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## **ASSESSMENT OF THE SIMILARITY OF THE EU COUNTRIES IN THE PROCESS OF SUSTAINABLE DEVELOPMENT IN THE CONTEXT OF AGENDA 2030 GOALS**

### **OCENA PODOBNYCH KRAJÓW UE W PROCESIE ZRÓWNOWAŻONEGO ROZWOJU W KONTEKŚCIE CELÓW PROGRAMU 2030**

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#### **Introduction**

There are many views and definitions of sustainable development, at these days. The first comprehensive definition of sustainable development appeared in the report of the Club of Rome (1972), which states that sustainable development is a state of global equilibrium, in which the global population and capital are maintained on more or less constant level and tendencies acting on increase or decrease in these quantities must be kept under close scrutiny.

The Brundtland Commission's brief definition of sustainable development as the "ability to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs"<sup>1</sup>.

The most widely accepted definition is creatively ambiguous: "Humanity has the ability to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs"<sup>2</sup>.

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<sup>1</sup> World Commission on Environment and Development (WCED), Our Common Future 1987 In: Kates, Robert W., Parris, Thomas M. and Anthony A. Leiserowitz, *What is Sustainable Development? Goals, indicators, values, and practice*, [In:] Environment: Science and Policy for Sustainable Development, Volume 47, Number 3, 2005

<sup>2</sup> Ibidem.

It is not possible to predict the needs of future generations without knowledge of past and current production and consumption models and accurate quantification of current needs. Sustainable development combines three basic dimensions, respectively pillars according to Demo, Hronec, Tóthová et al.; Dušek, Pána<sup>3</sup>, and sustainable development is defined as a balance between these pillars Sustainable development according to Maier<sup>4</sup>; Moldan<sup>5</sup>; Nováček<sup>6</sup>; Demo, Hronec, Tóthová<sup>7</sup> et al. and others, include:

- the economic dimension (quantifying the quality of the economic environment);
- the social dimension (quantifying the quality of life);
- and the environmental dimension (representing the quality of the environment).

Some authors refer also the fourth cultural pillar or the pillar of good governance<sup>8</sup>.

On this base, it is possible to quantify sustainable development using selected relevant indicators. The main objective of measuring sustainability is frequently to monitor the evolution of indicators over time. Indicators help us to choose targets for the future and to determine how far we are from where we want to arrive<sup>9</sup>.

The EU has a strong starting position on sustainable development and, together with its member countries, is committed to leading the UN Program by 2030. The objectives of sustainable development are part of all 10 European Commission priorities. The EU has played an active role throughout the process and is committed to implementing the 2030 Agenda for Sustainable Development and the SDGs within the EU and in development cooperation with partner countries. The Agenda reflects many of the EU's priorities for sustainable development. The 2030 Agenda for Sustainable Development and the SDGs including its 17 Sustainable Development Goals (SDGs) and 169 targets<sup>10</sup>. Monitoring of changes in the area and efficiency of policies and measures for promoting sustainable development is an essential part of the management of sustainable development.

<sup>3</sup> Demo Milan, Ondrej Hronec, Monika Tóthová a kol., *Udržateľný rozvoj: život v medziach únosnej kapacity biosféry*. Nitra: Slovenská poľnohospodárska univerzita, 2007; Dušek Jiří, Lubomír Pána a kol. *Udržateľný rozvoj v evropských regiónoch*. České Budejovice: Vysoká škola evropských a regionálnych štúdií 2010.

<sup>4</sup> Maier Karel a kol., *Udržateľný rozvoj území*. Praha: Grada Publishing, 2012.

<sup>5</sup> Moldan Bedřich, *Podmanená planéta*. Praha: Univerzita Karlova v Praze, Nakladatelství Karolinum, 2009.

<sup>6</sup> Nováček Pavel, *Udržateľný rozvoj*. Olomouc: Univerzita Palackého 2011.

<sup>7</sup> Demo Milan, Ondrej Hronec, Monika Tóthová a kol., *Udržateľný rozvoj: život v medziach únosnej kapacity biosféry*. op. cit.

<sup>8</sup> Maier Karel a kol., *Udržateľný rozvoj území*, op. cit., p. 14.

