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The Role of Environmental Attitudes in Explaining Public Perceptions of Climate Change and Renewable Energy Technologies in Lithuania

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Abstract: The Baltic states in general and Lithuania in particular represent a controversial combination of rapidly increasing climate change impacts and moderate or low concern with the climate crisis. A value shift is essential for the societal support and acceptance of renewable energy solutions. This study investigates the role of environmental attitudes in shaping the acceptance and risk perceptions of renewable energy technologies. The article analyses how environmental attitudes are shaping public attitudes towards climate change and perceptions of renewable energy technologies in Lithuania using New Environmental Paradigm (NEP) and environmental identity questions. The study analyses data from a representative public opinion survey with 1029 respondents conducted in Lithuania. The results reveal that environmental identity is a more significant factor in shaping risk perceptions of renewable technologies than is the NEP scale. The balance of nature dimension from the NEP is more closely related to perceptions of renewables than are humans' right to rule claims. The results show that environmental attitudes have low explanatory power in explaining perceptions of energy technologies in Lithuania.

Keywords: environmental attitudes; climate change perceptions; renewable energy; risk perception; HEP-NEP scale

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1. Introduction

Sustainability is a policy agenda that urges profound changes in social values in order to stimulate behavioural changes. A shift to green energy sources requires not only public acceptance in terms of policy support, but also public understanding of the causal relations of renewables to future environmental conditions and sustainability. Heberlein [1] has identified a difference between technological and cognitive fixes in relation to solving environmental problems. A technological fix occurs when technology influences the environment and environmental changes are achieved, while a cognitive fix happens when information influences human behaviour and accordingly attitudes need to be changed to influence behaviour [1] (p. 164).

The role of human values in the quest of sustainability has been identified by many authors, for instance Thøgersen and Ölander [2], Neckel [3] and Lockie [4]. Reflexivity regarding the consequences of one's own impacts and ecological footprint can meaningfully transfer to support for environmentally friendly solutions, like renewable energy production solutions.

The climate crisis and continued development of society require a broader approach in the public policy sectors than ever before. As global challenges threaten the current well-being of civilisation, the need to ensure and provide energy efficiency has reached a new high. Numerous development initiatives regarding technology and innovation have since attempted to make the energy sector more environmentally friendly. However, political will is a necessity to implement such initiatives. The European Union (EU) has

been acknowledged as one of the leaders of the energy transition due to its development of useful tools [5] and its setting of clear priorities towards a more sustainable future. In addition, over the last 50 years the EU has addressed various energy efficiency measures in Member States [6] by setting energy efficiency and energy conservation as the top priorities in the EU energy policies [7].

Lithuania represents a unique context, exhibiting increasing concerns about the climate crisis yet low public concern regarding this issue. According to Greenmatch [8] in an evaluation of the climate change impacts in European countries, Lithuania is the most affected country. Data show that Lithuania's surface and sea temperature increased the most of all European countries. However, according to European Social Survey (ESS) data [9], Lithuanians are much more concerned about the affordability of energy than climate change issues. Being the most affected yet least concerned country in Europe creates a need to evaluate how environmental attitudes can help explain public perceptions of climate change and renewable energy technologies. Indeed, possible energy transition barriers in the social world caused by a lack of awareness or a deprivation of information regarding global challenges may hamper further sustainable development processes.

Therefore, there is a need to look closer at the relationship between environmental attitudes and support for renewable energy technologies in Lithuania, in order to ascertain whether the implementation of a green energy policy is becoming embedded as a value-based policy measure.

The aim of this article is to analyse how environmental attitudes are shaping public attitudes towards climate change and perceptions of renewable energy technologies in Lithuania. To measure environmental attitudes, the New Environmental Paradigm (NEP) scale and environmental identity questions are used. The NEP scale was developed by Dunlap and colleagues [10] as a measure of pro-environmental worldviews, identifying a shift from anthropocentric understandings of human-nature relations to an environmentally conscious worldview. The use of NEP scale in Lithuanian survey allows to reveal what are the dominant environmental attitudes and how much ecocentric worldviews are common. We assume that environmental attitudes are significant predictors of risk perceptions and attitudes towards energy technologies.

