PROBLEMY EKOROZWOJU – PROBLEMS OF SUSTAINABLE DEVELOPMENT
2016, vol. 12, no 1, 117-124

Title Sustainable Development in the World from the Aspect of Environmental Health and Human Development Index: Regional Variations and Patterns

Rozwój zrównoważony z perspektywy wskaźników Zdrowia (EH) i Rozwoju Społecznego (HDI): regionalne odmiany i wzorce

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Abstract

In this paper we consider the impact of Human Development Index and Environmental Health on sustainable development in 178 observed countries. We focus on the necessity of multidisciplinary approaches that estimate and predict how selected indicators such as (1) Improved sanitation facilities (% of population with access); (2) Life expectancy at birth, female (years); (3) Improved water source, rural areas (% of rural population with access); (4) Access to electricity (% of population), and (5) Health expenditure *per capita* (current USD) influence on sustainable development and environmental health in the World. The Environmental Health and Human Development Indicator allow countries to compare their social and environmental inequalities with other surrounding countries/regions. Any correlations between Environmental Health and Human Development Index as well as with five World Bank indicators were to be analyzed. The objective was also to explore the heterogeneity of observed countries according to their level of sustainable development based on Environmental Health and Human Development Index.

Key words: Environmental Health, Human Development Index, sustainable development, World Bank Indicators, scores and ranks, air and water quality

Streszczenie

W artykule przedstawiono wpływ wskaźników Rozwoju Społecznego (Human Development Index, HDI) i Zdrowia (Environmental Health, EH) na zrównoważony rozwój w 178 krajach. Szczególny nacisk położono na (1) Poprawę dostępu do urządzeń sanitarnych (% populacji z dostępem); (2) Oczekiwany czas życia od momentu urodzenia u kobiet (w latach); (3) Poprawa dostępu do wody na terenach rolniczych (% populacji z dostępem); (4) Dostęp do elektryczności (% populacji) oraz (5) Wpływ poziomu wydatków na zdrowie na osobę (w USD) na zrównoważony rozwój i kwestie zdrowotne w perspektywie światowej. Wskaźniki (w połączeniu z tym przygotowanymi przez Bank Światowy) te pozwalają na porównanie różnych krajów w zakresie ich społecznych i środowiskowych nierówności wobec siebie i innych krajów/regionów. Przeanalizowano wszelkie występujące korelacje pomiędzy wskaźnikami. Celem było także zbadanie poziomu heterogeniczności poszczególnych krajów z perspektywy poziomu wdrażanego rozwoju zrównoważonego z uwzględnieniem wskaźników Rozwoju Społecznego (HDI) i Zdrowia (EH).

Słowa kluczowe: Wskaźnik Zdrowia (EH), Wskaźniki Rozwoju Społecznego, rozwój zrównoważony, Wskaźniki Banku Światowego, punkty i rankingi, jakość powietrza i wody

Introduction

This study demonstrates that the Human Development Index (HDI) and Environmental Health (EH) in observed 178 countries can be predicted by the selected indicators such as (1) Improved sanitation facilities (% of population with access); (2) Life expectancy at birth, female (years); (3) Improved water source, rural areas (% of rural population with access); (4) Access to electricity (% of population), and (5) Health expenditure *per capita* (current USD). The practical aspects of sustainable development by composite indicators are also analyzed in this article. The main objectives of the study are as follows:

First, this study explores that the sustainable development in the World from the aspect of EH and HDI shows a spatial disparity in a development capacity. High-developed countries have remained absolute leaders as a human and environmental capital, as well as ranking among the top countries for long-term sustainable development.

Second, the EH and HDI allows countries to compare their social and environmental inequalities with other surrounding countries/regions in the World. The EH and HDI clearly demonstrate that the key to win the super competitive race in the sustainable environment is improvement and investment in the future: infrastructure (sanitation, water, and electricity facilities), healthcare, and education.

Third, we analyzed the relationship between each dependent variable (EH and HDI) in 178 observed countries worldwide. The EH and HDI were compared validation in terms of its relationship to World Bank (WB) indicators such as (1) Improved sanitation facilities (% of population with access); (2) Life expectancy at birth, female (years); (3) Improved water source, rural areas (% of rural population with access); (4) Access to electricity (% of population), and (5) Health expenditure per capita (current USD).

Most of the published studies dealing with spatial analysis of EH and HDI refer to the significant relationship between environmental and social indicators and sustainable development (Dahl, 2012; Moldan et al., 2012; Hak et al., 2012; Costantini et al., 2008; Boehringer et al., 2007; Blanc et al., 2008; Bassi et al., 2014; Hotez et al., 2015).

