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Quality of life and environmentally responsible behavior in energy sector

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Abstract. The quality of life is very complex concept however one of the most important issues is environmental quality. There is close relationship between a quality of life and environmentally responsible behavior. The environmentally responsible behaviour has positive impact on quality of life in terms of increased environmental quality. Resource saving and sustainable consumption reduces environmental burden of human activities. The sustainable consumption also allows increasing quality of life in terms of resource savings. The paper presents the concept of quality of life in terms of environmentally responsible behavior in energy sector and provides the results of empirical study dealing with environmental responsible behavior in Lithuania.

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INTRODUCTION

Sustainable consumption and environmentally responsible behavior provides for sustainable development and increase of quality of life which can be considered as the most broad aim of sustainable development (Diener and Eunkook, 1997). Sustainable consumption is the consumption of goods and services that have minimal impact upon the environment, are socially equitable and economically viable whilst meeting the basic needs of humans. Current unsustainable consumption patterns destroys the environment; depletes stocks of natural resources and by distributing resources inequitably contributes to social problems such as poverty. Focusing on the demand side, sustainable consumption compliments sustainable production practices and achievements. Energy consumption is one of the most important challenges of sustainable consumption (Boarini et al, 2010).

Energy consumption causes a major burden on environment. As energy consumption is the main sources of GHG emission in developed economies and Europe's demand for energy is increasing with increase and fluctuation of energy prices. Greenhouse gas emissions are rising and natural reserves of fossil fuels such as oil and natural gas are concentrated in just a few supplier countries around the world. An increasing

dependency on energy imports and climate change are the main risks which European economy is facing today. As energy is the fuel of Europe´s economic engine, by switching from greenhouse gas intensive fossil fuel sources to renewable sources of energy, Europe is able to fully grasp its sustainable potential - in economic, ecologic and social terms.

As energy consumption is growing in many EU member states and the rate of deployment of renewable and they market uptake is too low comparing with support allocated for promotion of renewable and implemented policies targeting sustainable energy development. Therefore it is important to analyse the main drivers of energy consumption behaviour and to define the major issues of concern and to develop policies targeting these issues.

Based on paradigm of behavioural economics the society can shape individual preferences and beliefs, in particular through institutions and social norms, and socialization processes. Government by implementing policies to promote sustainable consumption and environmentally responsible behavior can also influence norms, in particular, through information-based instruments such as communication campaigns; this may also contribute to increasing the acceptability of policies.

The aim of this paper is to analyse indicators of environmentally responsible behavior in Baltic States and Poland and to compare them with EU average by providing insights of EU policies targeting sustainable energy consumption and success of MS in implementation of these policies. The main drivers of environmentally responsible behavior in energy sector we analysed in Lithuania based on results of recent empirical study conducted in the country. The main attention in this paper is allocated to environmental responsible behavior in energy sector as this sector is the most important in terms of climate change and well-being as increased energy prices and increased energy consumption have direct impact of energy affordability and ability of households to pay their energy and other households bills.

The main tasks to achieve this aim are as follows:

- To define relationship between quality of life and environmentally responsible behavior in energy sector
- To analyse indicators of environmentally responsible behaviour in energy field in Baltic States and Poland
- To analyse EU policies targeting sustainable energy development (increase in energy efficiency and use of renewable energy sources);
- To analyse the results of empirical study dealing with the main drivers of environmentally responsible behaviour in energy field of Lithuanian households
- To develop policy recommendations based on the analysis carried out by the authors.

