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COMPARATIVE ASSESSMENT OF ENVIRONMENTAL INDICATORS OF QUALITY OF LIFE IN ROMANIA AND LITHUANIA

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ABSTRACT. The paper presents a comparative study to assess quality of life in terms of environment in Lithuania and Romania. It introduces a system of indicators for assessing environmental issues of quality of life in these two countries. The environmental dimension is one of the major issues affecting quality of life as the environment, first and foremost, provides for healthy living conditions. The environmental indicators being assessed can be organized into 3 major groups of environmental indicators: environmental quality, environmentally responsible behaviour, and consumption of environmental services. These groups of indicators are closely interrelated as environmentally responsible behaviour has positive impact on environmental quality, and improved environmental quality provides for higher consumption of services provided by the environment. The dynamics of these integrated environmental indicators relevant to quality of life were investigated and compared in Lithuania and Romania, and policy recommendations were developed.

JEL Classification: I31, I38, O47

Keywords: integrated indicators, quality of life, environmental quality, environmentally responsible behaviour, consumption of environmental services.

Introduction

Environmental quality is a key dimension of people's well-being, as quality of life is strongly affected by a healthy environment (Holman & Coan, 2008; Kahn, 2002) and has a direct impact on human health. Besides affecting people's health, the environment also matters intrinsically as many people attach importance to the beauty and the healthiness of the place where they live (Balestra& Dottori, 2011; Kahn, & Matsusaka, 1997). People also directly benefit from environmental assets and services, such as water, clean air, lands, forests, and access to green spaces, as these assets allow them to satisfy basic needs and to enjoy free time and the company of others (Pretty, Peacock, Sellens, & Griffin, 2005; Balestra, & Sultan, 2011).

The environmental indicators reflecting the quality of life can be grouped based on their relationships with quality of life: indicators of environmental quality, indicators for assessing environmentally responsible behaviour, and indicators of consumption of environmental services. These groups of indicators are tightly interrelated as environmentally responsible

behaviour has positive impact on environmental quality, and improved environmental quality provides for higher consumption of services provided by the environment.

The aim of this paper is to develop a system of integrated environmental indicators that can be applied for comparative assessment of quality of life in Lithuania and Romania.

The paper has four main objectives:

- To select indicators for assessing environmental quality, environmentally responsible behaviour, and consumption of environmental services based on the EUROSTAT database;
- To develop integrated environmental indicators of quality of life;
- To analyse and compare integrated environmental indicator trends in Lithuania and Romania during the 2004-2011 period;
- To develop policy recommendations based on the analysis provided.

Environmental indicators related to quality of life

The quality of local living environment has a direct impact on human health and well-being, and economies rely not only on healthy and productive workers but also on natural resources such as water, timber, fisheries, plants and crops (Zheng, 2010; Reto & Garcia-Vega, 2012). Consumption of environmental services and amenities also has a direct impact on quality of life. Conversely, the quality of the environment and environmental services and amenities are affected by human behaviour (Osbaldiston & Sheldon, 2003; Thogersen, 2006).

Indeed, "environmental indicators related to quality of life" is a broad concept, and a system of indicators should be developed that inform about the quality of environmental media (e.g., soil, water, air) on people's access to environmental services and amenities, as well as on environmentally responsible behavior (Mace, Bell, & Loomis, 1999). Environmentally responsible behavior provides for higher quality of environmental media and environmental services and amenities. The environmental indicators relevant to quality of life and their classification under three different dimensional groups are presented in *Table 1*.

Table 1. The environmental indicators relevant to quality of life

Dimensions	Indicators				
Environmental quality	Urban population exposure to air pollution by particulate matter (PM_{10}), $\mu g/m^3$	Urban population exposure to air pollution by ozone, $\mu g/m^3$ day	Biochemical oxygen demand (BOD) in rivers, mg/L	Average carbon dioxide (CO_2)emissions per km from new passenger cars, gCO2/km	Municipal waste generated per capita, kg/capita
Environmentally responsible behaviour	Resource productivity, EUR/kg	Energy productivity in EUR per kg of oil equivalent, EUR/kg of oil equivalent	Share of renewables in final energy, %	Sewage sludge production and disposal, thousand t/capita	Recycling rates for packaging waste, %
Consumption of environmental services	Sufficiency of sites designated under the EU Habitats directive, %	Protected terrestrial areas, %	Total fresh water abstraction per capita, m^3/capita	Total inland fishery products per capita, kg live weights/capita	Total area of forests and other wooded land per capita, ha/capita

Source: database EUROSTAT.