The relationship between environmental factors and sustainable development of a countries' is complicated considering that large sections of the country's population depend on natural resources for their livelihood. Weak environmental and socioeconomic conditions may have an unfavorable effect on sustainable development and their improvement measures. In additional, Bradshaw et al. (2009) consider that elevated degradation and loss of habitats and species are compromising ecosystem services that sustain the quality of life for billions of people worldwide. *Sustainability* is among the most sought after of all seafood products adjective (Volpe et al., 2013). EH is one of the principal determinants reducing environmental stress to health and increases the human quality of life. EH increases significantly when human development increases (Boutayeb, 2009).

Data and methodology

To be able to explore regional inequalities, the following variables were used to perform a multinational comparison (data provided by WB):

1. *Improved sanitation facilities (% of the population with access)* – refers to the percentage of the population using improved sanitation facilities.
2. *Life expectancy at birth, female (years)* – indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.
3. *Improved water source, rural areas (% of rural population with access)* – percentage of the population using an improved drinking water source.
4. *Access to electricity (% of the population)* – the percentage of the population with access to electricity.
5. *Health expenditure per capita* (*current USD)* – provided by World Health Organization and Global Health Expenditure Database.

As depended variables were used indicators such as EH and HDI. The EH is calculated comparing three indicators: health impacts, air quality, and water and sanitation. The EH builds on measure relevant to one primary objective that is reducing environmental stress to human health (Chandrasekharan et al., 2013). The HDI is a composite index measuring average achievement in 3 basic dimensions (4 indicators) of human development; long and healthy life (life expectancy at birth), education (mean and expected years of schooling), and decent standard of living (gross national income *per capita*). The index ranges from 0-1, with a higher score reflecting a higher degree of human development (Lou et al., 2014).

The series of indicators reveal in a clear and objective way the relative position of each of the countries. Therefore, factors were ranked according to the degree to which they are useful in determining the competitive position of those countries.

Our research based on following objectives:
H1: *We assumed that there is a high level of heterogeneity in terms of human development, environmental health and environmental performance among all observed countries.*
H2: *There is a strong correlation between the Human Development Index and the Environmental Health Index as well as selected environmental variables provided by World Bank database*
To describe the association between five WB indicators, EH, and HDI, two statistical methods were used – Pearson and Spearman correlation and linear regression analysis. The regression models were checked for collinearity. Analyzes were made using Statgraphics Centurion version XVI, SPSS version 22.0 and MapInfo version 11.0.

Results

Environmental and social indicators influencing on sustainable development
For the purpose of this study, social and environmental indicators were chosen from official statistics published by the Yale Center for the Environmental Law & Policy, Yale University and World Bank (Hsu et al., 2014), in collaboration with World Economic Forum in Geneva. The most meaningful results of our environmental health analysis of sustainable development had a focus on the spatial distribution of the selected indicators published by World Bank compared with the EH and HDI in the World. To describe the associations between EH and HDU we used WB indicators (Table 1).
The *Improved Sanitation Facilities* indicator provided by WB characterizes as a percentage of the population using improved sanitation facilities. The improved sanitation facilities include flush/pour flush (to piped sewer system, septic tank, and pit latrine), ventilated improved pit latrine, and composting toilet. The spatial distribution of development of the sanitation facilities indicator worldwide displays that there is a significant distinction between High-income countries located in Western Europe and Northern America on one side and Low and middle – income countries in central Africa and Southern Asia on the other side.
In equatorial Africa and South Asia, the majority of dwellers live in informal settlements served by inadequate sanitation facilities. These settlements present unique challenge to the provision of sustainable and hygienic sanitation, and there is insufficient information on access to improved facilities (Okurut et al., 2015). The highest rankings were reached in all Scandinavian countries, Benelux and Switzerland (Table 1, Figure 1, 5) as the countries with the best sanitation facilities in the world. These countries' sanitation facilities provide high health and social standards towards their inhabitants.
The lowest ranking was reported in Africa. Niger (9.0%), Somalia (9.8%) and Malawi (10.3%) gained the smallest percentage of population with access to sanitation facilities and are among the worst performers in affording the basic elements of improved sanitation facilities. However, depending on the variance values (Table 1), there is a significant increase in macro-regional inequalities in the sanitation facilities among the selected countries in the World. The difference between the minimum (9%) and maximum value (100 %) is 91%.
Life expectancy at birth, females is another indicator published by WB that is also considered as a significant driver of sustainable development and environmental health. Life expectancy at birth is considered as an important indicator of the mortality level of a population. Life expectancy at birth can be also influenced by components of the gender inequality. In the recent years, most countries worldwide experienced improved health outcomes as longevity increased steadily, and infant mortality rate decreased, along with a growth of the health expenditures (Jaba et al., 2014). It is calculated as a number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. The range of the life expectancy females at birth in countries across the World reveals significant macro-regional disparities. Countries such as Japan (86.6 years), Spain (85.5), and France (85.4) have reached admirable overall life expectancy; as a result of outstanding conditions of healthcare as well as other factors including environmental health, socioeconomic conditions, etc (Figure 2, 5). The rest of high-income countries also have above-average values of life expectancy due to factors such as diet, public health, income and equal opportunities.
Poorly developed healthcare system, public social services and high level of inequality in society have significant impact on decreasing trends of life expectancy at birth in low-income countries such as Sierra Leone (45.8 years), Botswana (46.6), Swaziland (48.3), and Lesotho (49.5) and has an unfavorable impact on preventing diseases, prolonging life and promoting healthcare in a variety of ways. The difference between the marginal values is 40.8 years (minimum value 40.8 years, maximum value 86.6 years).
Access to an *improved water source in rural areas* refers to the percentage of the rural population using an improved drinking water source. Water source represents a compound of sustainable water infrastructure and environmental protection related indicators of sustainable development that provides reliable information about public taps or standpipes,

