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INTERRELATIONS BETWEEN ENERGY SECURITY ECONOMICS AND SOCIAL COHESION: ANALYSIS OF A LITHUANIAN CASE

Dainius Genys

Researcher; Ph.D.

Vytautas Magnus University, Energy Security Research Center (Lithuania)

Contact information

Address: Vileikos str. 8-227, 44404 Kaunas, Lithuania

Phone: +370 37 327822

E-mail address: d.genys@estc.vdu.lt

Ričardas Krikštolaitis

Professor; Ph.D.

Vytautas Magnus University, Faculty of Informatics (Lithuania)

Contact information

Address: Vileikos str. 8-227, 44404 Kaunas, Lithuania

Phone: +370 37 327898

E-mail address: r.krikstolaitis@if.vdu.lt

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ABSTRACT

Growing attention to sustainable development in academic discourse fosters discussions on how energy security affects society. In most cases the discussions consider the political and economic consequences, which affect or may affect the society. The aim of the article is to assess the impact of energy security economics on social cohesion in Lithuania. To achieve this aim the interrelations between energy security, energy economics and social cohesion are discussed. The theoretical framework of social cohesion (introduced by J. Jenson and P. Bernard) is presented and applied in empirical analysis. The

operationalization of empirical variables is based on economic, political and socio-cultural - activity areas, which are analyzed to verify the dichotomies between public attitudes and the actual behavior of society. These dichotomies help to distinguish six analytical dimensions, on the basis of which we created 17 empirical indicators, which analysis allows for describing the impact of Lithuanian energy security economics on social cohesion in quantitative data. The statistical analyses showed that the impact of attitudinal dimensions of energy security economics on social cohesion in Lithuania has an almost neutral effect: 3.05 (1-very negative; 3-neutral, 5-very positive). Whereas, the impact of behavioural dimensions of energy security economics on social cohesion has a negative effect: 2.47. The aggregated average of the overall impact of energy security economics on social cohesion in Lithuania has a negative effect: 2.76.

The article consists of four parts. The first part presents the interrelations between energy security, economy and social cohesion as well as discusses the theoretical framework that is used in empirical analysis. The second briefly provides the operationalization of theoretical model, concrete indicators that are used in the analysis and presents main statistic characteristics of indicators. The third part explains the results and stresses main discoveries taking into account the distribution of energy expenses for energy security among society. The fourth elaborates the noticeable differences among different social groups (in regard to age, education, income and living area).

KEYWORDS

Energy security economics, social cohesion, public attitude, public behavior, Lithuania

INTRODUCTION

The relationship between energy and economics in the contemporary world is more than obvious. In fact, the pursuit of energy is a fundamental driver of human history. Energy has shaped world economics and politics, and even the social structures of humans lives. It is almost impossible to find a strategy or more solid research where energy security would be analyzed aside from its economic aspects. Usually energy has an important share in every country's economy and its impact might be positive, but an inefficient and poorly functioning energy sector might cause serious problems for country's economy. The decent level of energy security usually means positive correlation between energy and economy efficiency. Therefore it is possible to grasp the growing attempts to purify and sharpen various energy economy optimization methods¹, calculate impact of energy sector to particular country's economy² as well as to validate methods for optimization of efficiency of economic investment in energy.³

Despite the differences in conceptualization, the interrelation of energy, and economy, from sociological point of view it is crucial to talk not only about energy impact on the economy but also its impact on social cohesion. A well-functioning and consistent performance of the energy sector is especially crucial in a small country such as Lithuania. Lithuania inherited an energy sector which was neither efficient nor developed to respond to independent country's need (for more than two decades it was totally dependent on Russian energy). Lithuania had to fundamentally restructure its energy sector; therefore energy security became a huge and expensive challenge which was laid on the shoulders of a relatively poor society. The originality of this article is based on the sociological approach, in which the empirical impact of energy security economics on Lithuanian social cohesion is studied. To answer this question it is not enough to calculate the price of particular energy projects or its economic payback, the analysis of energy economics needs to

¹ Andrea M. Bassi, Joel S. Yudken, and Matthias Ruth, "Climate policy impacts on the competitiveness of energy-intensive manufacturing sectors," *Energy Policy* 37 (2009); Ansgar Belke, Frauke Dobnik, and Dreger Christian, "Energy consumption and economic growth: New insights into the cointegration relationship," *Energy Economics* 33 (2011); Joseph F. DeCarolis, Kevin Hunter, and Sarat Sreepathi, "The case for repeatable analysis with energy economy optimization models," *Energy Economics* 34 (2012); Claudia Strambo, Mans Nilsson, and Andre Mansson, "Coherent or inconsistent? Assessing energy security and climate policy interaction within European Union," *Energy Research and Social Science* 8 (2015).

² Taiwen Feng, Linyan Sun, and Ying Zhang, "The relationship between energy consumption structure, economic structure and energy intensity in China," *Energy Policy* 37 (2009); Alexandros Gasparatos and Tatiana Gadda, "Environmental support, energy security and economic growth in Japan," *Energy Policy* 37 (2009); Kamil Kaygusuz, "Energy for sustainable development: A case of developing countries," *Renewable and Sustainable Energy Reviews* 16 (2012).

³ B. W. Ang, A. R. Mu, and P. Zhou. "Accounting framework for tracking energy efficiency trends," *Energy Economics* 32 (2010); Joseph F. DeCarolis, "Using modeling to generate alternatives (MGA) to expand our thinking on energy futures," *Energy Economics* 33 (2011).

be related to its broader social context, i.e., its interrelation with social justice from the point of view of both public attitudes (what society thinks) and social behavior (how it affects society).

To find out how the energy security economics affects social cohesion, a public poll⁴ was carried out. The social cohesion research model (introduced by P. Bernard⁵ and J. Jenson⁶) was employed in this pursuit. The conceptual framework identifies specific—economic, political and socio-cultural—activity areas, which are analyzed to verify the dichotomies between public attitudes and social behavior. These dichotomies help to distinguish analytical dimensions and empirical indicators, which allows for a description of the impact of Lithuanian energy security economics on social cohesion in quantitative data.

1. THE CONCEPTUAL RELATION BETWEEN ENERGY SECURITY, ENERGY ECONOMICS AND SOCIAL COHESION

The concept of energy security has greatly evolved over the last few decades and, even though according to some colleagues it still lacks consistency⁷ or clearer definition⁸, it is easy to grasp some of the main features commonly associated with the meaning of energy security. Usually they are: price, strategic interest, sustainable development and environmental concern. Depending on the particular case and the specific interest of a particular country, these aspects may be stressed in various order and with different importance. A broad content of energy security encompasses basic aspects of energy economics and sustainable development. However, it would be useful to more consistently define the concept of energy security economics that we propose in this article. By tracking the object and summarizing the interrelations among energy security, energy economics and sustainable development, we can draw some guidelines for the object of energy security economics.