The development of renewables in Lithuania and the issue of public acceptance is closely linked to green energy policy developments in the EU. Aligning with international agreements such as the Kyoto Protocol and the Paris Agreement, multiple action plans, frameworks and strategies have been set into the EU agenda, which are supposed to help meet the organisation's energy efficiency targets set until the year 2030 and the achievement of carbon neutrality by the 2050s [7]. In September 2020 the EU Commission even proposed to raise the 2030 greenhouse gas emission reduction target to 55% (compared with the 1990s) by embracing the need to consider all sectors for possible actions, which would lead to an increased energy efficiency [11]. However, such development in the energy sector requires significant technological improvement, mostly tied with energy transition pathways and the expansion of renewable energy technologies. One evaluation of the technical aspects of renewable energy technologies has identified that such a transition could help ensure broader energy access and improve air quality, while also increasing energy security and avoiding the negative consequences of climate change [12]. Nevertheless, developments and investments in wind, solar, hydro and other low-carbon energy sources continue to face multiple barriers because the whole transition process involves more than just a straightforward set of targets and policies [13]. As Biresselioglu et al. note [13], highly significant aspects of the energy transition are being played by various social factors, such as scepticism, economic gains and environmental concerns. Thus, the decision-making process cannot avoid the engagement of the general public. As the ways in which energy is being produced are just a part of the whole horizon, its usage plays a noteworthy role in the process as well. The European Green Deal [14] recognises that Europe must transform both economy and society towards a more sustainable path. To this end, the EU has acknowledged the need for active public participation and support for policies by finding

some motivators to increase public acceptance of such transition (e.g., financing schemes, household renovations and reduced energy bills).

The European Environment Agency (EEA) [15] has noted that energy usage among multiple sectors in the 28 EU Member States slightly dropped (5.7%) in 2017 compared with 2005. However, the final energy consumption leaders by sector did not change: as was true in 2005, the transport sector accounted for the largest part of final energy consumption (31%), with households in second place (27%) and industry in third (25%). Lithuania faces similar trends in its national energy consumption statistics [16]. The trends among the predominant final consumers of energy here were similar to the EU as a whole, with transport (38.8%) and households (27.2%) holding the top spots. The expectation for Europe to become the first climate-neutral continent in the world requires a huge shift towards renewable energy technologies. As is known, the benefits of renewable energy technologies perfectly align with such neutrality targets. An overview of Eurostat data [17] makes it apparent that renewable energy technologies accommodate 34% of EU energy production as a whole and in 2018 constituted the major source of energy across the EU. Nevertheless, internal differences in energy production still exist among Member States. Countries like Sweden, Finland and Denmark are capable of producing more than 30% of their total energy from renewable sources, while other EU Member States still lack an emphasis on and investments in renewable energy pathways. According to Eurostat data, Lithuania produces 19.4% of its energy from renewable sources. It is a moderate result in the EU, and the national targets and strategies of the Lithuanian energy sector are more ambitious. The main energy policy document in Lithuania—The National Energy Independence Strategy (NEIS)—sets strategic goals for the energy sector up to 2050. According to this document, the development of the energy sector is supposed to be based on quite rapid renewable energy expansion in the country, reaching 80% of energy production from renewable energy sources. Consequently, it is important to investigate the public acceptance of renewable energy technologies and the values that shape attitudes towards renewable energy.

2. Literature Review

The NEP scale was developed by American sociologist Riley Dunlap and his associates, with 12 items combining a range of worldview items used to provide significant insights into the relationship between humans and nature [18]. Dunlap et al. [10] later revised the NEP scale to improve it by including additional items, which expanded the coverage of an ecological worldview, provided a more balanced set of pro- and anti-NEP items and solved issues with the terminology. As López-Bonilla and López-Bonilla note [18], the original NEP scale included three main facets: balance of nature, limits to growth and human dominance over nature, while the revised scale added differently hypothesised facets and brought the total number of items to 15. However, in the period of time between the original and the revised NEP scales, Dunlap and van Liere developed the shortened six-item NEP scale [19]. Despite the fact that the explanatory power of this shortened scale was never published, researchers have used it and deemed it a useful tool in their research [20–22]. The shortened version comprises six items representing the multi-dimensionality of the full scale and includes these statements:

1. The balance of nature is very delicate and easily upset.
2. Modifying the environment for human use seldom causes serious problems.
3. Plants and animals exist primarily to be used by humans.
4. The Earth is like a spaceship with only limited room and resources.
5. There are no limits to economic growth even for developed countries like ours.
6. Humans were meant to rule over the rest of nature.

Statements 1 and 4 relate to the *balance of nature* dimension, 2 and 5 to the *limits to growth* dimension and 3 and 6 to the *humans' right to rule* dimension.