tube wells or boreholes, protected dug wells, protected springs, and rainwater collection.

Spatial distribution of sustainable water infrastructure indicators in rural areas across the World was rather varying with significant divergences across the macro-regions. The best outcomes, i. e. the highest values of the improved water source in rural areas indicator the evaluated countries were presented in Western European countries as well as in New Zealand, Australia, Japan and United Arab Emirates (100%). On opposite side, the lowest values for this indicator were reached in Somalia (10%), Democratic Republic of Congo (29%), Papua New Guinea (32.8%), and Angola (34.3%) among others. Information on quantity and quality of water resources in countries like Somalia, Niger, and Angola negatively affected the environmental protection and sustainable agricultural development because authorities of these countries cannot adequately afford water sources for sustainable development. The mean value of improved water source in rural areas was 81.6%; ranging from 10% to 100% (2012). Better management and protection of the water sources in rural areas, hygiene improvement, and domestic water treatment before consumption may be a possible solution to reduce health risks in low developed countries.

The next indicator within the selected WB indicators is of particular importance for a country's ability to provide *access to electricity*; while in most developed countries the proportion of households with access to electricity is almost 100%, in many developing countries the proportion may still be much smaller, depending on the level of urbanization and the level of development of the grid infrastructure.

About 1.5 billion people in developing countries lack access to electricity, and about three billion people rely on solid fuels – traditional biomass (2.6 billion) and coal (0.4 billion) – for cooking. Although energy access varies widely across developing countries, it is much lower in developing countries, placing poor countries at a huge disadvantage; it is also less in rural than in urban areas (Legros et al., 2011).

The indicator shows the percentage of the population with access to electricity. The spatial differentiation of the proportion of the population with secure access to electricity in the World is shown in Table 1; the countries with the highest proportion in the index (100%) covered all developed countries. Countries with 100% access to electricity of its population have the best households, factories as well as rural electrification networks that provide a measure of the overall level of regional sustainable development. The quartile with the lowest percentage of access to electricity (Q1) included the countries in central Africa. Chad (6.4%), Burundi (6.5%), and Liberia (9.8%) belonged to the countries with the lowest values in the access to electricity, due to low level of electrification especially in rural areas following by factors such as poverty, lack of resources, lack of political will, poor planning of sustainable development. The range of values in Access to electricity was from 6.4% to 100%; the variance is 950.2. It indicated that the access to electricity was inadequately spatially differentiated.

The last indicator within the analyzed WB indicators of EH is *Health expenditure per capita*. This indicator characterizes how the public and private health expenditure effects on quality of health services (preventative and curative), family planning activities, nutrition activities, and emergency aid designated for health in analyzed countries of this study. The highest values of the health expenditure per capita indicator were in Norway (9715 USD), Switzerland (9276 USD), and the United States of America (9146 USD). Norway and Switzerland are good examples of the phenomenon how efficiently utilize public and private healthcare funds for providing care that is respectful and responsive to individual patient preferences as well as supporting services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit (avoiding underuse and overuse).