QUALITY OF LIFE AND ENVIRONMENTALLY RESPONSIBLE BEHAVIOR IN ENERGY

Apart from being mostly concerned about the global air pollution, climate change, and diminishing biodiversity (Uzzell, 2000), many people are very sensitive to the quality of their own living environment and the availability of natural areas. A variety of approaches toward changing user behaviors have been proposed, such as providing technical alternatives, regulatory rules, financial incentives, information, social example etc. (Geller, 2002; Geller et al., 1982; Gardner & Stern, 2002; Vlek, Keren, 1992; Vlek, & Steg, . 2002; Vlek, 1996; 2000). Whichever strategies are considered, their effectiveness largely depends on indicating the actual behavior determinants. Changes in human behaviors may be encouraged by addressing individual persons' and groups' knowledge, beliefs, and preferences, for instance, through marketing, advertising, and information strategies. However, such "demand-side management" may have limited effects. Behavioral

changes and adaptations may also be induced by modifying choice situations through demand-side management measures (Borden, Schettino, 1979; Geller, 2002).

Several authors have explored consumers preferences for specific renewable energy sources compared to "generic" green electricity. They find that respondents have positive WTP for "green" electricity but also WTP differs by green energy source (Borchersa et al. (2007; Samela and Varho, 2006; Hansla et al, 2008). The authors looked at the barriers of renewable energy consumption in households (Ek, 2005; Scarpa, Willis, 2010).. The main barrier was lack of trust in green electricity and electricity companies by consumers. Several authors also found that the consumers suffer from information gaps and poor marketing of green electricity (Zografakis et al, 2010; Zoric, Hrovatin, 2012). The studies found that most of consumers are unfamiliar with green electricity and they need a lot of information and incentive in become an active participants in green electricity markets (Hansla et al, 2008; Akcura, 2013).

Based on paradigm of behavioural economics the society can shape individual preferences and beliefs, in particular through institutions and social norms, and socialization processes (Liere, Dunlap, 1980; Kahn, Matsusaka, 1997). Some authors have analysed the man drivers of environmn etally responsable behavior and their impact on (Pretty et al, 2005; Osbaldiston, Sheldon, 2003; Thogersen, 2006). Government can also influence norms, in particular, through information-based instruments such as communication campaigns; this may also contribute to increasing the acceptability of policies.

Environmentally responsible behavior can be achieved through environmental education (Harvey 1977; Childress, 1978; Disinger, 1983; Volk 1984; Arbuthnot, 1977). Stapp et al. (1969) proposed that environmental education should provide knowledge concerning the biophysical environment and its associated problems and provide awareness of how to help solve these problems, and motivated to work toward their solution. Therefore providing awareness of, and concern about economic, social, political and ecological interdependence allows to provide every person with opportunities to acquire the knowledge, values, attitudes, commitments and skills needed to protect and improve the environment; to create new patterns of behavior of individuals, groups and society as a whole towards the environment." Finally, Hungerford, Peyton, and Wilke (1980) developed the main goal of education: "to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment."

DEVELOPMENT OF INDICATORS OF ENVIRONMENTALLY RESPONSIBLE BEHAVIOR IN BALTIC STATES AND POLAND

Environmentally responsible behaviour in energy sector is associated with energy savings and use of renewable energy sources instead of fossil fuels. Based on EUROSTAT data the main indicators of environmentally responsible behaviour in EU were selected. These indicators have direct positive impact on quality of life as they are the main drivers of environmental quality. Therefore the increase of these indicators is the desired trend and Baltic States and Poland can be compared in terms of these indicators by indicating the best performing country based on higher values of these indicators.

In Table 1 the indicators of environmentally responsible behavior in energy field are presented inn Baltic States and Poland in 2012.

Table 1

The environmentally responsible indicators in energy sector in 2012

	The dynamics of energy productivity in EUR per kg of oil equivalent	The share of renewable in gross final energy consumption,%	The share of renewable in electricity consumption, %	The share of renewable in transport,%	The share of renewable in heating and cooling,%
Estonia	2.1	25.8	15.8	0.3	43.1
Latvia	3.0	35.8	44.9	3.1	47.4
Lithuania	3.4	21.7	10.9	4.8	35.5
Poland	3.3	11.0	10.7	6.1	13.7
EU-28 average	7.0	14.1	23.5	5.1	15.6

As it can be seen in Table 1 the main indicators of natural and built environment consists of 5 main indicators addressing energy efficiency and use of renewables in EU member states.