Environmental quality indicators

The environmental quality indicators encompass a number of environmental media such as air, soil, and water. Most of the attention, however, has focused on air pollution indicators related to environmental quality due to evidence of sizeable effects of air pollutants on human health and a lack of relevant data for some of the other media. The objective measure of air quality used in the paper only takes into account PM_{10} and ground ozone concentrations. One other important air quality indicator related to CO_2 emissions in transport was selected because the transport sector is one of the major problems for European Union (EU) sustainable development.

In soil media, waste plays the major role. The main indicator of environmental quality in waste is municipal waste generated per capita.

Despite significant progress by EU Member States in reducing water pollution from fixed sources such as industrial and municipal wastewater treatment plants and diffuse pollution from agriculture and urban run-offs, waste pollution management remains a challenge. The biochemical oxygen demand in rivers is the main indicator measuring water quality in rivers.

An increase in all environmental quality indicators represents a negative trend in terms of environmental quality and has a negative impact on quality of life. *Table 2* introduces the dynamics of the main environmental quality indicators in Lithuania, Romania, and the 27 European Union Member State (EU-27) average.

Table 2. Dynamics of Environmental quality indicators in Lithuania, Romania, and the EU-27 average

	2004	2005	2006	2007	2008	2009	2010	2011
Urban population exposure to air pollution by PM_{10}, $\mu g/m^3$								
EU average (27 countries)	27	28	30	28	26	26	26	27
Romania	54	49	53	46	40	30	35	39
Lithuania	23	23	20	21	19	23	27	23
Urban population exposure to air pollution by ozone, µg/m3.day								
EU average (27 countries)	3491	3677	4478	3611	3580	3648	3368	3706
Romania	6401	3470	2825	3752	3376	4496	1329	2013
Lithuania	2909	5048	4621	1891	3653	2110	1416	3057
Biochemical oxygen demand in rivers, mg/L								
EU average (27 countries)	2,55	2,19	3,76	4,41	3,82	-	3,22	
Romania	4,04	4,57	4,29	4,75	4,53	-	4,56	
Lithuania	2,90	2,80	2,90	2,50	2,70	-	2,80	
Carbon dioxide emissions per km from new passenger cars in the EU, gCO_2/km								
EU average (27 countries)	160	159,0	159,0	158,7	153,6	145,7	140,3	135,7
Romania	157	156,0	154,8	154,8	156	157	148,5	140,7
Lithuania	187,5	186,3	163,4	176,5	170,1	166	150,9	144,4
Municipal waste per capita, kg/capita								
EU average (27 countries)	513	515	521	522	519	509	505	500
Romania	345	378	389	379	392	362	365	365
Lithuania	367	377	391	401	408	361	381	442

Source: database EUROSTAT.

As one can see from the information provided in *Table 2*, the urban population exposure to air pollution by PM_{10} and ozone levels were higher in Romania than in Lithuania and the EU-27. The trends, however, were positive, and in 2011, Romania's urban population

exposure to air pollution by ozone levels were actually lower than those for Lithuania and the EU-27 average. Nevertheless, the urban population exposure to air pollution by PM_{10} levels in Romania were higher than those in Lithuania and the EU-27 during all investigated periods, and a positive trend of decline dramatically changed in 2009. In Lithuania, the urban population exposure to air pollution by PM_{10} was stable during the 2004-2011 period. Compared to the EU-27 average, urban population exposed to air pollution by PM_{10} for Lithuania was lower for all studied periods. However, it was higher than the World Health Organization Air Quality Guidelines (WHO AQG) for PM_{10}, which are set at 20 μg/m3 as an annual mean. In Lithuania, urban population exposure to air pollution by ozone was lower than the EU 27 average in all studied periods except 2005, 2006 and 2008.