The spatial differentiation of Health expenditure per capita in the World is illustrated in Table 1. According to the reported values of indicator, countries belong in four quartiles. One quartile represents all countries mostly low-income economies in Africa and Asia such as Somalia (4 USD), Central African Rep. (13 USD), Myanmar (14 USD), Dem. Rep. Congo (16 USD), and Eritrea (17 USD) among others. These countries belong to low-income economies; governments cannot provide qualitative standards related to access to proper healthcare services. The results of health expenditure *per capita* indicate that substantial proportions of residents in low-income economies face catastrophic health expenditure and would likely forgo health care they need but cannot afford. According to Buigut et al. (2015) immediately implementation mechanisms and international action programs that pool risk and cost (insurance) are needed to protect the poorest residents from catastrophic health expenditure and improve equality in health care access and payment.

Worldwide, there are tremendous inequalities in preventive services and access to care. The range of values between the highest and lowest countries in health expenditure per capita was from 4 to 9715 USD in 2013. It implies that the health expenditure per capita in World is strongly spatially differentiated (Table 1, Figure 5). The next two indicators – *Environmental Health and Human Development index* were used as sustainable indicators potentially influencing on the selected WB indicators (Table 1, Figure 3, 4, 5).

Table 1. Primary data on environmental and social indicators in the World, source: author's research

Indicators	Mean	Median	Q1	Q3	Range	Variance	Std. Deviation
1. Improved Sanitation Facilities - WB	72.5	87.8	46.8	98.2	91.0	920.1	30.3
2. Life Expectancy at Birth, Female - WB	72.7	76.2	65.3	80.0	40.8	97.4	9.9
3. Improved Water Source, Rural A. - WB	81.6	88.7	68.5	99.0	90.0	408.3	20.2
4. Access to Electricity – WB	77.5	97.7	55.2	100.0	93.6	950.2	30.8
5. Health Expenditure per Capita - WB	1071	343	93.8	1005.5	9711	3430165	1852.1
EH1 Health Impacts	66.6	72.0	43.8	92.0	90.3	761.6	27.6
EH2 Air Quality	79.6	80.1	69.7	95.8	86.2	283.6	16.8
EH3 Water and Sanitation	49.7	46.2	20.9	77.3	98.7	1050.4	32.4
EH 1-3 Environmental Health Index	65.3	69.3	42.7	85.4	75.5	492.7	22.2
Human Development Index (HDI) 2013	0.680	0.717	0.552	0.813	0.89	0.027	0.165

Table 2. Correlations between HDI 2013, EH 2014, and selected environmental and social indicators provided by World Bank (Pearson and Spearman Correlations), source: author's research

	INDICATORS								
	1.	2.	3.	4.	5.	EH1	EH2	EH3	*(HDI 2013*
Pearson Correlation									
1. Improved Sanitation Facilities - WB									.881**
2. Life Expectancy at Birth, Female - WB	.837**								.883**
3. Improved Water Source, Rural A. - WB	.803**	.750**							.801**
4. Access to Electricity – WB	.877**	.828**	.743**						.846**
5. Health Expenditure per Capita - WB	.450**	.512**	.432**	.377**					.614**
EH1 Health Impacts	.868**	.927**	.818**	.828**	.544**				.927**
EH2 Air Quality	.461**	.370**	.270**	.382**	.282**	.383**			.471**
EH3 Water and Sanitation	.863**	.805**	.823**	.759**	.652**	.870**	.391**		.885**
EH 1-3 Environmental Health Index	.896**	.870**	.808**	.809**	.614**	.934**	.602**	.946**	.934**
Spearman Correlation									
1. Improved Sanitation Facilities - WB									.913**
2. Life Expectancy at Birth, Female - WB	.850**								.915**
3. Improved Water Source, Rural A. - WB	.824**	.805**							.834**
4. Access to Electricity – WB	.826**	.793**	.720**						.822**
5. Health Expenditure per Capita - WB	.841**	.837**	.769**	.742**					.936**
EH1 Health Impacts	.879**	.931**	.854**	.811**	.846**				.936**
EH2 Air Quality	.473**	.469**	.365**	.439**	.608**	.447**			.539**
EH3 Water and Sanitation	.946**	.863**	.918**	.817**	.861**	.896**	.472**		.919**
EH 1-3 Environmental Health Index	.922**	.902**	.871**	.804**	.906**	.939**	.620**	.957**	.948**

Correlation is significant at the 0.01 level (two-tailed).