⁴ Representative survey was conducted by public opinion research company "Vilmorus" in May and June 2013. Number of respondents: N = 2002; interviewed 18 years old and older residents of Lithuania. Method of survey: questioning respondents at home using pre-made questionnaires. Method of selection: multi-stage, probabilistic sampling. Selection of respondents was prepared so that each resident of Lithuania should have an equal chance of being questioned. The results reflect the opinion of the entire population of Lithuania and distribution by age, sex, place of residence, education, purchasing power. Error of survey results – 3% (probability – no less than 97%).

⁵ Paul Bernard, *Social Cohesion: A Critique* (Canadian Policy Research Networks, 1999).

⁶ Jane Jenson, *Mapping Social Cohesion: The State of Canadian Research* (Ottawa: Canadian Policy Research Networks Inc., 1998).

⁷ Bert Kruijt, D. P. van Vuuren, H. J. M de Vries, H. Groenenberg. "Indicators for energy security," *Energy Policy* 37 (2009); B. W. Ang, W. L. Choong, T. S. Ng. "Energy security: Definitions, dimensions and indexes," *Renewable and Sustainable Energy Reviews* 42.

⁸ Christian Winzer, "Conceptualizing energy security," *Energy Policy* 46 (2012); Aleh Cherp and Jessica Jewel, "The three perspectives on energy security: intellectual history, disciplinary roots and the potential for integration," *Current Opinion in Environmental Sustainability* 3 (2011).

The energy system is particularly important for the economy of each modern country; its efficiency or inefficiency respectively have a positive or negative impact on country's economy and create (or not) conditions for sustainable development of society.⁹ Mulder accurately notes the distinction in the interpretation of economic aspect in energy security "from a political viewpoint, ensuring security of supply often means that a stable supply of energy needs to be guaranteed at 'affordable' prices, regardless of the circumstances. From an economic viewpoint, however, the concept of security of supply is related to the efficiency of providing energy to consumers."¹⁰ In sum, the traditional definition of energy economics takes into account such aspects as supply, consumption, efficiency as well as use of energy in the country and its distribution among society.

It is one thing to talk about the cost of projects that improve energy security from economic point of view which is usually determined by market and its usefulness is defined by experts opinion and politicians decisions (i.e., if it makes sense for the country's need), but it is another to investigate the impact of the specific projects in a broader social context. If energy economics is more concerned with energy poverty (usually defined as lack of reliable access to electricity networks and dependence on solid fuels for cooking and lighting) or energy efficiency (usually defined as cheaper energy and beneficial return of the investments), we believe that energy security economics should take into account its actual impact on society, not only the efficiency of energy economics but its impact on society in general as well as to households with different income, i.e., whether it amortizes the economic burden among various social groups from social justice point of view or, on the contrary, increases the economic distances.

Energy security obviously correlates with economic benefit, and the efficiency of particular energy projects are supposed to produce economic payback. However, this is not the rule. The emphasis on energy security and the will of the state to invest in energy security might have controversial consequences.¹¹ Even though the concrete project is strategically useful it might not necessarily contribute to the increase of energy security if the society opposes its implementation. Even if

⁹ Helcio Blum and Luiz F.L. Legey, "The Challenging Economics of Energy Security: Ensuring Energy Benefits in Support to Sustainable Development," *Energy Economics* 34 (2012).

¹⁰ Machiel Mulder, Arie ten Cate, and Gijsbert Zwart, "The economics of promoting security of energy supply," *EIB Papers* 12 (2007).

¹¹ The economic aspects do not necessarily become key elements for smooth energy security. Even if particular project looks good in official plans it might remain only a plan if society will not be persuaded its usefulness or the implementation will be covered by shadows and doubts. There were numerous public debates discussing and arguing the official price, wishful price, real-expected price, whether it is beneficial and who will enjoy the benefit of each particular project to be implemented in Lithuania since the declaration of Independence. Despite this huge public concern, it is difficult to assess the efficiency of some particular investments (made by the government). This applies for the development of solar energy, VNPP, and even such successful project as LNGT. The question that always remains relevant for society is – whether we are not paying for energy security too much?

concrete project is economically beneficial and useful for the state it still might serve as economic burden for society and foster fragmentation.

The efficiency of the investments in energy security from the point of view of sustainable development should be linked to society's short term interests (if society approves the advantage of the investments and legitimates it), long term interests (if society agrees with the justification of particular projects and its foreseen payback) and actual allocation of the investment cost (how the society assesses it from social justice point of view and how it de facto affects society and its different social groups). Having in mind the expensive price of energy security, it is important (especially in small countries) to consolidate society towards a common goal. However, if society does not approve of particular projects and is not mobilized for a particular goal, it is difficult to achieve it even if the economic side of the project is beneficial.¹² This is how energy security is interdependent with social cohesion, which is one of the most important aspects of sustainable development. It is not a surprise that the European Commission names the cohesion policy as a key factor for successfully coping with global warming and the energy security challenge.¹³

By analyzing conceptual relations between energy security, energy economy and sustainable development, we see that energy economics puts a stronger emphasis in the research of distribution of expenses, which arise as an inevitable result of the pursuit of energy security. In this paper we want to make one step forward in analyzing research energy security economics' impact on social cohesion. The effective performance of energy security economics from the point of view of social cohesion development should be linked to its capacity to meet public interest and its ability to reduce social and economic distances within society, so that expenditure for energy would not cause inconvenience for different social groups.

¹² The cases of shale gas development as well as renovation of multi-apartment houses reveal the essence of the issue. The development of shale gas extraction in 2012 in Lithuania should have increased Lithuania's energy independence from Russia and reduce gas costs that are the strategic goals. However, the *Chevron's* withdrawal from the shale gas extraction process did not cause a public concern, even though it is directly related with public interest in energy security. The renovation of multi-apartment houses is named as one of the most important project to cope with energy efficiency in Lithuanian Energy strategy (*National Energy Independence Strategy of the Republic of Lithuania, approved by Resolution No. XI-2133 of the Seimas of the Republic of Lithuania of 26 June 2012*, Ministry of Energy of the Republic of Lithuania, Vilnius, 2012), but throughout the 2005-2012 years (when the current renovation program was established) there were renovated only 479 houses (about 1.8%) (according to Public Company "Housing Energy Efficiency Agency"). The problem is quite obvious from sociological point of view, public interest as well as society's behaviour in the context of energy security is based not only on objective risk parameters, but also on the perception of energy policy and its related risks (i.e., subjective evaluation). Accordingly, the impact of the implementation of particular energy security projects may result in various social consequences (such as increasing/decreasing differentiation of society, public trust, general disappointment and etc.).