In European rivers, the oxygen demanding substances measured as BOD have decreased in the EU-27 by 55% (from 4.9 mg/l to 2.2 mg O2/l) from 1992 to 2010. The decrease was mainly due to improved sewage treatment resulting from the implementation of the Urban Wastewater Treatment Directive and national legislations. In Lithuania, BOD was stable during 2004-2010. It was slightly higher than the EU-27 average except 2006, 2008 and year 2010. In Romania, BOD values were higher than those for Lithuania and the EU-27 average in all investigated periods. In addition, Lithuania experienced a negative trend for BOD in 2009. A negative trend like this can be noticed in other countries after the global economic crisis of 2008.

Carbon dioxide emissions per km from new passenger car trends were positive in Lithuania and Romania. However, the levels in Romania were significantly lower than those for Lithuania and the EU-27 average during all investigated periods.

Table 2 also shows that municipal waste generated per capita was increasing in Lithuania until 2008. Municipal waste per capita increased from 367 kg/capita in 2004 to 442 kg/capita in 2011. It was lower than the EU-27 average (500 kg/capita) in 2011. In 2009, a significant reduction in municipal waste per capita was noticed in Lithuania; however, since 2009, it has been trending upwards. In Romania, the values for municipal waste generated per capita were lower than those for Lithuania and the EU-27 average in all studied periods and the trends have been favorable since 2008.

With regard to quality of environment, Lithuania is performing better than the EU-27 average in almost all environmental quality indicators except carbon dioxide emissions per km from new passenger cars. Romania is performing better than the EU-27 average and Lithuania in terms of urban population exposure to air pollution by ozone and waste generated per capita. Romania distinguished itself by positive trends in all environmental quality indicators except urban population exposure to PM_{10}, which has been increasing since the economic crisis.

Environmentally responsible behaviour indicators

Environmentally responsible behaviour is associated with resource and energy savings, use of renewable energy sources instead of fossil fuels, waste recycling, and proper wastewater management and disposal. The main indicators of environmentally responsible behaviour in the EU were selected based on EUROSTAT data and include resource and energy productivity, share of renewables in final energy consumption, packaging waste recycling rates, and sewage sludge production and disposal per capita. These indicators have a direct positive impact on quality of life as they are the main drivers of environmental quality indicators. Therefore, an increase in these indicators is the desired trend.

Resource productivity is gross domestic product (GDP) divided by domestic material consumption (DMC). DMC measures the total amount of materials directly used by an economy. Energy productivity is an important indicator and is assessed by dividing GDP by primary energy consumption. It indicates energy use efficiency for a given country.

Increased use of renewables is a priority in energy and environmental policy in the EU. The increased use results in greenhouse gas (GHG) emission reduction and security of energy supply as renewables are local and domestic energy supply sources.

Wastewater treatment and the quality of both drinking and bathing water have improved significantly in Europe over the past 20 years, but continued efforts are needed to further improve the quality of water resources. The residual of wastewater treatment is sewage sludge. The sewage sludge production and disposal per capita indicator was applied to assess environmentally responsible behaviour in the water sector.

Recycling of waste is the main policy measure to reduce negative impact of waste accumulated. Therefore, recycling rates for the packaging waste indicator were selected to monitor environmentally responsible behavior in the waste sector.

The dynamics of environmentally responsible behaviour in Lithuania, Romania, and the EU-27 average are provided in *Table 3*.

Table 3. Dynamics of environmentally responsible behavior indicators in Lithuania, Romania, and the EU-27 average

	2004	2005	2006	2007	2008	2009	2010	2011
Resource productivity in EU, EUR/kg								
EU average (27 countries)	1,39	1,4	1,42	1,43	1,46	1,57	1,65	1,6
Romania	0,25	0,24	0,24	0,21	0,18	0,21	0,23	0,21
Lithuania	0,49	0,51	0,55	0,51	0,49	0,62	0,57	0,56
Energy productivity in EUR per kg of oil equivalent, EUR/kg of oil equivalent								
EU average (27 countries)	6	6,1	6,3	6,5	6,6	6,7	6,6	-
Romania	1,9	2	2,1	2,3	2,4	2,6	2,5	-
Lithuania	2,1	2,4	2,6	2,7	2,7	2,5	3,2	-
Share of renewables in final energy consumption, %								
EU average (27 countries)	8,1	8,5	9,0	9,7	10,4	11,6	12,5	13,0
Romania	17,0	17,6	17,1	18,4	20,3	22,3	23,4	21,4
Lithuania	17,3	17,0	17,0	16,7	18,0	20,0	19,8	20,3
Sewage sludge production and disposal per capita, kg/capita								
EU average (27 countries)	18	18	20	20	22		22	
Romania	3	3	10	5	4		6	:
Lithuania	19	19	21	23	16		15	
Recycling rates for packaging waste, %								
EU average (27 countries)	54,0	54,6	56,9	59,2	60,5	62,5	63,3	63,6
Romania	23	23	28,6	30,6	33,5	40,5	43,4	50
Lithuania	32,7	32,5	37	42,9	51,7	57,7	60,4	62,2