Table 3. Linear regression between HDI, EH and selected environmental and social indicators provided by World Bank, source: author's research

	Environmental Health (2014)			Human Development Index (2013)		
	B	Std. Error	Sig.	B	Std. Error	Sig.
(Constant)	-19.505	6.314	.002	.028	.047	.555
Improved Sanitation Facilities (2012)	.346	.045	.000**	.001	.000	.000**
Life Expectancy at Birth, Female (20012)	.617	.118	.000**	.005	.001	.000**
Improved Water Source, Rural A. (2012)	.165	.048	.001**	.001	.000	.002**
Access to Electricity (2012)	-.015	.041	.711	.001	.000	.001**
Health Expenditure per Capita (2013)	.002	.000	.000**	1.915E-5	.000	.000**
R2		.892			.893	

Dependent Variables: Human Development Index (2013) and Environmental Health (2014), **Correlation is significant at the 0.01 level (two-tailed)

All indicators were computed for each country. The EH is based on indicators such as child mortality, household air quality, air pollution, access to drinkable water, and access to sanitation. The HDI is composing of life expectancy, education, and per capita income indicators, which is used to rank countries into four tiers of human development.

Environmental protection is critical attribute to maintain ecosystem services essential for human well-being. It is important to be able to rank countries by their environmental impact so that poor performers, as well as policy *models*, can be identified (Bradshaw et al., 2010). Environmental Health, using the percentage of the aggregate index calculated from following indica-

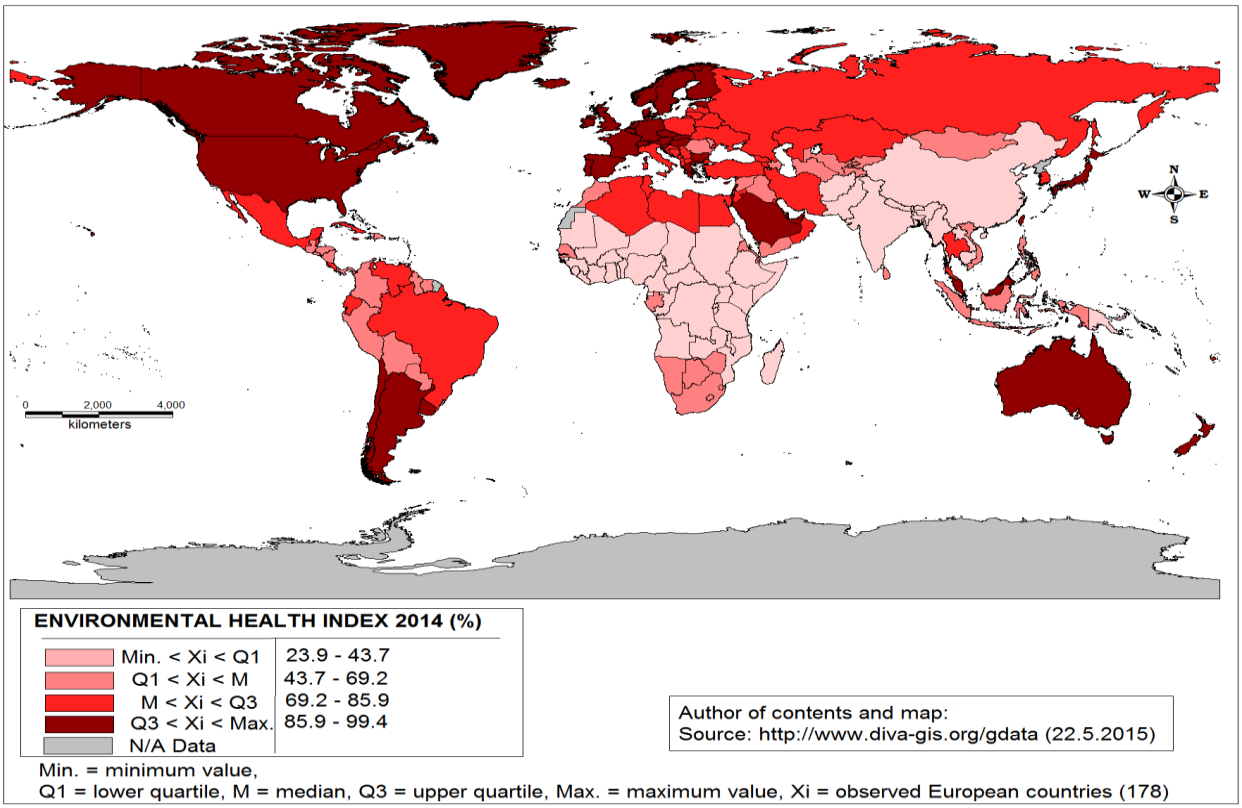

Figure 1. Environmental Health Index (%) in the World (2014)