Energy productivity is important indicator assessed by dividing GDP by primary energy consumption. It indicates energy use efficiency in the country.

The increase use of renewables is the priority in energy and environmental policy in EU. The increase of use of renewables provides for GHG emission reduction and security of energy supply as renewables are local and domestic energy supply sources. The share of renewables in gross final energy consumption, electricity consumption, transport and heating and cooling sector are assessed. These indicators represents the main targets of EU energy policy presented in various EC policy documents and directives.

As one can see from information provided in Table 1 in terms of environmentally responsible behavior indicators it is not possible to define the best performing country. According the energy productivity the best performing countries in 2012 were Lithuania and Poland though energy productivity in these countries was twice lower than EU-28 average level.

In terms of the share of renewable in final gross energy consumption, electricity consumption and heating and cooling is Latvia however in terms of the share of renewables in transport the Poland is leading. The share of renewable in transport in Poland is even higher than in EIU-28 average and twice higher than in Lithuania. Estonia distinguishes with low energy productivity and very low share of renewable in transport.

The trends of indicators of environmentally responsible behavior in energy sector in Baltic States and Poland from 2004 to 2012 are presented in Figures I-V.

As on can see from information presented in Figure 1 in all analysed countries energy productivity has increased however during investigated period the highest increase in energy productivity can be noticed in Lithuania. In Latvia energy productivity in 2012 was lower than in 2008 and economic crisis has negative impact on energy productivity in all countries.

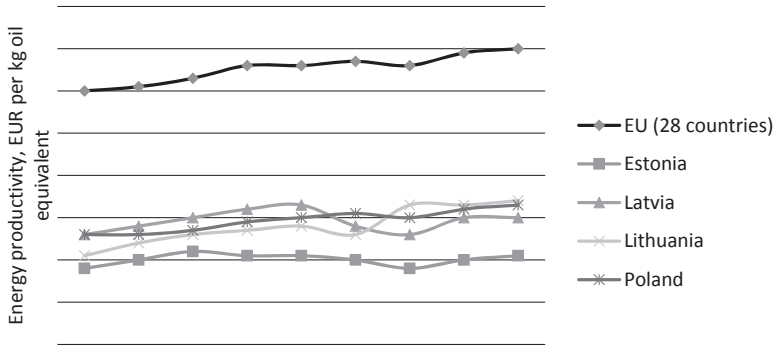

Figure 1: The trends of energy productivity indicators of Baltic States and Poland after EU accession

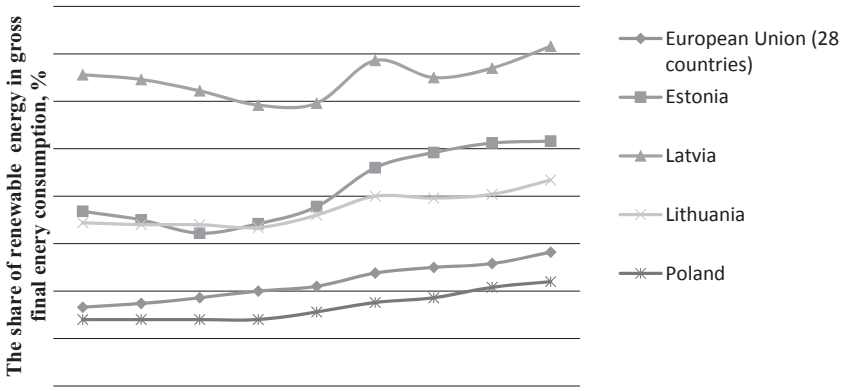

Figure 2: The trends of share of renewables in gross final energy consumption of Baltic States and Poland after EU accession

As one can see from Figure 2 the share of renewable in final energy consumption was increasing since 2004 in all investigated countries. However economic crisis again had negative impact of the share of renewable in Latvia. The highest increase in the share of renewable was in Estonia. In 2004 the share of renewable in final energy consumption in Estonia was lower than in Lithuania but in 2012 Estonia overcome Lithuania almost by 5%.