¹³ See: http://ec.europa.eu/regional_policy/sources/docgener/informat/2014/cp_investments_energy2014_2020.pdf; http://europa.eu/geninfo/query/resultaction.jsp?SMODE=2&ResultCount=10&Collection=EuropaFull&Collection=EuropaSL&Collection=EuropaPR&ResultMaxDocs=200&qtype=simple&DefaultLG=en&ResultTemplate=%2Fresult_en.jsp&page=1&QueryText=social+cohesion&y=0&x=0.

2. TENSIONS OF ENERGY SECURITY IN LITHUANIA AND THE MODEL OF SOCIAL COHESION

Energy independence or simply energy security is identified as a primary goal in the official documents of Lithuania.¹⁴ But the results of a public poll¹⁵ reveal that for society the most important aspect of energy security is price (89.7% *important* or *very important*). Even though it is obvious that it is almost impossible to achieve strategic goals and ensure the supply of cheap energy without achieving independence of energy sector from a monopolistic system, hence the society is not indented to support this goal at the expenses of personal wealth.¹⁶

This is how Lithuanian energy politics faces the contradiction between the need for cheaper energy and energy independence (which requires additional investments at the expense of society wealth). The parallel between energy independence and cheaper energy helps not only to identify the differences among various social groups on perception of energy security, but also reveals the potential fragmentation and decrease of social cohesion in society. It is important to identify the size of such potential, i.e., whether society understands, approves and supports the official goals of the government and to analyze what kind of effect on social groups with different income the government's pursuit of energy security (by installing particular energy projects) has.

Economic differentiation is quite visible in Lithuania;¹⁷ therefore, energy prices have a different effect on different social groups. The welfare of a large part of Lithuanian society depends on a centralized supply of energy resources (gas, electricity, district heating), the poor quality of energy infrastructure, inability to take individual decisions, and especially prices.¹⁸ It is obvious that the part of society with lower income is particularly vulnerable not only because of increasing energy prices, disruption in supply or other risks of the energy system, but also because of the growing financial burden that occurs due to the quest for energy security. The wellbeing of different groups are directly related to social cohesion, which is particularly important in successfully overcoming of the challenges of

¹⁴ *National Energy Independence Strategy*, *supra* note 12.

¹⁵ Here and hereinafter are used the results of public polls carried out in 2013 (by public opinion analysis agency "Vilmorus"), N-2002, and in 2014 public poll was repeated with smaller sample amount, N-1002.

¹⁶ Even though the majority of Lithuanian society agree the energy independency from other countries is important (important or very important - 71.8% agreed), however 68.7% mentioned that "the state should be concern with and do more about cheap energy instead of energy security", and only 30.8% agreed that "the state should be concern with energy independence despite the requirement for bigger investments".

¹⁷ Vaida Lisauskaitė, "Lietuvos gyventojų pajamų ir vartojimo diferenciacija," *Verslas: teorija ir praktika* 11 (2010); Rasa Zabarauskaitė and Inga Blažienė, "Gyventojų pajamų nelygybė ekonominių ciklų kontekste," *Verslas: teorija ir praktika* 13 (2012).

¹⁸ Vylius Leonavičius and Dainius Genys, "Daugiabučių namų renovacija: socialinis ir ekonominis aspektai," *Filosofija. Sociologija* 25 (2014).

energy policy (from increasing energy resources prices point of view). Successfully overcoming the challenges depends on the level of social cohesion.

Comparative research¹⁹ shows that those societies which are cohesive and mobilized usually overcome challenges faster and more successfully, and conversely, fragmented and unorganized societies face some extra challenges. The pursuit of energy security is also strongly related to social cohesion. On the one hand the efficiency of energy security economics is dependent on social cohesion (i.e., whether society is mobilized for realization of particular projects). On the other, energy economics itself can contribute to the increasing or decreasing of social cohesion (i.e., whether particular projects address the interest of all social groups and fosters involvement). If a vivid inequality is present in society and the burden of prices are experienced unequally, thus appears the ability to manipulate public attitude towards particular projects or even foster fragmentation in society. That is why the implementation of any reform or specific energy infrastructure projects should be based not only on the economic benefits, but also on the potential impact on social cohesion.

There are plenty of various research models of social cohesion, but despite the differences occurring in conceptualizing²⁰ and operationalizing²¹, the concept of cohesion serves as a kind of frame, which allows for understanding what in some societies even in times of crisis (or challenges) leads to cohesion growth, and what leads towards fragmentation.

Social cohesion is society's focused and integrated way to respond to the global challenges of the modern world: political and social transformation, accelerated economic competition, environmental, financial, energy, social and other crises. A socially cohesive society is where all groups have a sense of belonging, participation, inclusion, recognition and legitimacy.²² Social cohesion involves building shared values and communities of interpretation, reducing disparities in wealth and income, and generally enabling people to have a sense that they are engaged in a common enterprise, facing shared challenges and that they are members of the same community.²³ Accordingly, factors which foster these processes contribute to cohesion and vice versa.

¹⁹ See http://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/ef1472en.pdf.

²⁰ Gerard Duhaime, Edmund Searles, Peter J. Usher, Heather Myers, and Pierre Frechette, "Social cohesion and living conditions in the Canadian artic: from theory to measurement," *Social Indicators Research* 66 (2004); Regina Berger-Schmitt, "Considering social cohesion in quality of life assessments: concept and measurement," *Social Indicators Research* 58 (2002).

²¹ Jane Jenson, *supra* note 6; Paul Bernard *supra* note 5.

²² Jane Jenson, *supra* note 6.

²³ Judith Maxwell, "Social Dimensions of Economic Growth," Eric John Hanson Memorial Lecture Series, Volume VIII, University of Alberta, 1996: 13 // <https://era.library.ualberta.ca/downloads/nc580q389>.

This article adapts the model of social cohesion proposed by Paul Bernard. The integrated conceptual scheme of social cohesion provided by Bernard²⁴ is based first on three activity spheres: economic, political, and socio-cultural; second, on the formal, the subjective/attitudinal (how people perceive them) and substantial/behavioral (how people act) relations. These two theoretical facets lead to the conceptualization of the following dimensions: affiliation/isolation, insertion/exclusion, participation/passivity, acceptance/rejection, legitimacy/ illegitimacy and equality/inequality. This theoretical framework helps to form empirical dichotomies of activity spheres (Table 1) and such analysis helps to identify the relation between the attitudinal and behavioral aspects of society towards energy security economics. This model is quite popular and is used in comparative social cohesion analysis of various countries.²⁵

Table 1: Bernard's integrated conceptual scheme of social cohesion

Sphere	Nature of relations	
	Formal / attitudinal	Substantial / behavioural
Economic	Insertion / exclusion	Equality / inequality
Political	Legitimacy / illegitimacy	Participation / passivity
Sociocultural	Acceptance / rejection	Affiliation / isolation

3. OPERATIONALIZATION

The operationalization of empirical variables is based on the above-presented theoretical model²⁶, and later the analogies of empirical variables used in the research are presented.