<sup>9</sup> Rusko Miroslav, Chovancová Jana, and Bohdan Stejskal, *Methods and tools for sustainability measurement*, [In:] Research papers. Faculty of materials science and technology in Trnava. Slovak University of Technology in Bratislava. No 27, 2009, p. 55 – 60. Available at: [https://www.mtf.stuba.sk/buxus/docs/doc/casopis\\_Ve-decke\\_prace/27/rusko-chovancova.stejskal.pdf](https://www.mtf.stuba.sk/buxus/docs/doc/casopis_Ve-decke_prace/27/rusko-chovancova.stejskal.pdf)

<sup>10</sup> European Commission, 2017 available at: [http://ec.europa.eu/environment/sustainable-development/SDGs/index\\_en.htm](http://ec.europa.eu/environment/sustainable-development/SDGs/index_en.htm)

### **The Main Aim, Material and Methods**

The aim of the paper is to assess the similarity of the EU countries in achieving the Sustainable Development Goals according to 2030 Agenda. All the EU countries were assessed and the used data (per year 2016) was obtained from Eurostat (Sustainable development database). Each of the 17 sustainable development goals is represented by one (selected) indicator. The assessment was realized using the cluster analysis method. The Bray-Curtis distance was applied and the Ward cluster criterion was used for clustering.

### **Results and Discussion**

The European Union is considered to be a relatively homogeneous group of countries. This is also true in relation to sustainability achieving. However, there are regional disparities between individual European Union countries, including in the area of sustainable development (or its individual dimensions). Actually, there is Agenda 2030 as comprehensive set of priorities for achieving sustainable development goals. The aim of the paper is to assess the similarity of the EU countries in achieving the Sustainable Development Goals according to 2030 Agenda.

Table 1 presents all 17 sustainable development goals, according to Agenda 2030. Each of the goals is presented by one selected indicators (but it should be noted, that there is a set of indicators for each goals).

**Table 1. Selected indicators for Sustainable Development Goals in European Union countries (per year 2016)**

Goal	No poverty	Zero hunger	Good health and well-being	Quality education	Gender equality	Clean water and sanitation	Affordable and clean energy	Decent work and economic growth
Indicator	People at risk of poverty or social exclusion	Ammonia emissions from agriculture	Life expectancy at birth by sex	Early leavers from education and training by sex	Gender employment gap	Population having neither a bath, nor a shower, nor indoor flushing toilet in their household by poverty status	Primary energy consumption	Real GDP per capita
Unit of Measure	%	kilograms per hectare	total (M+F)	% of population aged 18 to 24	percentage points	% of population	million tonnes of oil equivalent (TOE)	chain linked volumes (2010), euro per capita
<b>EU (28 countries)</b>	<b>23,5</b>	<b>20,2</b>	<b>81</b>	<b>10,7</b>	<b>11,6</b>	<b>1,9</b>	<b>1542,7</b>	<b>27100</b>
Belgium	20,7	46,8	81,5	8,8	9,3	0,1	49	34500
Bulgaria	40,4	8,4	74,9	13,8	7,3	10,7	17,6	6000
Czech Republic	13,3	18,8	79,1	6,6	16	0,2	39,9	16500
Denmark	16,8	27	80,9	7,2	6,7	0,5	17,2	46300
Germany	19,7	37,8	81	10,3	8,2	0	295,8	34900
Estonia	24,4	10,5	78	10,9	8,2	5,1	6,1	13900
Ireland	24,2	26	81,8	6,2	12,1	0,2	14,6	53100
Greece	35,6	9,8	81,5	6,2	19	0,2	23,5	17100
Spain	27,9	18,8	83,5	19	11,5	0,3	117,2	23800
France	18,2	20,3	82,7	8,8	7,5	0,3	235,4	31800
Croatia	27,9	19	78,2	2,8	9,6	1,4	8,1	11100

	Industry, innovation and infrastructure	Reduced inequalities	Sustainable cities and communities	Responsible consumption and production	Climate action	Life below water	Life on land	Peace, justice and strong institutions	Partnership for the goals
	Gross domestic expenditure on R&D by sector	Purchasing power adjusted GDP per capita	Overcrowding rate by poverty status	Resource productivity and domestic material consumption (DMC)	Greenhouse gas emissions	Surface of marine sites designated under NATURA 2000	Surface of terrestrial sites designated under NATURA 2000	Corruption Perceptions Index (source: Transparency International)	Official development assistance as share of gross national income
	% of GDP	real expenditure per capita (in PPS_EU28)	% of population	euro per kilogram, chain linked volumes (2010)	tonnes per capita	km <sup>2</sup>	km <sup>2</sup>	score scale of 0 (highly corrupt) to 100 (very clean)	% of gross national income (GNI)
	<b>2,04</b>	<b>29200</b>	<b>16,6</b>	<b>2,0281</b>	<b>77,6</b>	<b>395528</b>	<b>789081</b>	<b>65</b>	<b>0,53</b>
	2,55	34300	3,7	2,7514	81,5	1271	3887	75	0,5
	0,78	14200	42,5	0,3106	57	2827	38222	43	0,13
	1,68	25600	17,9	1,0583	65,6	0	11148	57	0,14
	3,12	36100	8,2	1,9998	73,9	19053	3594	88	0,75
	2,92	36000	7,2	2,1909	74,1	25603	55200	81	0,7
	1,25	21900	13,4	0,5231	48,6	6754	8083	71	0,19
	1,19	53300	3,2	2,3896	113,4	10259	9226	74	0,32
	0,99	19700	28,7	1,43	89,7	7199	35747	48	0,19
	1,19	26700	5,4	2,788	116,4	84404	137872	57	0,35
	2,25	30400	7,7	2,9552	85,6	41685	70515	70	0,38
	0,84	17500	41,1	1,0968	76,2	4986	20704	49	0,07