We assume that attitudes towards energy technologies may be more strongly related to the dimension of limits to growth and attitudes to climate change to the dimension of balance of nature.

It is noticeable that the end-users of energy production in the household and transport sectors consume more than half of the total energy produced [16]. Thus, immediate actions require that policy-makers draw the public's attention to this question. Multiple programmes and instruments across the EU and Lithuania have been created to increase the adoption of renewables and other efficient technologies, including but not limited to information programmes and financial incentives (e.g., subsidies for household renovation and solar panel instalments in Lithuania). Nevertheless, remaining is a need to understand public attitudes towards global issues and multiple energy technologies. Indeed, public acceptance is necessary for the successful implementation of an energy transition towards renewable energy sources [23]. Multiple studies analysing public acceptance of particular energy technologies have focused on individual attitudes and environmental beliefs to identify what factors influence individuals' opinions [24–27]. This body of research has revealed that public acceptance is critical in planning future energy projects and consumer behaviour (i.e., willingness to pay). However, high costs and lack of information about or awareness of global environmental challenges seem to be the main barriers to gaining public support for renewable energy development [28]. To investigate the relationship between environmental attitudes and the acceptance of energy technologies, some investigations have focused on environmental values in the framing of global environmental challenges (e.g., lack of resources, environmental policy [2]) by using the lens of the NEP [29].

Several studies have used NEP paradigm questions to examine public attitudes towards climate change and support for climate change policies. For example, in their United States-based study, Mumpower et al. [30] have revealed that higher scores for NEP statements indicate higher climate change risk perceptions, yet psychometric variables were stronger predictors of climate change perceptions. Another study relating the NEP to climate change concerns in China [31] has identified positive significant correlations. The NEP has also been found to be a significant predictor of general ecological risk perceptions, especially global risks like global warming and ozone layer depletion [32]. Overall, it seems that the *New Environmental Paradigm* (some studies instead use the term *New Ecological Paradigm*) is relevant to different cultural contexts and can be applied as a quite universal measure of environmental attitudes.

As Steel et al. [29] have noted, multiple studies using NEP have proved their importance in the analysis of public support for renewable energy sources. The orientation of environmental values has been identified as one of the main factors shaping individuals' views towards energy sources. Buylova et al. [33] have recognised that individuals with more expressed environmental values (higher NEP scores) believe that more money should be invested in the research and development of new energy technologies. Ntanos et al. [34] have found that individuals with higher NEP scores are more likely to pay for renewable energy development projects. Steel et al. [29] have also found that individuals with higher NEP scores are more supportive of renewable energy sources like wind and solar. Thus, the connection between environmental values and energy sources has been confirmed in these and other investigations. Similar studies have analysed environmental attitudes and energy consumption behaviours, finding that environmental concerns among households increase electricity savings [35]. Poortinga et al. [36] have also revealed that the aim of environment protection significantly influences public support for energy policy decisions. In this case, the significance of the nexus of energy resources, society and global climate challenges, increases. Borowski [37] noticed that climate and resources are considered as the interconnected vessels which are required to ensure the balance of the whole system. However, the society axis cannot be underestimated. As the need for energy shapes the routines of daily life and the lack of resources are threatening the current well-being of people, the risks of unbalanced side effects occur. Thus, the need to implement energy transition towards renewable energy sources increases. On the other hand, people are not willing to waive a lot of their well-being if they have doubts about the possible positive outcomes of the changes [38,39]. As such, climate change and other environmental concerns have proved to be significant variables in multiple studies in explaining societal responses

to climate change mitigation strategies via an energy transition. Persisting differences in the public's attitudes towards further developments in the energy sector, shaped by unique geographical, geopolitical, cultural and societal conditions, requires that various countries be evaluated separately.

Despite the fact that previous studies provided useful insights by using full NEP scale, research with shortened version of NEP scale is still limited. Our research contributes to the better understanding of the six item NEP scale implementation in explaining public perceptions of climate change and renewable energy technologies.

3. Materials and Methods

Data analysis for this article is based on a representative public opinion survey (N = 1029) conducted in Lithuania in October 2018. Survey was conducted through face-to-face interviews. Multistage stratified random sampling was used and the sample structure corresponds to the demographic structure of Lithuanian population. To adjust for the minor deviations in the sample, weights were applied, hence the analysis presented in this article was conducted using weighted data.

The questions analysed in this article are part of the larger project (for more information and access to the primary data see Appendix A). Authors of this article participated in the project and questionnaire construction.