Economic sphere. The items of formal/attitudinal dimensions are supposed to help identify the attitude of society towards existing insertion/exclusion mechanisms. Meanwhile the items of substantial/behavioral dimensions are supposed to reveal the existing equality/inequality balance of society in reality. The analogy of empirical items from energy security economic impact on society point of view are prescribed in the following way: the items of formal/attitudinal dimension covers various questions with aim to reveal the societal attitude towards the evaluation of the burden of energy security as well as its social justice and evaluation of public opinion of particular projects. The items of substantial/behavioral dimensions cover various questions with the aim to reveal

²⁴ Paul Bernard, *supra* note 5.

²⁵ Paul Dickes, Marie Valentova, and Monique Borsenberger, "Social Cohesion: Measurement Based on the EVS Micro Data," *Statistica Applicata* 20 (2008).

²⁶ Jane Jenson, *supra* note 6; Paul Bernard, *supra* note 5.

the real economic burden experienced by the society, its impact to the distances (economic and social) between different groups of society and the approval of concrete projects.

Political sphere. The items of formal/attitudinal dimensions are supposed to help identify social trust in various governmental institutions and organizations, and its legitimacy and efficiency in representing public interest. Meanwhile the items of substantial/behavioral are supposed to reveal factual participation and the activity of society in democratic governance. The analogy of empirical items from energy security economic impact on society's attitude(s) are prescribed in the following way: the items of formal/attitudinal dimension cover various questions with the aim to reveal societal trust in various organizations and institutions as well as private companies (including foreign) related with energy security and attitude towards safety of concrete energy projects. The items of substantial/behavioral dimensions cover various questions with the aim of revealing society's civic activity and involvement as well as their knowledge about various aspects of energy security.

Sociocultural sphere. The items of formal/attitudinal dimensions are supposed to help identify the attitude of society towards openness and respect for diversity. Meanwhile the items of substantial/behavioral are supposed to reveal the dominant values and their diversity through how the society belongs to various organizations. The analogy of empirical items from energy security economic impact on society point of view are prescribed in the following way: the items of formal/attitudinal dimensions cover various questions with aim to reveal public perception of social justices of energy security economics and readiness to contribute to public interest in energy security as well as perception of energy security (whether it is based on self-interest or societal interest). The items of substantial/behavioral dimensions cover various questions with the aim of analyzing whether the existing effect of the energy system on society maintains the possibility to remain autonomous and the ability to individually defend oneself from energy threats.

Table 2. The operationalization of theoretical model and statistic characteristics of indicators

Indicator	Items/Questions	Cronbach's Alpha	Mean of responses	Standard deviation
Case A: Economic sphere – Formal relations Dimension: Insertion/Exclusion				
Attitude to social justice of energy politics	Evaluate the following statements (1-totally disagree; 3-don't know; 5-totally agree): 3.2. It is more important to achieve energy security than to ensure the conditions for democracy 3.5. Lithuanian democratic system	0.459	2.77	0.61

	works well, because the citizens are presented with opportunities to realize alternatives to government executed energy policy 3.6 The problem of energy security in Lithuania is addressed taking into consideration the interests of all social groups 24.1. I positively value energy policy executed by the Government of Lithuania			
Attitude to beneficence of energy projects	<i>Evaluate the following statements (1-totally disagree; 3-don't know; 5-totally agree):</i> 20.2. I think that Visaginas nuclear power plant will be economical beneficial for Lithuania 20.4. I think that the extraction of shale gas will be economical beneficial for Lithuania	0.579	2.83	0.87
Importance of particular energy security projects	<i>Evaluate the importance of the following aspects for Lithuania (1-very unimportant; 3-don't know; 5-very important):</i> 1.3. The development of renewable energy 1.7. The development of nuclear energy 1.9. The development of shale gas extraction 1.4. The price of energy resource	0.509	3.70	0.60
Case B: Political sphere – Formal relation Dimension: Legitimacy/Illegitimacy				
Trust in governmental organizations	<i>Do you trust the influence of these institutions and organizations on Lithuanian energy policy?(1-totally do not trust; 3-don't know; 5-totally trust)</i> 6.1. Lithuanian President; 6.2. Lithuanian Government 6.3. Lithuanian Seimas; 6.4. Municipalities; 6.6. Lithuanian Energy Ministry	0.861	3.09	0.74
Trust in energy organizations	<i>Do you trust the influence of these institutions and organizations on Lithuanian energy policy? (1-totally do not trust; 3-don't know; 5-totally trust)</i> 6.7. NGOs; 6.8. National Energy Companies; 6.9. Private Energy Companies.	0.851	2.89	0.70

Trust in foreign energy companies	<p><i>Do you trust the influence of these institutions and organizations on Lithuanian energy policy? (1-totally do not trust; 3-don't know; 5-totally trust)</i></p> <p>6.10. Russian Energy Companies; 6.11. Japan Energy Companies; 6.12. Scandinavian Energy Companies; 6.13. USA Energy Companies; 6.14. Polish Energy Companies</p>	0.937	2.76	0.65
Attitude to safety of energy projects	<p><i>Evaluate the following statements (1-totally disagree; 3-don't know; 5-totally agree):</i></p> <p>20.1. I think that Visaginas NPP project will be safe 20.5. I think that the extraction of shale gas will be ecologically safe</p>	0.579	2.65	0.83
Case C: Cultural sphere – Formal relation Dimension: Acceptance/Rejection				
Personal will to contribute to energy security	<p><i>Evaluate the following statements (1-totally disagree; 3-don't know; 5-totally agree):</i></p> <p>I would voluntarily agree to sacrifice particular amount of my income if I knew it would for sure directed to strengthen the efficiency/reliability of energy infrastructure I agree that the public interest service tax is in line with social justice (i.e., it is beneficial for society)</p>	0.640	2.45	0.86
Perception of energy security	<p><i>Evaluate the importance of the following aspects for Lithuania (1-very unimportant; 3-don't know; 5-very important):</i></p> <p>1.2. Energy independence from other states 1.6. Independent energy generation 1.12. Integration into the common European Union energy market 1.14. The ability to take advantage of international political relations (e.g., EU, NATO) to defend Lithuanian interests</p>	0.741	3.98	0.621
Case D: Economic sphere - substantial relation Dimension: Equality/inequality				
Approval of particular energy projects	<p><i>How do you value/assess the following to be implemented projects? (1-totally disagree; 3-don't know; 5-totally agree)</i></p> <p>19.6. The development of shale gas 19.7. The construction of Visaginas NPP 19.9. The development of renewable</p>	0.478	3.34	0.60