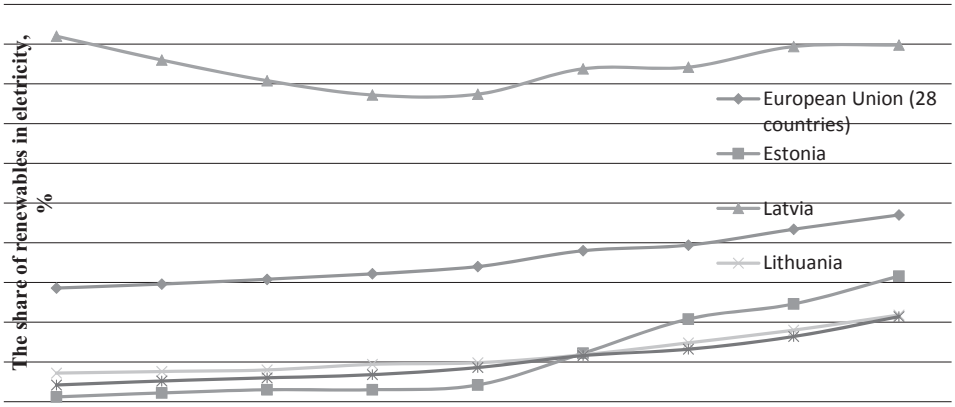

Figure 3: The trends of share of renewables in electricity consumption of Baltic States and Poland after EU accession

As one can see from Figure 3 the share of renewable in electricity consumption was increasing in all Baltic States and Poland. The highest increase can be noticed in Estonia. In 2009 Estonia overcome Lithuanian and Poland in the share of renewable in electricity consumption though in 2004 this indicator was the lowest in Estonia compared to other neighboring countries.

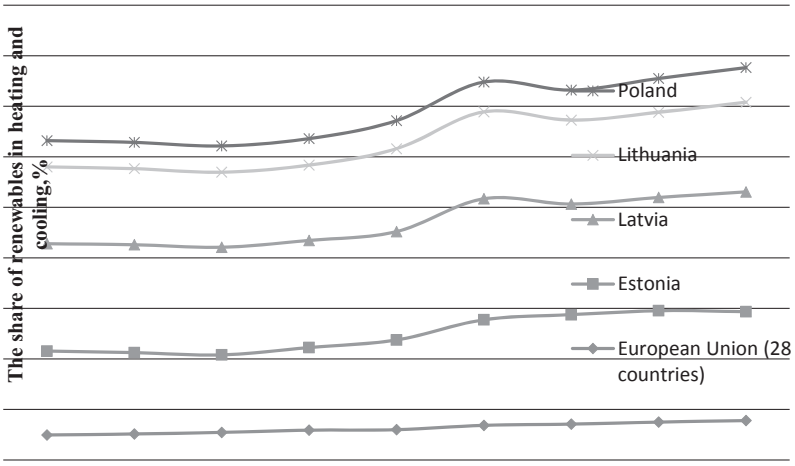

Figure 4: The trends of share of renewables in heating and cooling of Baltic States and Poland after EU accession

As one cane see from Figure 4 the share of renewable in heating and cooling has been increasing in all investigated countries since EU accession. In 2009 after economic crisis the rate of increase was higher than before crisis in Baltic States and Poland.