The main research goal is to provide insights into the role of environmental attitudes in explaining perceptions of climate change and renewable energy technologies in Lithuania.

The *independent variables* used in this study are environmental attitudes, conceptualised through:

- The New Environmental Paradigm (NEP) and;
- Ecological identity.

As noted by Hawcroft et al. [19], the NEP scale in general represents the relationship between humankind and their environment, by explaining a diverse typology of value orientations. In this case, higher mean scores on the NEP scale indicate a more ecocentric orientation, with higher expressed concerns about the preservation of natural surroundings, whereas lower mean scores relate to anthropocentric values and human dominance over nature. The shortened version of the NEP scale (outlined in the literature review section) was used in our survey.

Respondents were asked to identify their support for or opposition to each statement by using a five-point Likert scale ranging from 1 (strongly oppose) to 5 (strongly support).

The scales of statements 2, 3, 5, and 6 were re-coded so that all the higher values in the statements would represent stronger ecocentric attitudes.

As regards each respondent's environmental identity, two statements were included in the questionnaire: 1—Being environmentally friendly is an important part of who I am; and 2—Being environmentally friendly is an important part of being Lithuanian. Both statements had possible answers on the five-point Likert scale from 1 to 5, where 1 represented strong disagreement and 5 strong agreement.

The *dependent variables* in our analysis are:

- Climate change concerns;
- Attitudes towards renewable energy technologies;
- Risk perceptions of renewable technologies.

As regards climate change concerns, respondents were asked the following question: *How worried are you, if at all, about climate change?* A five-point Likert scale was used for possible answers from 1 (not at all worried) to 5 (extremely worried). To better represent differences among multiple groups, socio-demographic characteristics such as gender, income and education were used as well.

Attitudes towards energy technologies were measured on the negative-positive continuum. A list of renewable and non-renewable options was provided (comprising 10 technologies in total).

The question measuring attitudes towards energy production methods was as follows: *What is your general opinion about the following methods of energy production in Lithuania?* Answers ranged from 1 (very negative) to 5 (very positive).

Risk perceptions of energy technologies were measured by the following question: *What level of threat do these energy sources pose?* Answers in Likert scale ranged from 1 (absolutely no threat) to 5 (poses a very serious threat). The same list of 10 energy technologies was used as in the question for the attitudes.

As this article aims at analysis the role of environmental attitudes towards the perception of renewables, our conceptual model includes separate variables for the general attitudes towards renewables and risk perceptions, because low risk perception of energy technology does not necessarily transfer to the positive general attitude. For example, coal can be regarded as positive energy source because of low price, however the risk perception of related energy production technology can be very high because of the environmental impacts.

All technologies were divided into either renewable (wind, solar, hydro and biomass) or non-renewable (coal, oil, natural gas, nuclear power, hydraulic fracturing, waste incineration) and derivative indexes from mean scores were created as new variables. Following derivative variables were created with sufficient internal consistency to be used for further analysis:

(1) Attitudes towards renewable technologies (on negative- positive continuum) (Cronbach's $\alpha = 0.750$);
(2) Risk perception of renewables (Cronbach's $\alpha = 0.798$);
(3) Risk perception of non-renewables (Cronbach's $\alpha = 0.640$).

The analysis includes descriptive statistics, correlations and regression analysis methods.

For the explanatory model of role of environmental attitudes on the perception of renewables, regression analysis was conducted. Dependent variables in the regression models are the derivative indexes of the attitudes and risk perceptions of renewables, therefore multiple regression was used.

4. Results

The data show that the general level of concern about climate change in Lithuania is relatively moderate (see Figure 1). The results are close to those attained by the European Social Survey in 2018 [37], showing that public concern regarding climate change is quite low.