Italy	30	27,9	83,4	13,8	20,1	0,1	148,4	26000
Cyprus	27,7	47,4	82,7	7,6	9,7	0,7	2,4	22000
Latvia	28,5	7,2	74,9	10	2,9	11,7	4,3	11000
Lithuania	30,1	10,2	74,9	4,8	1,9	12	6	12000
Luxembourg	19,8	47,4	82,7	5,5	11	0,5	4,2	80900
Hungary	26,3	14,7	76,2	12,4	14	3,8	23,9	11300
Malta	20,1	64,3	82,6	19,2	25,5	0	0,7	19700
Netherlands	16,7	61,3	81,7	8	11	0,1	64,8	39800
Austria	18	23,7	81,8	6,9	7,8	0,2	31,8	36500
Poland	21,9	18	78	5,2	14,2	2,3	94,3	11300
Portugal	25,1	12,6	81,3	14	6,8	0,9	22,1	17000
Romania	38,8	10,9	75,3	18,5	17,6	30	31,3	7700
Slovenia	18,4	34,8	81,2	4,9	6,6	0,2	6,7	18500
Slovakia	18,1	15,1	77,3	7,4	14,2	0,8	15,5	14600
Finland	16,6	12,4	81,5	7,9	3,3	0,3	33,1	34800
Sweden	18,3	15,5	82,4	7,4	3,8	1,9*	47,1	42500
United Kingdom	22,2	14,6	81,2	11,2	11	0,3	181,7	31800

\* EU-28 average

Source: European Commission, Eurostat, 2018. Available at: <https://ec.europa.eu/eurostat/web/sdi/main-tables>

Based on the results of the Sustainable Development Goals achieved by individual countries, it could be noted following:

Indicator for the SDG1 - People at risk of poverty or social exclusion

- 15 of the EU countries have a lower poverty rate than the EU average (Belgium, Czech Republic, Denmark, Germany, France, Luxembourg, Malta, Netherlands, Austria, Poland, Slovenia, Slovakia, Finland, Sweden, United Kingdom); but there are countries with the highest poverty rate - Bulgaria, Romania, Greece.

Indicator for the SDG2 - Ammonia emissions from agriculture

- There are 16 of the EU countries which achieving lower values of the Ammonia emissions from agriculture indicator than the EU-28 average; 4 of the EU countries have visibly higher indicator values than the EU-28 average, it can be caused by intensification of agricultural production.

Indicator for the SDG3 - Life expectancy at birth by sex

- Only 13 of the EU countries have Life expectancy at birth higher than the EU-28 average; the highest age is in Spain (84 years), the lowest in Latvia, Lithuania and Romania (75 years).

1,37	28200	27,8	3,0932	83,9	6806	57173	50	0,27
0,53	24200	2,4	1,3162	152,9	131	1653	57	0,53*
0,44	18800	43,2	0,5474	43,8	4387	7446	58	0,11
0,84	22000	23,7	0,7668	42	1563	8086	59	0,14
1,3	75100	8,1	3,1781	87,5	0	702	82	1
1,2	19700	40,4	0,9044	65,8	0	19949	45	0,17
0,58	27500	2,9	1,4072	99,4	3490	41	56	0,2
2	37200	4	4,107	91,6	15083	5520	82	0,65
3,13	37200	15,2	1,7809	103,1	0	12691	75	0,42
0,96	19900	40,7	0,6434	85	7236	61165	60	0,15
1,28	22600	10,3	1,1445	115,8	31885	19010	63	0,17
0,48	17000	48,4	0,2897	45,8	6362	54214	48	0,15
2,01	24100	12,6	1,4412	95,2	11	7675	61	0,19
0,79	22400	37,9	1,091	55,6	0	14442	50	0,12
2,74	31900	6,6	1,107	84	7140	48847	85	0,44
3,27	36000	14,4	1,8832	76,1	20229	55280	84	0,94
1,68	31400	8	3,6817	63,6	87164	20989	82	0,7

Indicator for the SDG4 - Early leavers from education and training by sex

- The lowest value of the indicator was identified in Croatia; a negative result (higher indicator value) was identified in Malta and Romania.