Source: database EUROSTAT.

Resource productivity indicators were lower in Romania than in Lithuania. These indicators were significantly lower for both countries compared to the EU-27 average in all investigated periods. Romania demonstrated particularly low energy productivity rates (i.e., they were almost 3 times lower than the EU-27 average). In Lithuania, energy productivity rates were almost two times lower than the EU-27 average. The rates were relatively stable in Romania during the investigated period with some trend decline during the economic crisis.

Romania had the highest values for renewables in final energy consumption during all studied periods. The trends were positive in all countries being compared.

The sewage sludge production and disposal per capita indicator values were very low for Romania compared to Lithuania and the EU-27 average, and the trend was also negative.

However, this indicator depends on state policy. Typically, four different types of disposal make up a considerable share of the total volume of sewage sludge treated: more than two thirds of the total was used as fertiliser in agriculture in Spain and Ireland, while in other Member States (Lithuania, Hungary, and Bulgaria) the total mass of sewage sludge was being disposed of through agricultural uses.

As one can see from the information provided in *Table 3*, the recycling rates of packaging waste steadily increased in Lithuania and Romania; however, they still did not reach the 2011 EU-27 level.

In conclusion, with regard to environmentally responsible behaviour, Lithuania and Romania are performing better than the EU-27 average in terms of use of renewable energy sources; however, for all other indicators, they are below the EU-27 average.

Consumption of environmental services indicators

The selected indicators of consumption of environmental services and amenities are based on data provided by EUROSTAT and include the following: index of sufficiency of sites designated under the EU Habitats directive, share of protected terrestrial area, total fresh water abstraction per capita, total inland fishery products per capita, and total area of forests and other wooded land per capita. An increase in these indicators indicates an increased use of services provided by the environment, which has a direct positive impact on quality of life. *Table 4* shows the dynamics of indicators of consumption of environmental services in Lithuania, Romania, and the EU-27 average.

Table 4. Dynamics of indicators of consumption of environmental services in Lithuania, Romania, and EU-27 average

	2004	2005	2006	2007	2008	2009	2010
Sufficiency of sites designated under the EU Habitats directive, %							
EU average (27 countries)	80	80	83	84	84	-	89
Romania	82	82	82	82	82	-	82
Lithuania	61	61	61	61	61	-	66
Protected terrestrial areas, %							
EU average (27 countries)	14	14	14	14	14	14	14
Romania	13	13	13	13	13	13	13
Lithuania	10	10	10	10	10	13	14
Total fresh water abstraction per capita, m³/capita							
EU average (27 countries)	620	612	613	587	587	-	577
Romania	269	245	247	319	335	-	320
Lithuania	951	690	611	670	673	-	720
Total inland fishery products per capita, tones live weights/capita							
EU average (27 countries)	0.9	0.9	0.8	0.8	0.8		0.8
Romania	0.5	0.5	0.7	0.8	0.9	-	0.8
Lithuania	1.3	1.1	1.1	1.6	1.5		1.5
Total area of forests and other wooded land per capita, ha/capita							
EU average (27 countries)	0.35	0.36	-	-	-	-	0.35
Romania	0.31	0.31	-	-	-	-	0.33
Lithuania	0.62	0.64	-	-	-	-	0.72

Source: database EUROSTAT.

As one see from the information provided in *Table 4*, Romania has quite low indicators of consumption of environmental services compared to Lithuania. Only the sufficiency of sites designated under the EU Habitats directive indicator is higher in Romania. However, Romania distinguishes itself by showing positive trends in total fresh water abstraction and total area of forests per capita indicators.

