first time-lag SDG 9 do influence the performance in GDP *per capita*.

Table 6. Results of testing hypothesis – panel data model, random effects

Parameter	Estimate	Std. error	z-statistics	p-value
θ_{00}	154395.000	151807.000	1.017	0.309
θ_{10}	2171.760	1995.930	1.088	0.277
θ_{01}	-6378.630	6214.040	-1.026	0.305
θ_{20}	-49.114	27.240	-1.803	0.0714
θ_{11}	-40.716	40.874	-0.996	0.3192
θ_{02}	77.661	63.861	1.2160	0.224
α	-4585.740	10661.100	-0.430	0.667
β	26761.900	9356.890	2.860	0.004
Breusch-Pagan test: χ^2 =663.636 p-value = 0.000				
Hausmann test: χ^2 =0.734 p-value = 0.693				

Table 7. Final results of testing hypothesis – panel data model, random effects

Parameter	Estimate	Std. error	z-statistics	p-value
θ_{00}	7541.170	9509.320	0.793	0.428
θ_{20}	-38.490	10.622	-3.624	0.000
θ_{02}	8.929	3.740	2.388	0.017
β	24913.200	7039.180	3.539	0.000
Breusch-Pagan test: χ^2 =670.539 p-value = 0.000				
Hausmann test: χ^2 =0.054 p-value = 0.816				

The very last step of this paper is to check the rate of growth in SDG 9 across EU countries, for the year 2016 in comparison to 2008, what is shown in Figure 5. It is calculated by the difference in TMD of SDG 9 from 2016 to 2008 which is then divided by TMD of SDG 9 in 2008. The rate of growth in SDG 9 for EU countries is 0.1124. Countries that worsened their results, scored less than 0 and are marked with green color. Then, countries that scored between 0 and 0.1124 are marked with bright red. Finally, the best performing countries that score more than the rate of growth for the EU, are colored with dark red.

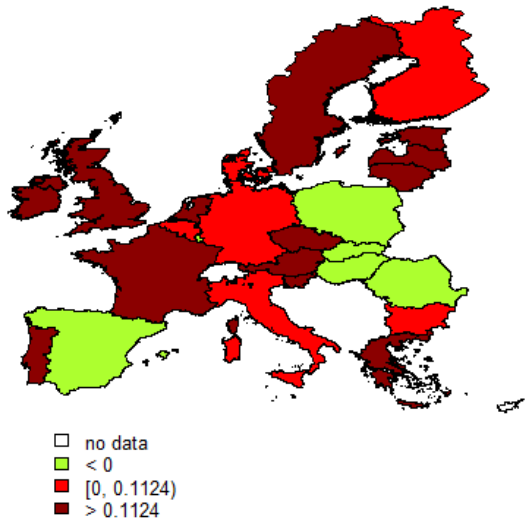

Figure 5. The rate of the growth in SDG 9 across EU countries

It is interesting to analyze the countries with a declining trend of performance in SDG 9, what is illustrated in figure 6. Countries that are lagging behind the others in terms of rate of growth in SDG 9 are LU, HU, ES, SK, PL and RO which is the worst-off.

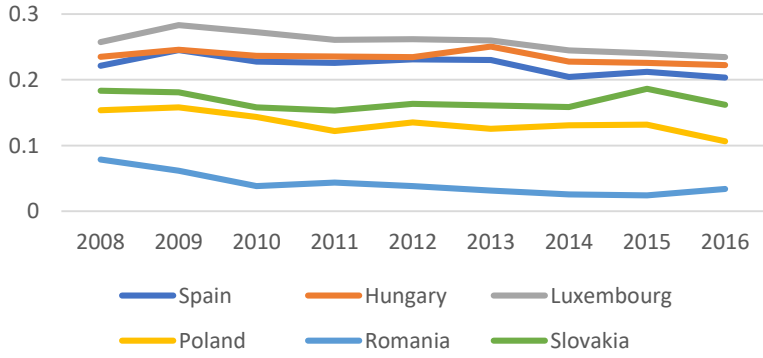

Figure 6. The values of the SDG 9 in 2008-2016 for the countries with a declining trend of SDG 9

Sustainable development goals are indeed needed in the contemporary World but it turns out that it is not necessarily an easy task to fulfill them. One can expect that all countries would be trying to follow the 2030 agenda and improving their performance,

even slightly, in all measure. However, this paper shows that there is room for improvement for EU countries, in particular, central and eastern EU countries, in meeting SDG 9. The focus of the European Commission (2017) is to monitor progress in R&D, innovation, industry, and infrastructure, but the question for a debate is whether the EU can implement some strategy across its member states so the progress can be expected in the future in all SDGs.