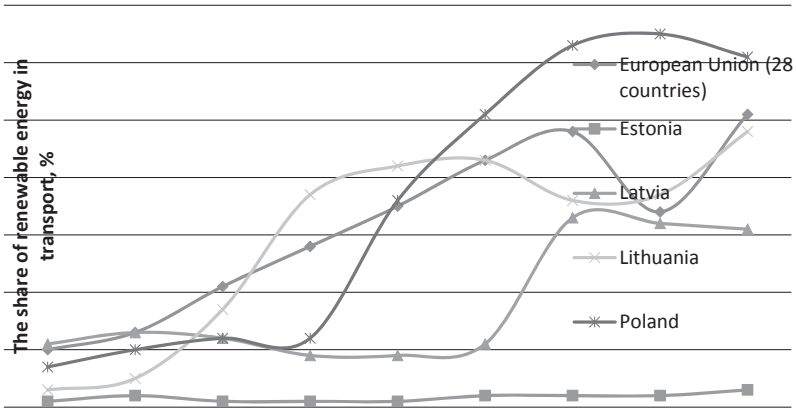

Figure 5: The trends of share of renewables in transport of Baltic States and Poland after EU accession

As on can see from Figure 5 the share of renewable in transport was very small and stable in Estonia.

Significant increase since 2004 can be noticed in Poland, Lithuania and Latvia. The highest increase was achieved in Poland.

The selected indicators of environmentally responsible behavior in energy field do not depend only on environmental behavior as availability of renewable resources in country is playing very important role. For example Latvia distinguishes from other neigbouring countries with huge hydro potential and has more than twice higher indicators of the share of renewable in gross final energy consumption than EU-28 average. However energy productivity and the share of renewable in transport are more directly reflecting the environmentally responsible behavior patterns in the country. The policies implemented in the countries targeting energy savings and renewable are also very important drivers of selected indicators.

eu policies promoting renewable energy use and energy efficiency

Since the publication of the 2009 Renewable Energy Directive (2009/28/EC) the following are the European mandatory targets: 20% for all energy to come from renewable energy sources by 2020 (12% by 2010). Different targets are given to each member state in order to achieve this overall target for Europe and 10% of all transport energy to come from renewable sources by 2020. EU has RES targets for 2010 as well: an increase in the contribution of renewables to 12% of Europe's total energy by 2010. By 2010, the target share of renewable energy in gross electrical consumption of the EU is 22.1% from all EU 15 countries (21% for the EU (27)). The member states must ensure that the minimum share of biofuels sold on their markets is 5.75% by December 2010.

The Renewable Energy Directive (2009/28/EC) presents Member States with a huge implementation challenge that cannot simply be met by an extension of existing promotional policies for renewables. The Directive required each Member States submit a National Renewable Energy Action Plan (NREAP) by 30 June 2010, setting out how it plans to achieve its 2020 target. The European Commission issued a strict template for this plan which Member States must adhere to, setting out in detail how they plan to reach their

overall RES target through development in the three RES energy sectors – electricity, heating and cooling and transport.. It is also notable that because the target is based on a percentage of final energy consumption, efforts to improve energy efficiency are also relevant and indeed Member States are required to set out in the plans energy consumption according to business as usual and with enhanced energy efficiency scenarios (the latter scenario is used for the target compliance calculations in the plans).

The 20% target for renewable energy is calculated as a percentage of total final energy consumption, including all energy use – electricity, heating & cooling and transport. There are no sectoral targets for electricity or heating/cooling, but a separate 10% target has been set for use of renewable energy in transport. Within the Member States covered in this article, the individual targets have been set out in Table 2.

Table 2

National binding renewable energy targets in 2020

EU Member State	RES in 2005	2020 RES Target	% increase required
Estonia	18.0%	25%	7.0%
Latvia	32.6%	40%	7.4%
Lithuania	15.0%	23%	8.0%
Poland	7.2%	15%	7.8%
EU -28	8.5%	20%	11.5%

As can be seen from the Table 2, the challenge varies significantly from one Member State to another. The fourth column (Δ2020) expresses the marginal increase in the renewable energy share required by each Member State. In the above Table 2 Member States have been assigned to achieve different marginal increases in their national RES percentages, on the following principles:

– All Member States must achieve a marginal flat increase of 5,75%
– A further increase, based on national GDP per capita, is applied in addition to the flat 5.75%, such that the total of GDP-modulated targets in principle averages 5,75%.