With regard to consumption of environmental services, Lithuania is performing better in almost all indicators compared to Romania and EU-27 except for the indicator on sufficiency of sites designated under the EU Habitats directive.

Integrated index of quality of life in terms of environment

Seeking to compare countries in terms of environmental indicators related to quality of life, integrated indices were developed for Lithuania, Latvia, and Estonia.

The integrated index I_E of quality of life related to environmental dimension can be assessed by applying the following formula:

$$I_E = \sum_i a_i I_i; \qquad (1)$$

Here: I_i – integrated index of environmental indicators; a_i – weights of integrated indices of environmental indicators ($\sum_i a_i = 1$); and I_{DV} – integrated index of quality of life related to environmental dimension.

As in our case, we have 3 groups of indicators, and Formula (1) can be presented in the following way:

$$I_E = a_1 I_{EQ} + a_2 I_{ER} + a_3 I_{CE}; \qquad (2)$$

Here I_{EQ} – integrated index of environmental quality; I_{ER} – integrated index of environmentally responsible behaviour; I_{CE} – integrated index of consumption of environmental services; and a_1, a_2 *and* a_3 – the weights of integrated indicators ($a_1 + a_2 + a_3 = 1$).

Each of these integrated indicators consists of 5 indicators and are developed by applying the following formula:

$$I_n = \sum_{i=1}^{n} w_i \cdot Q_{in} \quad \text{here: } \sum_{i=1}^{n} w_i = 1; \qquad (3)$$

Here I_n – integrated index of environmental indicator at time moment *n*; Q_{in} – the index of i-environmental indicator at time moment n; and w_i – the weight of i-indicator.

The index of i- environmental indicator is obtained by the following formula if the increase of indicators is the desirable trend:

$$Q_{in} = q_{ni} / q_{oi}, \qquad (4)$$

Here: Q_{in} – index of i- environmental indicator at time moment n; q_{ni} – the value of i-environmental indicator at time moment for specific country; and q_{oi} – the value of i-environmental indicator at time moment n for EU-27 average.

If the increase of indicators is the undesirable trend, the inverted indicators should be calculated as in the case of environmental quality indicators:

$$Q_{in} = 1/(q_{ni} / q_{oi}), \qquad (5)$$

In *Table 5*, the dynamics of integrated indices of quality of life relevant to environment are presented for the Baltic States. The indices of environmental indicators were obtained by normalizing all indicators based on the EU-27 average data (Formula 4). All indicators and all integrated indices are being treated equally; therefore, weights have not been applied in the assessment of integrated indices of quality of life. More research and surveys from experts are needed to define the weight of indicators in integrated indices.

The dynamics of integrated indices of quality of life relevant to environment in Lithuania and Romania are presented in *Table 5*. The indices were calculated by applying data in *Tables 2-3* and the formulas presented above. As the increase of indices is the desirable trend and the higher index represents a higher quality of life, the indices of environmental quality indicators were assessed as inverted because EUROSTAT data for environmental quality is presented in the form of negative indicators (urban population exposure to pollution, biochemical oxygen demand, municipal waste per capita, etc.).

Table 5. Dynamics of integrated indices of quality of life relevant to environment in the Baltic States