Indicator for the SDG5 - Gender employment gap

- Finland and Sweden have the best results in this indicator; on the other hand Malta, Italy and Greece are the worst.

Indicator for the SDG6 - Population having neither a bath, nor a shower, nor indoor flushing toilet in their household by poverty status

- The results of this indicators are close to zero in most of the EU countries; the negative results was identified in Romania (even 30% of the population have neither a bath, nor a shower, nor an indoor flushing toilet in their homes by poverty status) Latvia and Bulgaria.

Indicator for the SDG7 - Primary energy consumption

- Target of this indicator (Primary energy consumption) is 1483 million TOE (tonnes of oil equivalent) in 2020 in the EU countries; countries results in this indicator also reflect the size and performance of the individual economies

Indicator for the SDG8 - Real GDP per capita

- The highest long-term economic performance was achieved in Luxembourg and the lowest economic performance in Bulgaria and Romania.

Indicator for the SDG9 - Gross domestic expenditure on R&D by sector

- Most funds in the field of R & D were invested in Sweden, Austria and Denmark; the lowest support for R & D we identified in Latvia, Romania and Matla.

Indicator for the SDG10 - Purchasing power adjusted GDP per capita

- Best indicator values were achieved in Luxembourg; the lowest GDP per capita was identified in Bulgaria, Croatia and Romania.

Indicator for the SDG11 - Overcrowding rate by poverty status

- Fewer and fewer people in the EU are living in overcrowded conditions (Sustainable development in the European Union Monitoring report on progress towards the SDGs in an EU context, 2018), the best results were achieved in Cyprus, Malta and Belgium; the worst in Romania, Bulgaria, and Croatia.

Indicator for the SDG12 - Resource productivity and domestic material consumption

- The best results of this indicator have been achieved by Netherlands, United Kingdom and Luxembourg; the lowest value of Resource productivity and domestic material consumption been identified in Romania and Bulgaria.

Indicator for the SDG13 - Greenhouse gas emissions

- The highest value of Greenhouse gas emissions in tonnes per capita was identified in Cyprus, Spain and Portugal; lowest production of Greenhouse gas emissions was identified in Latvia and Lithuania.

Indicator for the SDG14 - Surface of marine sites designated under NATURA 2000

- This indicator cannot be evaluated in Slovakia, Austria, Luxembourg, Hungaria and Czech Republic; because of these countries is not a coastal country.
- The largest area of Surface of marine sites designated under NATURA 2000 has been identified in United Kingdom and Spain; on the other hand, the lowest value of the indicator we identified in Cyprus.

Indicator for the SDG15 - Surface of terrestrial sites designated under NATURA 2000

- The most km<sup>2</sup> of Surface of Terrestrial Sites designated under NATURA 2000 has been identified in Spain and France; there is a smallest area of these territories in Malta.

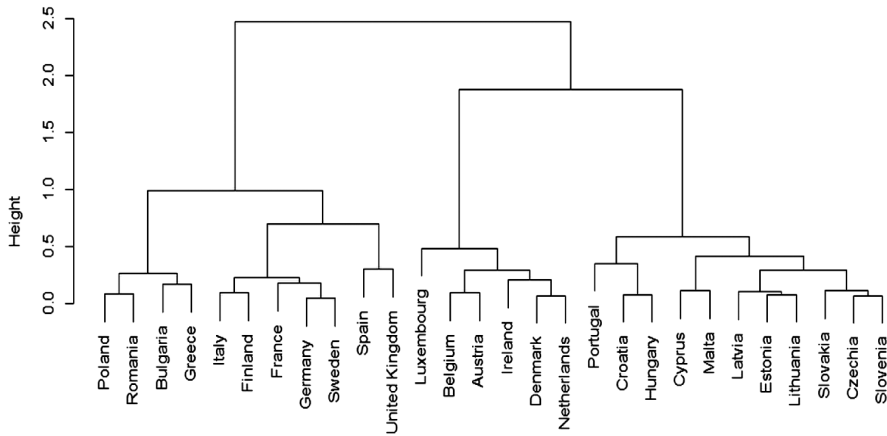
Indicator for the SDG16 - Corruption Perceptions Index

- Denmark, Finland and Sweden are closest to no corruption. A high degree of corruption has been identified in Bulgaria, Hungary, Greece and Romania.