As one can seen from Table 3 the highest target is established for Latvia as country distinguishes with plenty of hydro energy resources. Poland has the lowest RES target comparing with neighbouring countries because of limited renewable resources in the country.

Energy efficiency is the main target of sustainable development policy. Energy efficiency improvement allows to save means, to reduce energy consumption, energy import dependency and GHG emissions. The EU is aiming for a 20% cut in Europe's annual primary energy consumption by 2020. On 8 March 2011, the EC adopted the Communication "Energy Efficiency Plan 2011" for saving more energy through concrete measures. The set of measures proposed aims at creating substantial benefits for households, businesses and public authorities: it should transform our daily lives and generate financial savings of up to €1000 per household every year. It should improve the EU's industrial competitiveness with a potential for the creation of up to 2 million jobs.

The European Commission has proposed several measures to increase efficiency at all stages of the energy chain: generation, transformation, distribution and final consumption. The measures focus on the public transport and building sectors, where the potential for savings is greatest. Other measures include the introduction of smart meters (which encourage consumers to manage their energy use better), and clearer product labelling. The most important for all branches of economy are: EU directive 2012/27/EU (on energy efficiency), EU Directive 2010/31/EU (on the energy performance of buildings); EU Directive 2010/30/EU (on the indication by labelling and standard product information of the consumption of energy; EU Di-

rective 2008/98/EU (on waste and repealing); Directive 94/62/EC (on packaging and packaging waste) and EU Directive 2008/1/EC (concerning integrated pollution prevention and control) and Directive 2006/32/EC on energy end-use efficiency and energy service.

Under the framework of the Directive 2006/32/EC, Member States were required to show in their National Energy Efficiency Action Plans (NEEAPs) how they intended to reach the 9% indicative energy savings target by 2016. NEEAPs should describe the energy efficiency measures. Furthermore, the NEEAPs were supposed to describe how Member States intended to comply with the provisions on the exemplary role of the public sector and the provision of information and advice to final consumers. EU MS including Lithuania prepared and submitted two NEEAPs and reported their progress in implementing targets set by Directive 2006/32/EC.

2012 EU Energy Efficiency Directive (EED) establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union's 2020 20 % headline target on energy efficiency. Commission Directive 2012/27/EU on energy efficiency requires all EU-28 countries to use energy more efficiently at all stages of the energy chain– from the transformation of energy and its distribution and final consumption. The new Directive will help remove barriers and overcome market failures that impede efficiency in the supply and use of energy and provides for the establishment of indicative national energy efficiency targets for 2020.

Table 3 gives the cumulative amounts of savings between 2014 and 2020 and the total planned savings in 2020 as reported by the individual countries (exemptions applied).

Table 3:

Cumulative energy saving targets in 2020

Country	Cumulative energy savings target over 2014 -2020, Mtoe	Total final energy savings planned in 2020
Estonia	0.614	0.154
Latvia	0.851	0.315
Lithuania	1.004	0.287
Poland	14.725	3.681

The majority of MS have reported plans to deliver savings higher than the minimum expected, with Estonia reporting savings significantly below the minimum expected. These differences are due to a variety of reasons. For Latvia, although the savings reported as planned for 2020 are significantly above the minimum expected because of steep ramping up of savings, the planned cumulative savings between 2014 and 2020 are below the minimum expected. This is probably because of the baseline they use for calculating the target, from which energy from fuel wood is subtracted. Smaller differences could be due to use of different baselines, which is allowed under the Directive.