	2004	2005	2006	2007	2008	2009	2010	2011
Environmental quality indicators								
Urban population exposure to air pollution by PM_{10} index								
Romania	0.47	0.06	0.56	0.61	0.65	0.87	0.74	0.69
Lithuania	1.18	1.22	1.49	1.33	1.37	1.14	0.96	1.18
Urban population exposure to air pollution by ozone index								
Romania	0.97	1.06	1.59	0.96	1.06	0.81	2.56	1.85
Lithuania	1.20	0.73	0.97	1.92	0.98	1.72	2.38	1.22
Biochemical oxygen demand in rivers index								
Romania	0.63	0.47	0.88	0.93	0.84	-	0.70	-
Lithuania	0.88	0.78	1.27	1.75	1.41	-	1.16	-
Carbon dioxide emissions per km from new passengers car index								
Romania	1.02	1.02	1.03	1.02	0.96	0.96	0.91	0.70
Lithuania	0.85	0.85	0.97	0.90	0.90	0.88	0.93	0.94
Municipal waste per capita index								
Romania	1.49	1.37	1.33	1.39	1.32	1.41	1.39	1.37
Lithuania	1.22	1.37	1.33	1.12	1.27	1.41	1.33	1.14
Environmental quality index								
Romania	4.58	3.98	5.39	4.91	4.83	-	6.30	-
Lithuania	5.33	4.95	6.03	7.02	5.93	-	6.76	-
Environmentally responsible behaviour indicators								
Resource productivity index								
Romania	0.18	0.17	0.17	0.15	0.12	0.13	0.14	0.13
Lithuania	0.35	0.36	0.39	0.36	0.33	0.40	0.35	0.35
Energy productivity index								
Romania	0.32	0.33	0.35	0.35	0.36	0.39	0.38	-
Lithuania	0.35	0.39	0.41	0.42	0.41	0.37	0.49	-
Share of renewables in final energy consumption index								
Romania	2.10	2.07	1.90	1.90	1.95	1.92	1.87	1.65

Lithuania	2.14	2.0	1,89	1,72	1.73	1.72	1.58	1.56
Sewage sludge production and disposal per capita index								
Romania	0.17	0.17	0.15	0.25	0.18	-	0.28	-
Lithuania	1.05	1.05	1.05	1.15	0.73	-	0.68	-
Recycling rates for packaging waste index								
Romania	0.43	0.42	0.50	0.52	0.55	0.65	0.69	0.79
Lithuania	0.61	0.60	0.65	0.72	0.85	0.92	0.95	0.98
Environmentally responsible behaviour index								
Romania	3.20	3.16	3.07	3.17	3.16	-	3.36	-
Lithuania	4.47	4.40	4.39	4.40	4.05	-	4.05	-
Consumption of environmental services indicators								
Sufficiency of sites designated under the EU Habitats index								
Romania	1.03	1.03	0.99	0.98	0.98		0.92	-
Lithuania	0.76	0.76	0.73	0.72	0.73	-	0.74	-
Protected terrestrial area index								
Romania	0.93	0.93	0.93	0.93	0.93	0.93	0.93	-
Lithuania	0.71	0.71	0.71	0.71	0.71	0.92	1.00	-
Total fresh water abstraction per capita index								
Romania	0.43	0.40	0.40	0.54	0.57	-	0.55	-
Lithuania	1.53	1.13	1.00	1.14	1.15	-	1.25	-
Total inland fishery products per capita index								
Romania	0.56	0.56	0.88	1.00	1.13	-	1.10	-
Lithuania	1.44	1.22	1.38	2.00	1.88	-	1.88	-
Total area of forests and other wooded land per capita index								
Romania	0.89	0.86	-	-	-		0.94	
Lithuania	1.77	1.71	-	-	-	-	2.06	
Consumption of environmental services index								
Romania	3.84	3.78	-	-	-	-	4.44	-
Lithuania	6.21	5.53	-	-	-	-	9.37	
Integrated environmental index of quality of life								
Romania	11.62	10.92					14.1	
Lithuania	16.0	14.9	-	-	-	-	20.2	-

Source:

As one can see from the information provided in *Table 5*, Lithuania distinguishes itself by demonstrating very positive trends in terms of all indicators developed and by having the highest values for all integrated environmental indicators. During the 2004-2010 period, the integrated environmental index of quality of life increased significantly in both Lithuania and Romania.

Conclusions

1. The system of environmental indicators presented in this paper summarize information about major dimensions of environmental indicators relevant to quality of life and includes the following: quality of environment, environmentally responsible behavior, and services provided by environment.
2. The environmental quality indicators encompass a number of environmental media (e.g., soil, water, air, and waste). The measure of air quality used in this paper takes into account PM_{10}, ground ozone concentrations, and CO2 emissions from cars. The biochemical oxygen demand in rivers was selected as a water quality indicator, and the

municipal waste per capita indicator was selected to assess environmental quality in terms of waste generated.