	energy (wind energy) 19.10. The development of renewable energy (solar energy)			
Individual energy expenses	What is your average monthly expenditure for energy resources/services? ²⁷ 15.1. Fuel (gasoline, diesel, gas) 15.2. Electricity 15.3. Hot water 14.1. Heating	0.583	2.43	0.84
Case E: Political sphere – substantial relation Dimension: Participation/Passivity				
Individual participation	<i>Assess your civic participation activity (1-very seldom; 3-don't know; 5-very often)</i> 4.2. Do you initiate the petitions? 4.3. Do you participate in demonstrations, rally, picket? 4.4. Do you donate money, commodities or support individuals or organizations in some other way?	0.769	2.27	0.81
Knowledge on energy strategy formation	<i>How much do you know about the formulation of Lithuania's energy strategy? (1-very little; 3-don't know; 5-very well)</i> 10.1. the role of governmental organizations? 10.2. the role of various private enterprises? 10.3. the role of scientists/experts? 10.4. the role of society? 10.5. the role of NGO's? 10.6. the role of foreign countries and their interests representation? 10.7. the role of foreign private companies and their interests representation?	0.974	2.04	0.82
Personal awareness	<i>Evaluate the following statements (1-totally disagree; 3-don't know; 5-totally agree)</i> 9.1. I am very well informed about energy problems 9.3. I know the advantages and disadvantages of nuclear energy 9.4. I know the advantages and	0.884	2.57	0.93

²⁷ Two scales were used in this indicator due to the obvious difference in expenditure in case of fuel, electricity, hot water (1- till 50; 2- 51-100; 3-101-150; 4- 151-200; 5- more than 200) and in case of heating (1- till 200; 2- 201-400; 3-401-600; 4- 601-800; 5- more than 800). However, the aggregated result (from both scales) was calculated for the further analysis of this indicator.

	disadvantages of renewable energy 9.6. I know the advantages and disadvantages of shale gas extraction			
Case F: Cultural sphere- substantial relation Dimension: Belonging/Isolation				
Effect of energy policy on individual	<i>What would be the damage caused to you by the following aspects? (1- very big; 3-don't know; 5- very little)</i> 12.5. Increased electricity prices; 12.6. Increased hot water prices; 12.7. Increased heating prices; 12.8. Increased fuel (gasoline, diesel, gas) prices.	0.821	2.64	0.73
Confidence in self-protection	<i>Assess your possibilities to protect yourself (1-very low; 3-don't know; 5-very high)</i> 16.5. From increasing prices of electricity 16.6. From increasing prices of hot water 16.7. From increasing prices of heating 16.8. From increasing prices of fuel (gasoline, diesel, gas)	0.930	1.76	1.01
Kind of effect of energy policy on individual	<i>What kind of burden/inconvenience does create for you increasing energy prices? (1- very big; 3-don't know; 5- very little)</i> 13.1. Increases outcome; 13.2. Increases anxiety; 13.3. Limits your possibilities for abundant leisure; 13.4. Endangers your health; 13.5. Reduces your ability to feel dignified; 13.6. Increases social isolation.	0.908	2.28	0.95

4. RESULTS

A five point Likert scale was used for data analysis and interpretation. Respondent disapproval of a particular issue was marked 1, indecisiveness / not knowing 3, and approval 5. All questions are formulated in a way that the increased average of the responses (e.g., when responses average is approaching 5) means a higher importance of the particular aspect from the point of respondents opinion and, conversely, a lower average means lower importance (e.g., when responses average is approaching 1).

In trying to identify which aspects of energy security economics (economic, political, sociocultural) have the biggest impact on Lithuanian social cohesion, several indicators (Table 2) were formed to test each dimension. In order to assess the quality of constructed indicators and test the reliability of internal indicators, estimates of internal consistency using Cronbach's alpha coefficients were computed separately for each indicator ranging from 0.495 to 0.974. This shows a reliable and proper allocation of indicators and their adequacy for the analysis of each dimension. Table 2 also shows the mean and standard deviation of each indicator.

Table 3. Aggregated mean results of each dimension

Sphere	Nature of relations	
	Formal / attitudinal	Substantial / behavioural
Economic	3.10	2.89
Political	2.85	2.29
Sociocultural	3.22	2.23
Average	3.06	2.47

Further, the average of each dimension, consisting from 2 to 4 indicators, was calculated. The obtained results showed the main tendencies in how energy security economics affects social cohesion in Lithuania (see Table 3). The statistical analyses showed that from the point of view of the public's attitude, the impact of energy security economics on social cohesion in Lithuania has an almost neutral effect – the average of indicators from formal/attitudinal dimension is 3.06 (1-very negative; 3-neutral, 5-very positive). Meanwhile the actual impact of energy security economics on social cohesion has a negative effect - the average of indicators from substantial/behavioral dimension is 2.47. Even though it is close to a neutral impact the average is below this line. Finally, the aggregated average of the indicators from both nature of relations shows that the overall impact of energy security economics on social cohesion in Lithuania has a negative effect: 2.76. Thus from the attitudinal point of view the impact of energy security economics with a little improvement might lead to a positive effect; however, the actual effect of energy security on society needs to be improved more consistently.

The figure below illustrates the impact of every indicator on social cohesion.

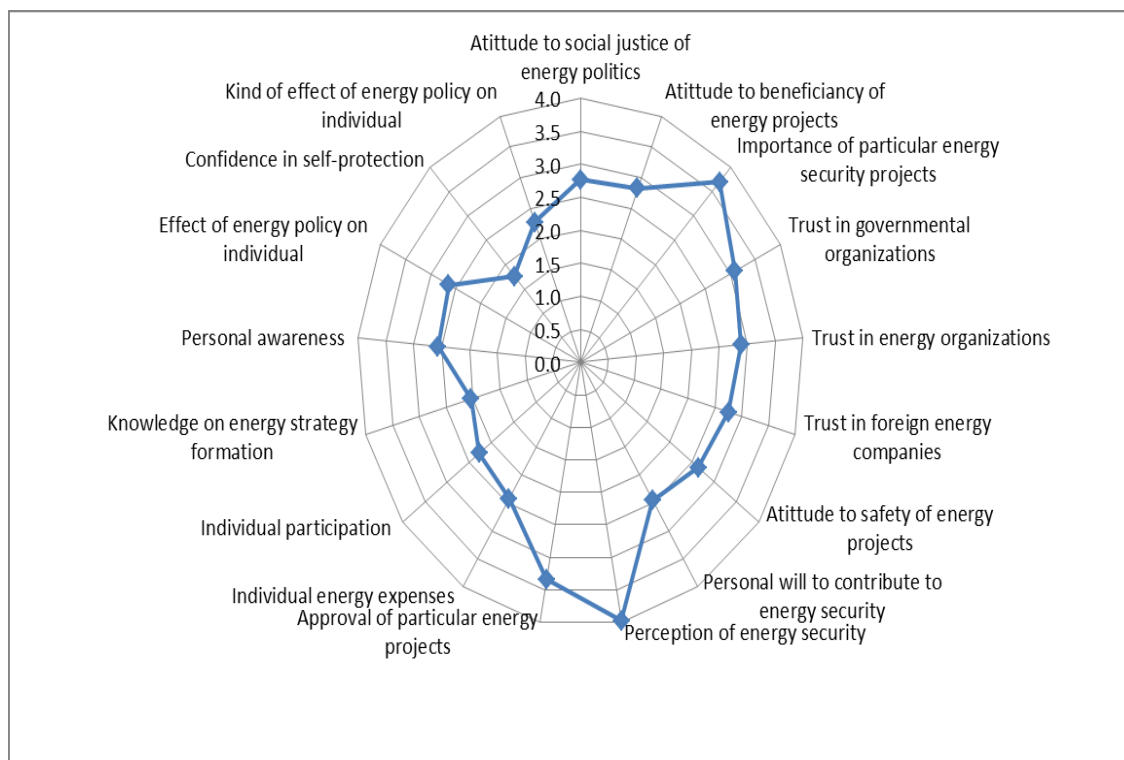


Figure 1. The aggregated results of the impact of every indicator.