RESULTS OF EMPIRICAL STUDY OF ENVIRONMENTALLY RESPONSIBLE BEHAVIOR PATTERNS IN LITHUANIA

The empirical study was conducted in Lithuania in 2014 April11 – 23 seeking to reveal the main drivers of environmental behavior of Lithuanian households related to energy consumption. The study was performed by VILMORUS for the project funded by the European Social Fund under the Global Grant

measure (No. VP1-3.1-ŠMM-07-K-03-032). Number of Respndents: N = 1002. The surwy was conducted at home of respondents. The multi-stage random sampling approach eas appied. The research error – 3.1%.

The several questions related with environmentally responsible behavior were included in questionnaire:

1. Do you prefer energy saving appliances when buying?
2. Do you save energy at home?
3. Do you willing to pay more for electricity produced from renewable?
4. Do you use biofuels in car?

All these questions allow to understand the involvement of Lithuanian households in implementation of sustainable energy development targets: increase in energy productivity, the share of renewable in electricity, transport and final energy.

The main drivers of environmentally responsible energy behavior in energy sector were assessed by applying correlation analysis between the main drivers of environmentally responsible behavior and selected answers: education level, income, the share of income paid for energy bills, environmental awareness etc.

In Figure 6 the distribution of respondents in terms of answering to the first question are presented.

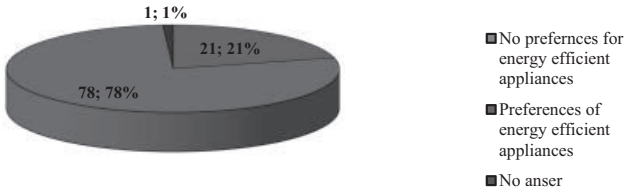

Figure 6: The distribution of respondents according the answers to the first question

As one see from Figure 6 78% of respondents answered that they prefer energy efficient appliances then buying new one. 21% of respondents do not take into account energy use efficiency of electric appliances then buying.

The distribution of respondents based on their answers o the second question is presented in Figure 7.

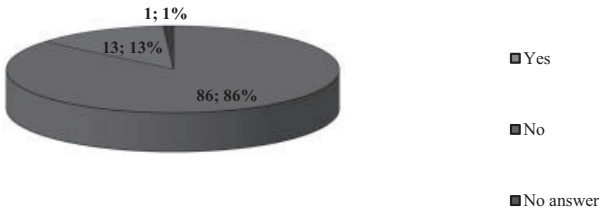

Figure 7: The distribution of respondents according the answers to the second question

As one can see from the Figure 7 87% respondents are saving energy at their homes. Just 13% do not save energy at home.

The willingness of Lithuanian households to pay more for electricity produced from renewable is presented in Figure 8.

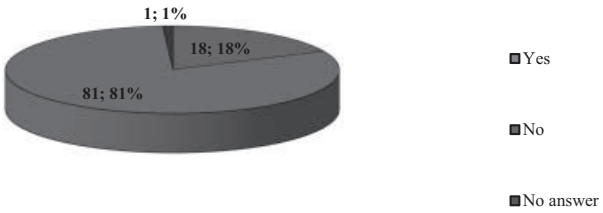

Figure 8: The distribution of respondents according the answers to the third question

As one can see from Figure 8 81% of respondents are not willing to pay more for electricity produced from renewable energy sources. Just 18% of respondents are ready to pay more for green electricity.

The distribution of respondents based on answers to the forth question is presented in Figure 9.

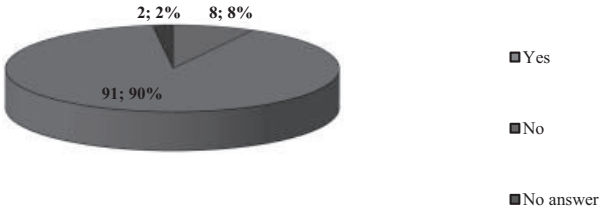

Figure 9: The distribution of respondents according the answers to the forth question

As one can see from Figure 9 more than 90% of respondents do not use biofuels in their cars.