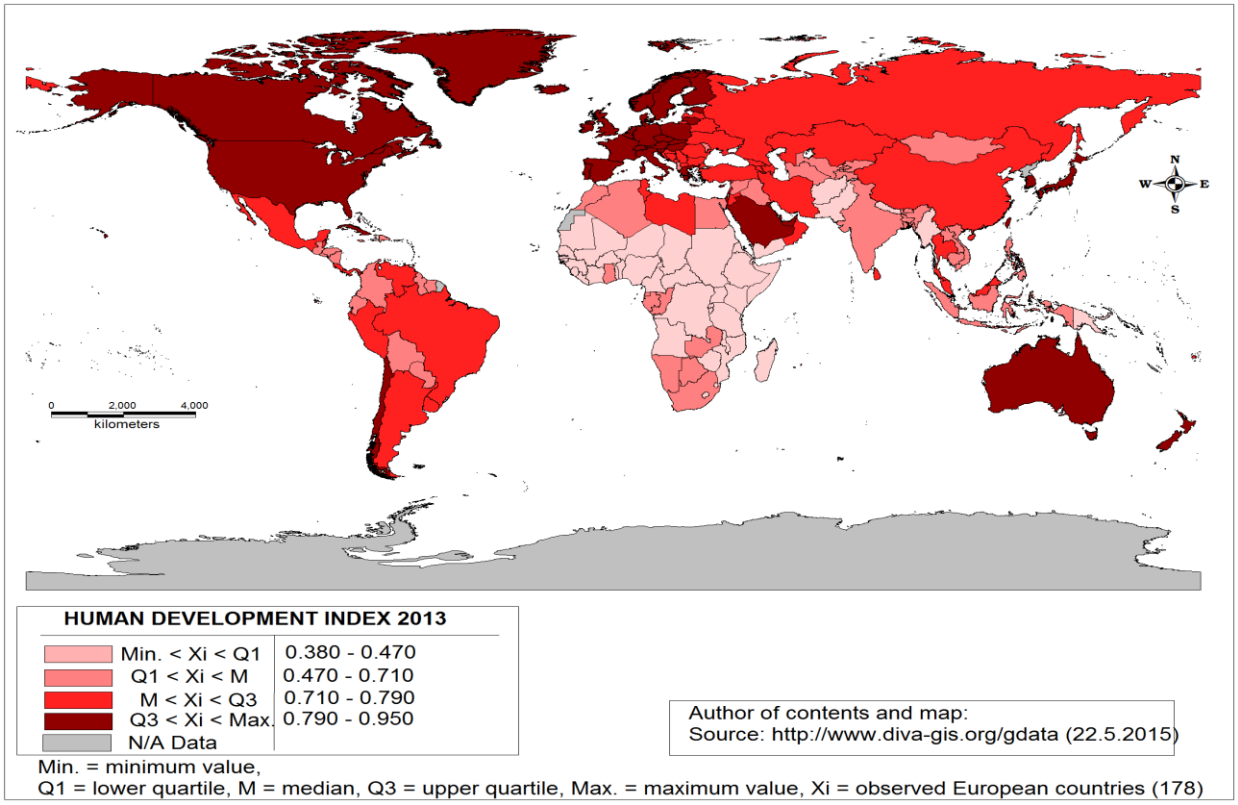

Figure 2. Human Development Index in the World (2013)

tors: (EH1) health impacts, (EH2) air quality, and (EH3) water and sanitation. It was based on the 2014 survey published by the Yale Center for the Environmental Law & Policy, Yale University and the Center for International Earth Science Information Network, Columbia University, in collaboration with World Economic Forum in Geneva. The mean proportion in the World was 65.3% (ranging from 23.9% in Dem. Rep. Congo to 99.44% in Norway).

Human Development Index rankings have provided a referenced measure for people to choose a country in which to travel or live (Wu et al., 2014). HDI (includes level of social and economic development based on four criteria: Life expectancy at birth, mean years of schooling, expected years of schooling and gross national income per capita) was based on data 2013 survey; provided by the United Nations. The mean HDI in the countries was 0.680 in the year 2013; ranging from 0.050 for Somalia to 0.944 for Norway.