Detailed analysis of the results shows that the respondents positively evaluate the importance of particular energy projects (3.70), but have doubts about their beneficiary (2.83) as well as the implementation of energy security according to social justice (2.77). The fact that a majority of society disagrees that “the problem of energy security in Lithuania is addressed taking into consideration the interests of all social groups” reveals the existing fragmentation (or even hostile attitude towards richer part of society) among society. Despite the approval of particular energy projects, further analysis shows that most of respondents remain skeptical about the safety of the same projects (2.65). A larger part of society tends to trust more in governmental organizations (3.09) than in energy organizations (2.90) or foreign energy companies (2.76). Finally, quite diverse opinion is fixated in socio-cultural indicators, when a large part of the respondents understand and agree with the importance of energy security (3.98), however only a small part are willing to contribute personally to this aim (2.45).

Similarly diverse opinions within the same dimension are fixated on the behavioral nature of relations. The greater part of society assesses the development of particular energy projects more positively (3.34), but at the same time most of the respondents spend a lot on energy expenses (2.43), which leads to an inadequate burden of energy costs forced on groups with an average or lower than average income. If the quite passive individual participation in civic activities

(2.27) comes as no surprise, then the negative evaluation of knowledge of the formation of energy strategy (2.04) as well as personal awareness about energy problems in general and advantages as well as disadvantages of particular projects (2.57) does become a surprise. It indicates that there is a big gap in public knowledge about energy affairs. Finally, after analysis of the socio-cultural dimension it became clear that the biggest damage of energy sector to social cohesion derives from society's total dependence on the existing system, i.e., only a small part of respondents believe in self-protection from increasing energy prices (1.76). A little bit better (but still negative) is the evaluation of the effect of energy policy on the individual (2.28). This shows that energy security affects social cohesion not only in different ways but the effect is quite different among different social groups.

It is interesting to study the diverse impact of energy security economics on social cohesion among different social groups in regard to income, education and living area.²⁸

4.1. INCOME

During the research respondents were classified into eight groups depending on their income (Under 300 Lt²⁹(86.89 Eur); 301-600 Lt (87.18 - 173.77 Eur); 601-900 Lt (174.06 - 260.66 Eur); 901-1200 Lt (260.95 - 347.54 Eur); 1201-1500 Lt (347.83 - 434.43 Eur); 1501-1800 Lt (434.72 - 521.32 Eur); 1801-2100 Lt (521.61 - 608.20 Eur); 2101 Lt and more (608.49 and more)), but because the size of some groups are not proportional (the amount of the respondents throughout the groups varies from 8 to 631 which limits the precision and validity of statistical operation), we decided to reveal the most noticeable difference between two groups: 301-600 Lt (87.18 - 173.77 Eur) versus 1201-1500 Lt (347.83 - 434.43 Eur).

²⁸ We haven't included the comparison on gender as well as occupation, because previous research indicated there are no statistically significant differences within these groups. Surprisingly there are only two worth mentioning difference in opinion between young (age of 18-25) and elderly people (66 and more). Young people are more concern with approval of particular energy security projects and they individually spends more (2.55) than elder people (1.89). In this case the first exceeds the aggregated average while the second fall behind from it. Elderly people experience bigger damage from energy policy, but young people experience this damage in more diverse effects.

²⁹ The public poll was carried out in 2013 when national currency Litas was still in use, therefore in further analysis in this article income in litas is used as a category. The analogue amount in Euros is provided in the brackets.

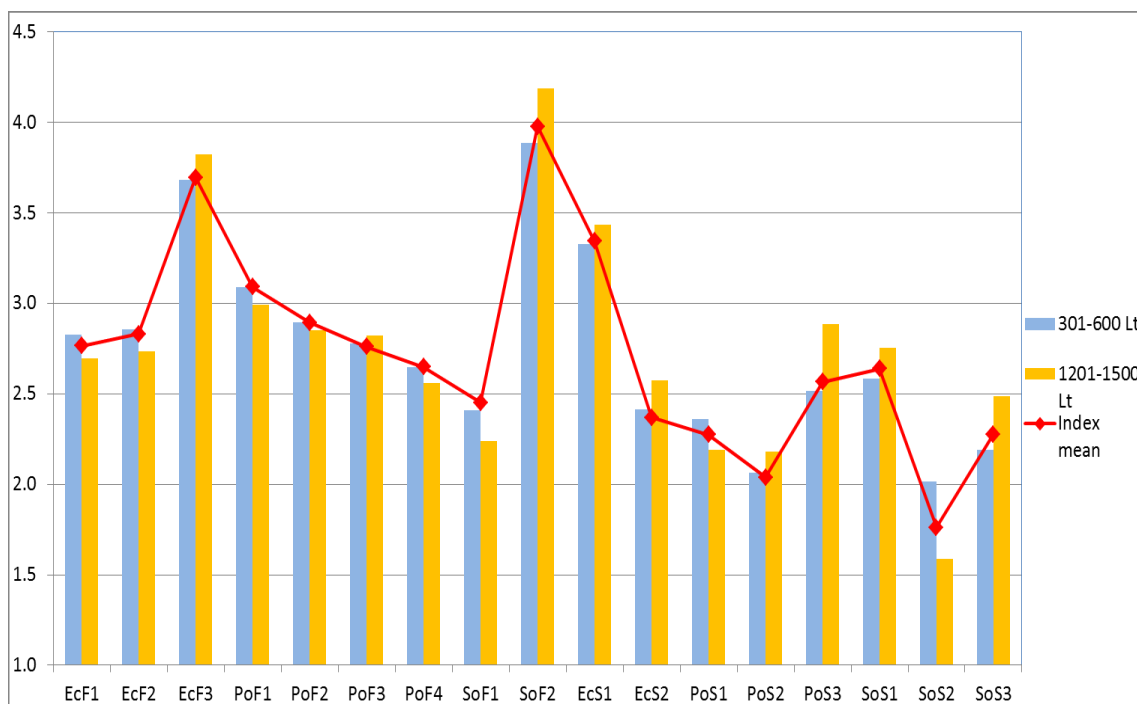


Figure 2. The difference of aggregated results between different income groups

The figure above shows there are differences in opinion on every parameter, yet in many cases they are not as big as one might expect. In most cases the differences reach only 0.05% or 0.1% and only in some cases it grows to 0.3% or 0.4%. The non-parametric Mann-Whitney U test was used to explore whether differences existed between mean values of parameters between different income subsamples. The statistically significant difference at 0.05 level was discovered in such parameters: the Importance of particular energy security projects (EcF3); Approval of particular energy projects (EcS1); Individual participation (PoS1); Personal awareness (PoS3); Effect of energy policy on Individual (SoS1); Confidence in self-protection (EcF3); Kind of effect of energy policy on Individual (SoS3).