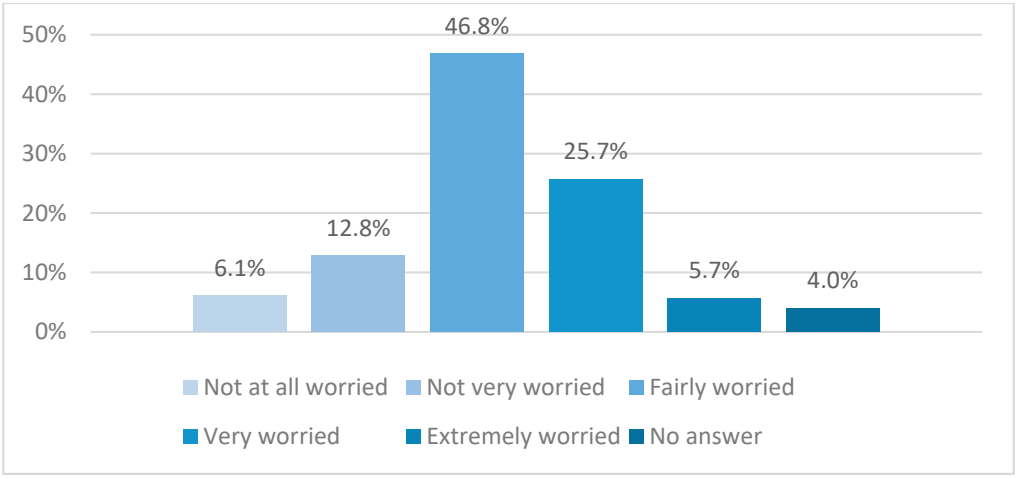

Figure 1. Climate change concerns in Lithuania, 2018.

Our data revealed significant differences in climate change concerns between males and females in Lithuania, comparing mean scores (Mann–Whitney U test, $p = 0.000$).

Indeed, it can be noted that females are much more concerned about climate change (M = 3.23) than males are (M = 2.98). The effects of gender in climate change concerns and knowledge have been observed in previous studies, revealing that women in general are more concerned about environmental issues. Higher concerns are connected with the increased vulnerability [40–42] emerging from the economic dimension. On the other hand, higher concerns affected by a greater sense of vulnerability strengthen a possibility to demonstrate leadership in decision-making. Critical changes as required in economic development and the energy sector could be focused on achieving a more sustainable future, drawing on the collective and continuous effort of both females and males.

This article aims to analyse public attitudes and concerns with respect to energy technologies. One of the main goals in climate change mitigation and adaptation strategies is the realisation of an energy transition, but this requires public support. It has been recognised that energy and its consumption is a part of social practices [43], thus social practices need to be changed in a more sustainable way. To better evaluate the possibilities of altering the current practices by which energy is produced and used, understanding the public's attitudes towards various energy sources is crucial. Detaching from the material side of attitude formation and leaving just general attitude aspects towards risk perceptions regarding energy technologies provides a good way of reviewing the uptake of possible policy responses by the Lithuanian public. To do so, the respondents in Lithuania were asked to share their attitudes towards the risks of renewable and non-renewable energy technologies (see Figure 2).