Indicator for the SDG17 - Official development assistance as share of gross national income

- There is the largest participation of Luxembourg and Sweden in Official Development Assistance (as share of gross national income); low participation rates (in relation to GNI) in Official Development Assistance, have been identified in Croatia, Latvia and Slovakia.





**Figure 1. Dendrogram of similarity of the EU countries in achieving Sustainable Development Goals**

Source: own processing based on Eurostat data (Eurostat, 2018. Available at: <https://ec.europa.eu/eurostat/web/sdi/main-tables>).

Based on the results of the cluster analysis (Figure 1), it can be said that the individual EU countries have a certain degree of similarity in achieving the Agenda 2030 goals.

EU countries can be divided into 2 large (cluster n. 1 - Poland, Romania, Bulgaria, Greece, Italy, Finland, France, Germany, Sweden, Spain, United Kingdom; cluster n. 2 - Luxembourg, Belgium, Austria, Ireland, Denmark, Netherlands, Portugal, Croatia, Hungary, Cyprus, Malta, Latvia, Estonia, Lithuania, Slovenia, Czech Republic, Slovenia) and then in 4 relatively homogeneous clusters according to the actual results in the individual indicators for the year 2016:

- Poland, Romania, Bulgaria, Greece;
- Italy, Finland, France, Germany, Sweden, Spain, United Kingdom;
- Luxembourg, Belgium, Austria, Ireland, Denmark, Netherlands;
- Portugal, Croatia, Hungary, Cyprus, Malta, Latvia, Estonia, Lithuania, Slovenia, Czech Republic, Slovenia.

However, it should be noted, that the results of cluster analysis do not provide information which of that clusters of countries achieve the best results in achieving the SDGs.

## Conclusion

Based on the results of realized cluster analysis, it is not possible to determine which of the countries achieve better results of the individual goals (represented by selected indicators), but it is possible to assess which of the countries are similar in SDGs achieving.

Based on the assessment of individual results achieved in the EU (individual SDGs), it is possible to conclude that the group of countries - Luxembourg, Belgium, Austria, Ireland, Denmark, Netherlands achieved the best results in the process of sustainable development. The worst results we identified in the Romania and Bulgaria.

The similarity of the EU countries identifying using the cluster analysis, could be used in sustainable development management at EU level, and due to the similarity of these countries (included in individual clusters), it is possible to co-operate in the achieving of individual sustainable development goals and sustainability.

In a more detailed analysis of created clusters, we could see also some geographic and political-economic similarities (Romania, Bulgaria, Latvia, Lithuania, Estonia, Cyprus, Malta), which is also an opportunity to intensify cooperation.

It is obvious that not all the EU countries are able to achieve its goals (especially SDGs) using the same instruments.

Similarity of individual countries can become a common denominator also for finding and applying functional instruments in the process of the sustainable development goals achieving.

It is not decisive what instruments will be used, but it is very important efficiency or effectiveness of the used instruments, in the process of sustainable development and sustainability management.

From this point of view, the knowledge of the similarities of the EU countries is very significant for ensure the sustainability.

## Summary

Sustainability ideas are implemented in almost all areas of life, not only into the economic and social life. However, the ways to sustainable development quantifying are still relatively complicated and incomplete. One of the possibilities of assessment and achievement of sustainable development and sustainability can be considered assessment using the Sustainable Development Goals (SDGs) presented in Agenda 2030. The aim of the paper is to assess the similarity of the EU countries in achieving the Sustainable Development Goals according to 2030 Agenda.

**Keywords:** Sustainable Development, Sustainable Development Goals, European Union countries, similarity, Agenda 2030.

## Streszczenie

Koncepcje zrównoważonego rozwoju są wdrażane niemal we wszystkich dziedzinach życia, nie tylko w życiu gospodarczym i społecznym. Jednak sposoby szacowania zrównoważonego rozwoju są nadal stosunkowo skomplikowane i niekompletne. Jedną z możliwości oceny i osiągnięcia zrównoważonego rozwoju jest wykorzystanie celów zrównoważonego rozwoju przedstawionych w Agendzie 2030. Celem artykułu jest ocena podobieństwa krajów UE w osiąganiu celów zrównoważonego rozwoju zgodnie z Agendą 2030.

**Słowa kluczowe:** zrównoważony rozwój, cele zrównoważonego rozwoju, kraje Unii Europejskiej, podobieństwo, Agenda 2030

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