Correlations and linear regression of indicators influencing on sustainable development

There was evidence of high correlation and concordance among the different composite indicators compared. The results of Pearson and Spearman correlations are provided in Table 2, which pointed out the correlation between the selected WB indicators such as Improved sanitation facilities, Life expectancy at birth – female, Improved water source in rural areas, Access to electricity, Health expenditure per capita, and two aggregated indexes – EH and HDI. EH and HDI were positively correlated (Pearson's r = 0.934; Spearman's r = 0.948, P <0.01). For EH, in 2014 the Pearson and Spearman correlation between all five selected indicators provided by WB was significant at 0.01 levels (2-tailed). There was strong positive relationship between EH and Improved sanitation facilities (Pearson's r = 0.896; Spearman's r = 0.922), Life expectancy at birth – female (Pearson's r = 0.870; Spearman's r = 0.902), Improved water sources in rural areas (Pearson's r = 0.808; Spearman's r = 0.871) and Access to electricity (Pearson's r = 0.809; Spearman's r = 0.804). The same positively correlation were demonstrated between Improved sanitation facilities (Pearson's r = 0.881; Spearman's r = 0.913), Life expectancy at birth – female (Pearson's r = 0.883; Spearman's r = 0.915), Improved water sources in rural areas (Pearson's r = 0.801; Spearman's r = 0.834), Access to electricity (Pearson's r = 0.846; Spearman's r = 0.822), Health expenditure per capita ((Pearson's r = 0.927; Spearman's r = 0.936), and HDI.

The table 3 presence of the linear regression of the EH, HDI in 178 countries and the separate WB indicators in 2012. In the presented model, the variables were calculated successively to examine the effects independently. The dependent variables are the EH rate and HDI for 178 observed countries. Table 3 illustrates, that the Improved sanitation facilities, Life expectancy at birth – females, Improved water resources in rural areas, and Health expenditure per capita were significantly associated with the EH and Access to electricity did not contribute to the prediction of the EH index. All selected WB indicators were significantly associated with the HDI. The model also explained 89.2% of the variance in EH among the countries in 2013 and 89.3% of the variance in HDI in the year 2014.

Conclusions

The results of the research conducted in this paper indicate which variables determine EH. To be precise, the results suggest that environmental development, measured by WB indicators, and human development measured by the Human Development aggregated index, a significant influence on sustainable development. Developing a national statistic comparison of sustainable development for each country is a real effort to construct a tool to support its development.

Sustainable development of the 178 countries in World is placed on different levels, which confirms their various positions on the sustainability world list as measured by the EH and HDI. By analyzing the countries according to EH score in 2014 the order of the top 5 positions is as follows: Norway (99.44), Australia (99.44), Singapore (99.44), Finland (99.44), and Sweden (99.04). The resulting maps of selected WB indicators as well as EH and HDI show that the low developed countries mostly in central Africa and South Asia have less potential for social and environmental development and accomplish progress in sustainable development of its environment and human habitat. It should be mentioned, however, that these different conditions among the countries are generally caused by considerable differences in their spatial distribution of development of the sanitation facilities; factors such as diet, public health, income and equal opportunities; sustainable water infrastructure and environmental protection; the level of urbanization and the level of development of the grid infrastructure and reducing environmental stress to human health. Mentioned statement confirmed the first hypothesis of this research that there is a high level of heterogeneity in terms of HDI, EH and environmental performance among all observed countries. The strong correlation between the EH and HDI suggest that the analyzed countries should innovate social, economic and environmental strategies to increase the overall sustainable development. It is important to show that incensement of the HDI significantly con-

tributes to the EH. In other words, the incensement of the HDI and EH of the countries enables increase net of its overall sustainable development competitiveness. Mentioned facts were also confirmed by using linear regression analysis to determinate the influence of HDI on the EH, as well as the in influence variables chosen by the WB statistics. Hence, the second hypothesis of this research is confirmed.

Limitation of our research based on published datasets from different sources such as World Bank, United Nations Development Program as well as Yale Center for the Environmental Law & Policy. Consequently, we were limited to mentioned data and the available relevant sources thus this may be frustrating not to give a complete panorama of this interesting subject of research.

Another limitation of this analysis is heterogeneity of the countries within the selected World Bank indicators and short period of observations as well as not including other indicators that represents sustainable development in the model, due to lack of available and comparable data.