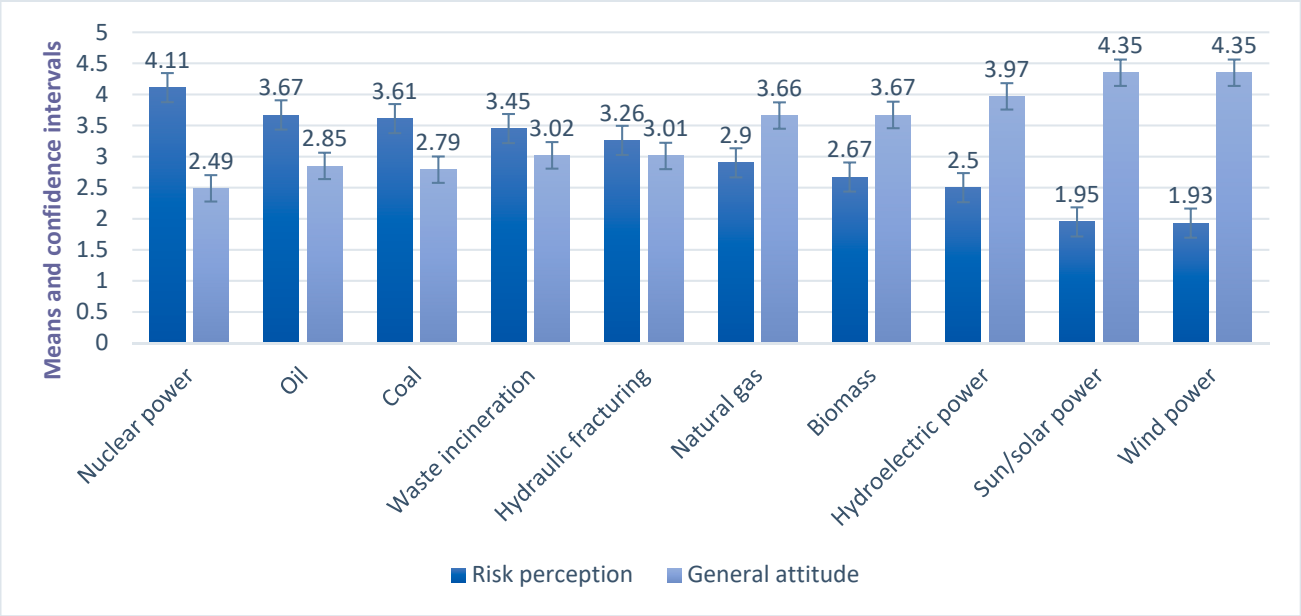

Figure 2. Mean scores of general attitudes towards energy technologies (where 1—'very negative' through to 5—'very positive') and risk perceptions (where 1—'absolutely no threat' through to 5—'poses a very serious threat').

Data from Figure 2 identifies that general attitudes of energy technologies are related to the risk perception. The majority of risky energy production sources (nuclear energy, oil and coal) are evaluated most negatively. There is a significant negative correlation between general attitudes towards renewable technologies and risk perceptions ($r_s = -0.493$, $p = 0.000$); more positively perceived technologies are regarded as less risky and vice versa.

Perceptions of risk are explained as an essential part of the policy-making process [44], so better knowledge of an individual's assessment of risk can be useful in future predictions of social responses towards policy initiatives. It is apparent that among the Lithuanian public, the main concerns about energy technologies pertain to nuclear energy and other non-renewable energy sources, such as oil, coal and hydraulic fracturing. It is interesting

to note that despite their technological differences in extraction methods, natural gas and hydraulic fracturing are seen as quite similar energy sources. However, natural gas is deemed a less risky alternative, mainly because of the public's existing knowledge and habits, using it part of their daily routine. In general, the mean scores of risk perceptions regarding energy technologies differ significantly between renewable (M = 3.51) and non-renewable energy technologies (M = 2.26).

To analyse differences in attitudes towards energy technologies and climate change, it is important to consider the general aspects of environmental identity. It has been recognised that attachment to natural surroundings based on various historical and emotional aspects can be expressed through an individual or collective/national identity [45]. To better understand the Lithuanian public's attitudes in relation to their environmental identity, two statements were presented to them; their answers are displayed in Figure 3 below. The possible answers (which were strongly agree, agree, strongly disagree and disagree) were combined into two categories (agree and disagree).

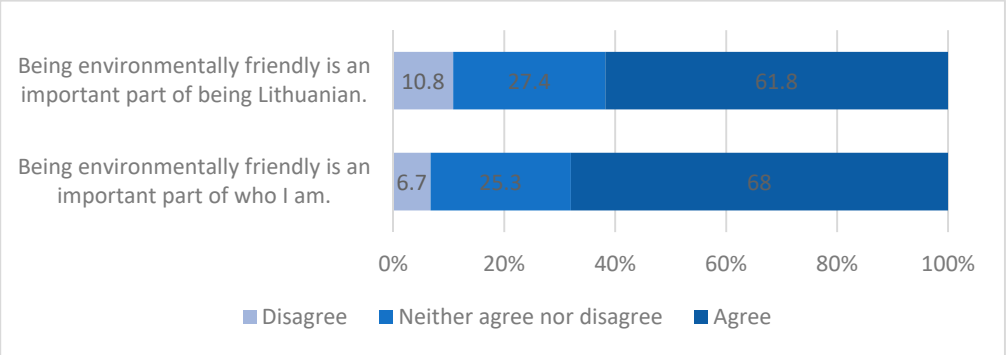

Figure 3. Environmental identity in Lithuania, %.

An environmental identity is quite strongly expressed by the Lithuanian public. Indeed, more than 60 per cent of the respondents agree or strongly agree with the statements that being environmentally friendly is important to one's national and individual identities. Moreover, an environmental identity is perceived as a stronger element of one's individual than national identity, with only a small number of respondents claiming that it is not important to either.

Table 1 presents the descriptive statistics of the NEP statements, where higher mean scores mean stronger pro-environmental attitudes.

Table 1. Mean scores of NEP statements.

Six-Item NEP Statement	N	Mean	Std. Deviation
1. The balance of nature is very delicate and easily upset.	998	4.04	0.774
2. Modifying the environment for human use seldom causes serious problems [1].	979	3.06	1.071
3. Plants and animals exist primarily to be used by humans [1].	999	2.94	1.081
4. The Earth is like a spaceship with only limited room and resources.	976	3.96	0.842
5. There are no limits to economic growth even for developed countries like ours [1].	968	2.53	1.000
6. Humans were meant to rule over the rest of nature [1].	982	3.34	1.126

[1] Recoded in reverse order, where 1 means 'agree' and 5 'disagree'.