Conclusion

Sustainable development goals have been set in order to improve the quality of life of human being on the planet. Although there is a common will in fulfilling agenda 2030, the economic measures of particular statistics show that more effort is needed. Analyzing innovation, industry, and infrastructure as SDG 9, it is clear that old EU member states are doing better than new EU member states, on average. The richer the EU country in terms of GDP *per capita* is, on average, the more advanced it is in fulfilling SDG 9: industry, innovation, and infrastructure. The rate of growth in SDG 9 across EU countries is quite differential what makes it more difficult to indicate what is the overall EU approach to this problem, which seems to be more country-specific one. Further research on innovation, industry, and infrastructure in the EU will: (1) include a wider range of indicators than only those supported by the SDGs, (2) focus on the regional dimension of a particular EU country or group of countries.

References

Baltagi, B.H. (2008). *Econometric analysis of panel data.* Chichester: John Wiley & Sons.

Barry, J., Baxter, B., & Dunphy, R. (2004). *Europe, Globalization and Sustainable Development.* Taylor & Francis.

European Commission. (2017). Sustainable development in the European Union: overview of progress towards the SDGs in an EU context. Retrieved from https://ec.europa.eu/eurostat/documents/4031688/8461538/KS-01-17-796-EN-N.pdf/f9c4e3f9-57eb-4f02-ab7a-42a7ebcf0748.

Eurostat. (2018). SDG 9 - Industry, innovation and infrastructure - Statistics Explained. Retrieved from http://ec.europa.eu/eurostat/statistics-explained/index.php/SDG_9_-_Industry,_innovation_and_infrastructure.

Gusmão Caiado, R.G., et al. (2018). A literature-based review on potentials and constraints in the implementation of the sustainable development goals. *Journal of Cleaner Production, 198*1276-1288.

Hellwig, Z. (1968). Zastosowanie metody taksonomicznej do typologicznego podziału krajów ze względu na poziom ich rozwoju oraz zasoby i strukturę wykwalifikowanych kadr [Application of the taxonomic measure to the typological division of countries based on the level of their development and the resources and structure of qualified personel]. *Przegląd Statystyczny [Statistical Review],* 4.

Moran, P.A.P. (1950). The Interpretation of Statistical Maps. *Journal of the Royal Statistical Society*. B(10), 243-251.

OECD (2017). OECD Science, Technology and Industry Scoreboard 2017. Retrieved from http://dx.doi.org/10.1787/9789264268821-en

Pluta, W. (1977). *Wielowymiarowa analiza porównawcza w badaniach ekonomicznych. Metody taksonomiczne i analizy czynnikowej [Multidimensional comparative*

analysis in economic research. Taxonomic methods and factor analysis]. Warszawa: PWE.

Sarangi, U. (2017). International Trade and Sustainable Development Goals (SDGs) of Economies: A Way Forward. *Journal of International Economics*, 8(2), 77-101.

Schabenberger, O., & Gotway, C. A. (2005). *Statistical Methods for Spatial Data Analysis*, Boca Raton-London–New York: Champion & Hall/CRC.

Sobczyk, M. (2006). *Statystyka. Aspekty praktyczne i teoretyczne [Statistics. Practical and theoretical aspects].* Wyd. Uniwersytetu Marii Curie-Skłodowskiej, Lublin.

Statistical Office of the European Communities. (2016). Sustainable development in the European Union: a statistical glance from the viewpoint of the UN Sustainable Development Goals. Luxembourg: Eurostat.

United Nations. (2015). Transforming our world: Agenda for sustainable development 2030. Resolution adopted by the General Assembly on 25 September 2015. Retrieved from http://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf.

United Nations. (n.d.). *Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation.* Retrieved from https://www.un.org/sustainabledevelopment/infrastructure-industrialization/.

Walz, R., Pfaff, M., Marscheider-Weidemann, F., & Glöser-Chahoud, S. (2017). Innovations for reaching the green sustainable development goals - where will they come from?. *International Economics & Economic Policy, 14*(3), 449-480.

World Bank. (2017). *Atlas of Sustainable Development Goals 2017*: From World Development Indicators. The World Bank. Retrieved from https://doi.org/10.1596/978-1-4648-1080-0.