Even though the impact of energy security economics on the social cohesion of different income groups in general is very similar, we can grasp a few differences which are interesting from a conceptual point of view. Comparing the results by each group of indicators we see that the attitude is quite similar—only richer people put a stronger emphasis on the importance of particular energy security projects (3.82 vs. 3.68). A similar situation arises in the next set of indicators where we see very similar results of trust tendencies only richer people trust more in foreign energy companies (2.82 vs. 2.78).

The most interesting results (which came as a surprise) we see in the cultural set of indicators. Even though it could be presumed that richer people would be concerned with post-materialist and self-expression values and poorer people would

be concerned with survival values, we see this is not the case. The richer people are less willing to personally contribute to energy security and tend to disagree that tax of public interest service is in line with social justice (i.e., it is beneficial for society) (2.24 vs. 2.41). The more notable (but less surprising) difference comes from the perception of energy security, where richer people demonstrate better results (4.19 vs. 3.89).

It is not surprising that richer people demonstrate better results in the economic set (substantial relations) of indicators. However, the differences of opinion are not as significant as one might expect. Interestingly enough, richer people think they are aware (2.88 vs. 2.51) of energy security but they are less active (2.19 vs. 2.36) than people with lower incomes. Finally, both richer and poorer people experience a noticeably negative effect of energy security policy but richer people obviously have better options for self-protection (2.02 vs. 1.59).

4.2. EDUCATION

During the research respondents were classified into six groups depending on their educational degree (Primary education; Secondary education; Vocational training; Further education; Unfinished higher education; Higher education). After careful examination of each group we decided to present two groups (primary versus higher education) which reveal the most noticeable differences in opinion.

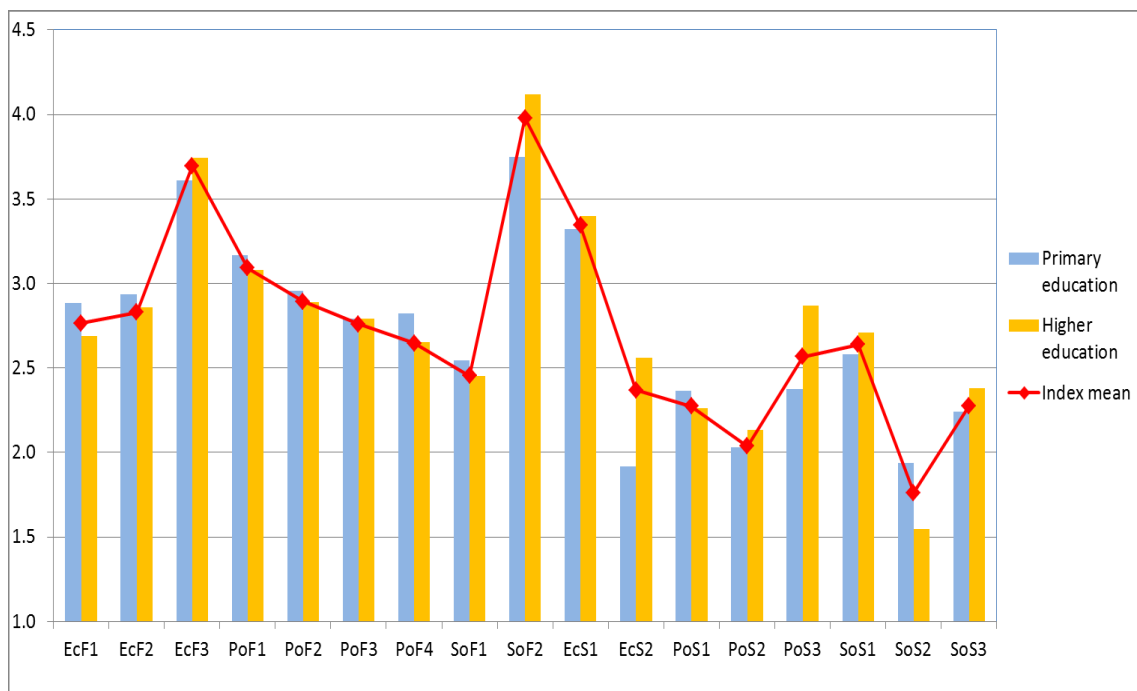


Figure 3. The difference of aggregated results between different education groups

It is easy to note that the main differences of energy security economics' impact on social cohesion of different education groups mainly come from indicators of substantial/behavioral relations.

People with primary education are a bit more willing to personally contribute to energy security, but people with higher education put a stronger emphasis on perception of energy security. The most notable difference is fixated in the indicator of individual energy expenses. People with primary education spend notably less (1.92) than people with higher education (2.56). At the same time they are less aware (2.38) of energy security affairs than people with higher education (2.56). Finally, they are more confident in self-protection (1.94) than people with higher education (1.55).

The non-parametric Mann-Whitney U test was used to explore whether differences existed between mean values of parameters between different education subsamples. The statistically significant difference at 0.05 level was discovered in such parameters: Attitude to social justice of energy politics (EcF1); Importance of particular energy security projects (EcF3); Attitude to safety of energy projects (PoF4); Perception of energy security (SoF2); Individual energy expenses (EcS2); Individual participation (PoS1); Personal awareness (PoS3); Confidence in self-protection (SoS2).

4.3. LIVING AREA

During the research respondents were classified into four groups depending on their living area (Main Cities; District Centers; Small Towns; Rural Settlements and single farms). Here we present the data of the two groups (main cities versus rural settlements and single farms) which reveal the most noticeable differences in the opinion.