3. The indicators of environmentally responsible behavior selected in the paper correspond to environmental quality indicators addressed in the paper (atmospheric emissions, water pollution, and generation of waste).
4. Consumption of environment services has a significant impact on quality of life and is related to environmental quality indicators such as air, water, and soil. Land pollution by waste has a negative impact on environmental services and amenities such as forest areas, sufficiency of sites designated under EU Habitats directive, fresh water abstraction, and inland fishery products per capita.
5. Integrated environmental indicators relevant to quality of life were assessed for Lithuania, Romania, and the EU-27 average based on objective data provided by EUROSTAT databases.
6. The environmental indicators for Lithuania and Romania were normalized by EU-27 average data, and integrated indicators of quality of environment, environmentally responsible behavior and environmental services were developed.
7. The combination of integrated environmental quality, environmentally responsible behavior, and environmental services indicators provides the framework for a basic system of integrated environmental indicators of quality of life.
8. Concerning environment quality, Lithuania is performing better than the EU-27 average in almost all related indicators except carbon dioxide emissions per km from new passenger cars. Romania is performing better than Lithuania and the EU-27 average in terms of urban population exposure to air pollution by ozone and waste generated per capita. Romania distinguishes itself by showing positive trends in all environmental quality indicators except urban population exposure to air pollution by PM_{10}, which has increased since the global economic crisis.
9. With regard to environmentally responsible behaviour, Lithuania and Romania are performing better than the EU-27 average in the use of renewable energy sources but are lagging behind the EU-27 average for all other indicators.
10. Relating to consumption of environmental services, Lithuania is performing better than Romania and the EU-27 average in almost all indicators except the indicator on sufficiency of sites designated under the EU Habitats directive.
11. The analysis of integrated environmental indicators in Lithuania and Romania indicates that regarding the quality of environment, Lithuania distinguishes itself in having the highest ratings for all integrated environmental indicators.
12. During the 2004-2010 period, the integrated environmental index of quality of life increased significantly in Lithuania and Romania. Therefore, EU accession has had a positive impact on the growth of quality of life in terms of environment in both countries.

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References

Balestra, C. and D. Dottori (2011), Ageing society, health and the environment, *Journal of Population Economics*, http://dx.doi.org/10.1007/s00148-011-0380-x.

Balestra, C. and J. Sultan (2012), Home sweet home: The determinants of residential satisfaction and its relation with well-being, *OECD Statistics Directorate Working Papers* (forthcoming), OECD, Paris.

Holman, M.R. and T. G. Coan (2008), Voting green, *Social Science Quarterly*, Vol. 89, pp. 1121-1135.

Kahn, M.E. and J.G. Matsusaka (1997), Demand for environmental goods: Evidence from voting patterns on California initiatives, *Journal of Law & Economics*, Vol. 40, No. 1, pp. 137-173.

Kahn, M.E. (2002), Demographic change and the demand for environmental regulation, *Journal of Policy Analysis and Management*, Vol. 21, No. 1, pp. 45-62.

Mace, B., P. Bell, and R. Loomis (1999), Aesthetic, affective, and cognitive effects of noise on natural landscape assessment, *Social and Natural Resources*, Vol. 12, No. 3, pp. 225-242.

Osbaldiston, R. and Sheldon, K. M. (2003), Promoting internalized motivation for environmentally responsible behavior: A prospective study of environmental goals, *Journal of Environmental Psychology*, Vol. 23, No. 4, pp. 349-357.

Pretty, J., J. Peacock, M. Sellens, and M. Griffin (2005), The mental and physical health outcomes of green exercise, *International Journal of Environmental Health Research*, Vol. 15, No. 5, pp. 319-337.

Reto, F. and Garcia-Vega, J. (2012), Quality of life in Mexico: A formative measurement approach, *Applied Research in Quality of Life*, 2012, Vol. 7, No. 3, pp. 220-230.

Thogersen, J. (2006), Norms for environmentally responsible behaviour: An extended taxonomy, *Journal of Environmental Psychology*, Vol. 26, No. 4, pp. 247-261.

Zohora, M.F., Hoque, K.E. (2014), Corporate social responsibility: attitudes of bankers and corporate professionals in Bangladesh, *Actual Problems of Economics*, No. 3(153), pp. 342-349.

Zheng, Y. (2010), Association analysis on pro-environmental behaviors and environmental consciousness in main cities of East Asia, *Behaviormetrika*, Vol. 37, No. 1, pp. 55-69.