References

1. BASSI A., BEČIĆ E., LOMBARDI N., 2014, An Introduction to the Assessment of Sustainable
2. PATHS, Models, and Metrics, in: *Asian Social Science,* vol. 10, no. 11, p. 17-27.
3. BLANC I., FRIOT D., MARGNI M., JOLLIET O., 2008, Towards a New Index for Environmental Sustainability Based on DALY Weighting Approach, in: *Sustainable Development,* vol. 16, no. 4, p. 251-260.
4. BOEHRINGER CH., JOCHEM P.E.P., 2007, Measuring the immeasurable – A survey of sustainability indices, in: *Ecological Economics*, vol. 63, no. 1, p. 1-8.
5. BOUTAYEB A., 2009, The impact of HIV/AIDS on human development in African countries, in: *BMC Public Health*, vol. 9, no. 1, p. 1-10.
6. BRADSHAW C.J.A., SODHI N.S., BROOK, B.W., 2004, Tropical turmoil: a biodiversity tragedy in progress, in: *Frontiers in ecology and the environment,* vol. 7, no. 2, p. 79-87.
7. BRADSHAW C.J.A., GIAM X., SODHI N.S., 2010, Evaluating the Relative Environmental Impact of Countries, in: *Plos One*, vol. 5, no. 5, p. 1-16.
8. BUIGUT S., ETTARH R., AMENDAH D.D., 2015, Catastrophic health expenditure and its determinants in Kenya slum communities, in: *International journal for equity in health,* vol. 14, no. 46, p. 1-12.
9. COSTANTINI V., MONNI S., 2008, Environmental, human development and economic growth, in: *Ecological Economics,* vol. 64, no. 4, p. 867-880.
10. DAHL A.L., 2012, Achievements and gaps in indicators for sustainability, in: *Ecological Indicators*, no. 17, p. 14-19.
11. HAK T., KOVANDA J., WEINZETTEL J., 2012, A method to assess the relevance of sustainability indicators: Application to the indicator set of the Czech Republic's Sustainable Development Strategy, in: *Ecological Indicators*, no. 17, p. 46-57. HOTEZ P.J., HERRICKS J.R., 2015, Helminth Elimination in the Pursuit of Sustainable Development Goals, in: *Plos Neglected Tropical Diseases,* vol. 9, no. 4, p. 1-6.
12. HSU A., EMERSON J., LEVY M., SHERBININ A., JOHNSON L., MALIK O., SCHWARTZ J., JAITEH M., *The 2014 Environmental Performance Index*, New Haven, 2014.
13. CHANDRASEKHARAN I., KUMAR R.S., RAGHUNATHAN S., CHANDRASEKARAN S., 2013, Construction of Environmental performance index and ranking of states, in: *Current Science*, vol. 104, no. 4, p. 435-439.
14. JABA E., BALAN C.B., ROBU I.B., 2014, The relationship between life expectancy at birth and health expenditures estimated by a cross-country and time-series analysis, in: *Procedia Economics and Finance*, vol. 15, p. 108-114.
15. LEGROS G., GITONGA S., RIJAL K., 2011, Global changes in household access to electricity and modern fuels, in: *Current opinion in environmental sustainability,* vol. 3, no. 4, p. 241-247.
16. LOU L.X., CHEN Y., YU CH., LI Y.M., YE J., 2014, National HIV/AIDS mortality, prevalence, and incidence rates are associated with the Human Development Index, in: *American Journal of Infection control,* vol. 42, no. 10, p. 1044-1048.
17. MOLDAN B., JANOUSKOVA S., HAK T., 2012, How to understand and measure environmental sustainability: Indicators and targets, in: *Ecological Indicators*, vol. 17, p. 4-13.
18. OKURUT K., KULABAKO R.N., ABBOTT P., ADOGO J.M., CHENOWETH J., PEDLEY S., TSINDA A., CHARLES K., 2015, Access to improved sanitation facilities in low-income informal settlements of East African cities, in: *Journal of water sanitation and hygiene for development,* vol. 5, no. 1, p. 89-99.
19. VOLPE J.P., GEE J.L.M., ETHIER V.A., BECK M., WILSON A.J., STONER J.M.S., 2013, Global Aquaculture Performance Index (GAPI), in: *Sustainability,* vol. 5, no. 9, p. 3976-3991.
20. WU P.C., FAN C.W., PAN S.C., 2014, Does Human Development Index Provide Rational Development Rankings?, in: *Social Indicator Research,* vol. 116, no. 2, p. 647-658.