The level of agreement for the six NEP statements indicates that the differences between males and females are insignificant; however, some differences exist between the following statements (one-way ANOVA $p < 0.05$) and respondents' level of education: 'Modifying the environment for human use seldom causes serious problems'; 'Humans were meant to rule over the rest of nature'; 'Plants and animals exist primarily to be used by humans'. Individuals with a higher level of education also received a higher mean score for agreement with these statements. This indicates that education still plays a significant

role in the human–environment relationship and knowledge about the sensitivity and the costs of human actions across the globe.

The mean score of the six-item NEP scale (indexed variable) is 3.30, showing that environmental attitudes are somewhat moderately expressed among the Lithuanian public. However, to see how the NEP scale relates to the attitudes towards climate change and perceptions of energy technologies, a further correlation analysis is presented (see Tables 2–4).

Table 2. Correlations of derived variables and perception of climate change.

Variable	N	NEP Scale
Concerns about climate change	989	0.105 **
Risk perceptions of non-renewable energy technologies	959	0.124 **
Risk perceptions of renewable energy technologies	964	−0.059
Attitudes towards renewable energy technologies	998	−0.033

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

Table 3. Correlations of NEP Statements with attitudes (on negative—positive scale) to renewable energy technologies.

NEP Statement	Biomass	Wind	Sun/Solar Power	Hydroelectric Power
1. The balance of nature is very delicate and easily upset.	0.119 **	0.221 **	0.222 **	0.131 **
2. Modifying the environment for human use seldom causes serious problems [1].	−0.024	0.032	0.018	−0.022
3. Plants and animals exist primarily to be used by humans [1].	−0.116 **	−0.130 **	−0.143 **	−0.082 *
4. The Earth is like a spaceship with only limited room and resources.	0.115	0.181 **	0.181 **	0.120 **
5. There are no limits to economic growth even for developed countries like ours [1].	−0.115 **	−0.179 **	−0.153 **	−0.083 *
6. Humans were meant to rule over the rest of nature [1].	−0.094 **	−0.089 **	−0.053	−0.024

[1] Recoded in reverse order, where 1 means 'agree' and 5 'disagree'. ** Correlation is significant at the 0.01 level (two-tailed) * Correlation is significant at the 0.05 level (two-tailed).

Table 4. Correlations of NEP statements with risk perceptions of renewable energy technologies.

NEP Statement	Biomass	Wind	Sun/Solar Power	Hydroelectric Power
7. The balance of nature is very delicate and easily upset.	−0.014	−0.151 **	−0.146 **	−0.052
8. Modifying the environment for human use seldom causes serious problems [1].	−0.099 **	−0.022	−0.046	0.008
9. Plants and animals exist primarily to be used by humans [1].	0.015	0.000	−0.023	−0.035
10. The Earth is like a spaceship with only limited room and resources.	−0.069*	−0.141 **	−0.138 **	−0.73 *
11. There are no limits to economic growth even for developed countries like ours [1].	0.031	0.094 **	0.079 *	0.006
12. Humans were meant to rule over the rest of nature [1].	0.071 *	0.034	−0.013	−0.051

[1] Recoded in reverse order, where 1 means 'agree' and 5 'disagree'. ** Correlation is significant at the 0.01 level (two-tailed) * Correlation is significant at the 0.05 level (two-tailed).

The results show that the NEP scale is indeed significantly related with perceptions of climate change and the risks of non-renewable energy technologies (see Table 2). Individuals with stronger prevailing environmental attitudes are generally more concerned about climate change and perceive higher risks from non-renewable energy technologies.

Given that the correlations are very weak, their significance shows that a slightly broader analysis in these aspects is needed. To better understand how different aspects of environmental attitudes affect perceptions of risk within different types of energy

technologies, the correlations between general attitudes towards and risk perceptions regarding different types of energy technologies and each NEP scale statement are provided below (Table 3).

General attitudes towards renewable technologies are significantly correlated to some (but not all) NEP statements, but it is important to note that these correlations are rather weak. It is surprising to note that some of the statements have positive correlations with attitudes towards renewables, while others are negative.