The impact of the main drivers of environmentally responsible behavior (gender, age, income, education, environmental awareness was assessed by correlation matrix presented in Table 4.

Table 4

Correlation matrix

		Gender	Age	Income per month, LTL:	Education	The share of income paid for energy consumption per month	Preferences for energy saving appliances	Willingness to pay for renewables	Use of biofuels in transport	Energy saving at households
1	2	3	4	5	6	7	8	9	10	11
Gender	Pearson Correlation	1	-0,03163	0,015589	0,08505	-0,04020	-0,010717	-0,009591	0,013901	0,01169
	Sig. (2-tailed)		0,3172	0,622093	0,00706	0,20356	0,73472	0,761710	0,660296	0,71166
Age	Pearson Correlation	-0,0316	1	-0,07562	-0,1316	-0,11218	-0,02022	0,090336	0,031459	-0,0356

1	2	3	4	5	6	7	8	9	10	11
	Sig. (2-tailed)	0,31725		0,016654	2,9E-05	0,00037	0,522416	0,004212	0,319809	0,25994
Income per month, LTL	Pearson Correlation	0,01558	-0,075	1	0,02438	0,60291	0,03438	-0,002587	0,073317	0,01517
	Sig. (2-tailed)	0,62209	0,0166		0,44070	9,0E-11	0,27682	0,934797	0,020285	0,63143
Education	Pearson Correlation	0,08505	-0,131	0,024383	1	-0,03935	-0,06242	-0,035939	-0,03875	0,03343
	Sig. (2-tailed)	0,00706	2,91E-05	0,440704		0,21330	0,04822	0,255705	0,220332	0,29032
Environmental; awareness	Pearson Correlation	0,08178	-0,006	0,065211	0,1431	-0,10552	-0,06975	-0,012036	-0,51398	-0,4968
	Sig. (2-tailed)	0,00960	0,834	0,039033	5,3E-06	0,00082	0,02725	0,703548	0,658438	0,00214

As one can see from Table 4 the age gender and income does not have impact on environmentally responsible behavior in Lithuanian households (energy saving, buying energy efficient electric appliances, willingness to pay electricity from renewable energy sources; use of biofuels). Just environmental awareness has impact on energy saving behavior at home and use of biofuels in cars.

CONCLUSION

Sustainable energy consumption and environmentally responsible behavior in energy sector provides for sustainable development and increase of quality of life as energy consumption causes a major burden on environment and households budgets

Energy consumption is growing in EU and the rate of deployment of renewable and they market uptake is too low comparing with support allocated for promotion of renewable and implemented policies targeting sustainable energy development.

Analysis of environmentally responsible indicators in energy sector of Baltic States and Poland indicated similar trends in increase of these indicators since EU accession however situation differs among analysed countries though the same EU policies targeting energy efficiency and renewable energy sources were implemented in all analysed countries

The most important role in implementing EU polices targeting sustainable development can be placed on promotion of eenvironmentally responsible behavior which can be achieved through environmental education

Providing awareness of, and concern about economic, social, political and ecological interdependence allows to provide every person with opportunities to acquire the knowledge, values, attitudes, commitments and skills needed to protect and improve the environment.

The main drivers of energy consumption behaviour in Lithuania were assessed by applying households surveys in order o define the major issues of concern and to develop relevant policies targeting these issues

The environmental awareness was the major driver of environmentally responsible behaviour in Lithuania as other drivers like education, income etc. didn't have impact on energy saving, use of biofuels n cars, buying energy efficient appliances etc.

The Government of Lithuania should more focus on developing policies promoting use of renewable energy sources on demand side. Information campaigns and other soft policy measures would be useful to stimulate Lithuanian households to switch to renewable energy suppliers and to increase demand for renewable electricity in Lithuania.

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