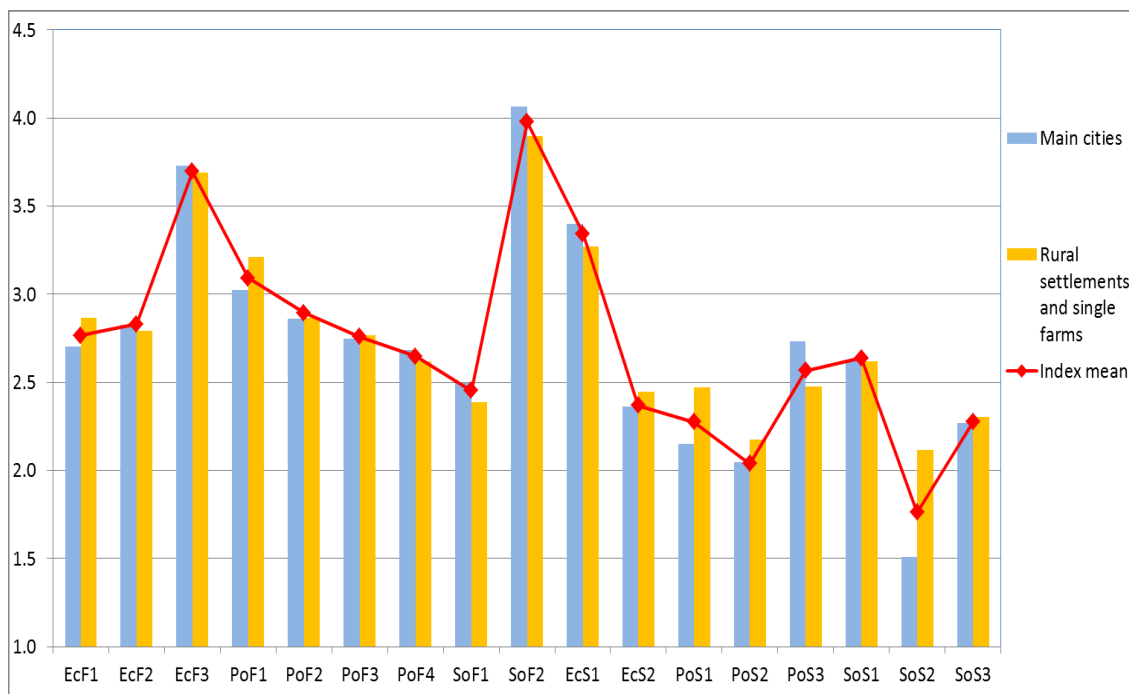


Figure 4. The difference of aggregated results between different living area groups.

As in the previous case, the main differences of energy security economics' impact on social cohesion of different groups living in different areas come mainly from indicators of substantial/behavioral relations. However, it is also worth mentioning three differences from indicators of attitudinal dimension. The first is related to the general attitude towards social justice of energy politics when people living in main cities are a bit more skeptical (2.70) about it than people living in rural settlements (2.86). The second is the people living in rural settlements tend to trust more (3.21) in governmental institutions than those living in main cities (3.02). The third is those living in main cities acknowledge the perception of energy security more (4.07) than other group (3.90).

Quite a different picture could be seen from the other indicators of substantial/behavioral dimension. Every category reflects notable differences, but there are again three which are most significant. The first is related to individual participation when we see that people living in main cities are more passive (2.15) than people living in rural settlements (2.47). The second is that the latter are less personally aware of general energy security affairs (2.48) than those living in main cities (2.73). Finally, the third is that the people living in rural settlements felt more confident in self-protection (2.12) than people living in main cities (1.51). This is easy to explain: in the main cities energy infrastructure is more elaborated and yet more dependent on central communication and its regulation; however, rural settlements usually have more autonomic energy systems and therefore are more independent in its regulations.

The non-parametric Mann-Whitney U test was used to explore whether differences existed between mean values of parameters between different education subsamples. The statistically significant difference at 0.05 level was discovered in such parameters: Attitude to social justice of energy politics (EcF1); Trust in governmental organizations (PoF1); Perception of energy security (SoF2); Approval of particular energy projects (EcS1); Individual participation (PoS1); Knowledge of energy strategy formation (PoS2); Personal awareness (PoS3); Confidence in self-protection (SoS2).

CONCLUSIONS³⁰

The research showed that the aggregated average of the indicators from both types of relations show that the overall impact of energy security economics on social cohesion in Lithuania has a negative effect: 2.76. It seems that it tends to increase the distances among people in society rather than bridging those distances. Thus from the attitudinal point of view the impact of energy security economics has an almost neutral effect: 3.05 (mean of formal/attitudinal dimension) and with a little improvement might lead to a positive effect. However, the actual effect of energy security on society needs to be improved more consistently. The actual impact of energy security economics has a negative effect - 2.47 (mean of substantial/behavioral dimension). The negative effect of energy security economics on social cohesion in Lithuania could be explained by the fact that energy expenses have no "equilibrium" effect towards different social groups and therefore it leads to fragmentation.

The statistical analysis revealed the existing different impact of energy security economics on social cohesion among different social groups (and also within these groups) in regard to income, education and living area. The following are the indicators that reveal existing statistically significant difference within all three groups: "trust in foreign companies", "individual participation", "personal awareness" and "confidence in self-protection". These differences indicate the aspects that create the greatest tensions among different social groups and from the social cohesion point of view requires careful attention.

The detailed analysis of each social group showed that people with lesser and higher income have different opinions (which is statistically significant) on "importance of particular energy security projects", "approval of particular energy

³⁰ As it was mentioned before the empirical data of 2013 year was used in the study which indicates situation of that time, meanwhile in recent years the energy sector has undergone a number of significant changes that most likely would have an effect on current public perception, since the improvements in the energy sector is directly linked with the aspects that have the most negative impact on social cohesion (i.e., the prices of energy resource and individual abilities to protect from energy risks).

projects", "individual participation", "personal awareness", "effect of energy policy on Individual", "effect of energy policy on Individual", "confidence in self-protection" and "kind of effect of energy policy on Individual". Even though there are some differences in attitude we see that a diverse impact strikes from a substantial dimension. It seems there are no conceptual differences from the attitudinal point of view between two analyzed income groups; however, they experience the actual impact of energy security economics in a different way due to the objectively different possibilities.

People with primary and higher education have a different opinion (which is also statistically significant) on "attitude to social justice of energy politics", "importance of particular energy security projects", "attitude to safety of energy projects", "perception of energy security", "individual energy expenses", "individual participation", "personal awareness" and "confidence in self-protection". Differently than in the previous case, here we see significant differences in both attitudinal and substantial dimensions. It is not surprising that people with different educations would interpret differently. However, as in previous case we see that more significant and more diverse impact on these two groups derives from a substantial dimension.

Lastly, people living in main cities and rural settlements and single farms differently perceive the importance of "attitude to social justice of energy politics", "trust in governmental organizations", "perception of energy security", "approval of particular energy projects", "individual participation", "knowledge of energy strategy formation" and "personal awareness" "confidence in self-protection". The differences indicate the most controversial aspects (its different interpretation and diverse impact) that arise due to the obvious differences of those living in main cities and in rural settlements.

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