The correlation analysis between the NEP statements and renewable energy technologies (Table 4) shows that some of the statements remain significant in explaining renewable energy risk perceptions. These statements demonstrate a negative relationship with energy sources, revealing that increased pro-environmental attitudes reduce risk perceptions regarding renewable energy sources. This may indicate that perceptions of the environment's vulnerability lead to the development of more environmentally friendly options and higher public support. However, the NEP statements have fewer and weaker correlations with the risk perceptions regarding renewables than the general attitudes of social acceptance (as identified in Table 3).

To better understand the NEP statements' effects on risk perceptions regarding energy technologies, non-renewable options have also been included in this analysis (Table 5).

Table 5. Correlations of NEP statements with risk perceptions of non-renewable energy technologies.

NEP Statement	Coal	Natural Gas	Nuclear Power	Oil	Hydraulic Fracturing	Waste Incineration
1. The balance of nature is very delicate and easily upset.	0.208 **	−0.093 **	0.161 **	0.164 **	0.060	0.010
2. Modifying the environment for human use seldom causes serious problems [1].	0.042	−0.069 *	0.004	−0.001	0.199 **	−0.053
3. Plants and animals exist primarily to be used by humans [1].	0.019	−0.008	−0.024	0.056	0.186 **	−0.044
4. The Earth is like a spaceship with only limited room and resources.	0.145 **	−0.051	0.101 **	0.050	−0.028	−0.023
5. There are no limits to economic growth even for developed countries like ours [1].	−0.010	0.033	−0.108 **	−0.026	0.189 **	−0.048
6. Humans were meant to rule over the rest of nature [1].	0.027	0.064	0.041	0.173 **	0.196 **	−0.008

[1] Recoded in reverse order, where 1 means 'agree' and 5 'disagree'. ** Correlation is significant at the 0.01 level (two-tailed) * Correlation is significant at the 0.05 level (two-tailed).

The NEP statements have higher correlation coefficients with the risk perceptions regarding non-renewable energy sources compared to the renewables. It is important to note that only statements 1 and 4 exhibit weak correlations (0.189 ** and 0.134 **) with concerns about climate change, indicating that only strongly addressed environmental values can lead to a higher level of concern about climate change.

A further two regression models are discussed: the first analyses the role of environmental attitudes in explaining the variance of risk perceptions regarding renewable energy technologies; the second investigates how environmental attitudes are influencing attitudes towards renewables.

Table 6 presents the multiple linear regression results of environmental attitudes as independent variables and risk perceptions of renewables as the dependent variable.

Table 6. Multiple regression of environmental attitudes and risk perceptions regarding renewables.

	Unstandardised Coef. B	SE	Standardised Coef. β	Sig.	VIF
Constant	3.96	0.19		0.000	
Mean of NEP scale (1—low; 5—high NEP attitudes)	−0.166	0.46	−0.111	0.000	1.01
Being environmentally friendly is an important part of who I am.	−0.176	0.04	−0.188	0.000	1.79
Being environmentally friendly is an important part of being Lithuanian	−0.131	0.03	−0.158	0.000	1.78
R = 0.336					
R^2 = 0.11					

(F = 40.173, $p < 0.00$); dependent variable: risk perceptions of renewables (derivative index).

Regression model (Table 6) explains 11% of the variance in risk perceptions regarding renewables. Pro-environmental attitudes (measured using the NEP scale) and environmental identity questions significantly predict the risk perceptions regarding renewables and there is a negative direction of influence. More pro-environment individuals with a stronger environmental identity tend to evaluate renewable technologies as less risky.

Table 7 presents the multiple regression results of environmental attitudes as independent variables and attitudes towards renewables as the dependent variable.

Table 7. Multiple regression of environmental attitudes and attitudes towards renewable energy sources.

	Unstandardised Coef. B	SE	Standardised Coef. β	Sig.	VIF
Constant	3.39	0.16		0.000	
Mean of NEP scale (1- low; 5- high NEP attitudes)	−0.019	0.04	−0.016	0.620	1.01
Being environmentally friendly is an important part of who I am.	−0.094	0.03	−0.124	0.003	1.8
Being environmentally friendly is an important part of being Lithuanian	−0.127	0.03	−0.188	0.000	1.79
R = 0.286					
R^2 = 0.08					

(F = 28.036, $p < 0.00$); dependent variable: general attitudes towards renewables (derivative index).

The variables of environmental attitudes in the regression model (Table 7) explain even less variance in general attitudes towards renewables. Moreover, the NEP scale is not significant with this dependent variable; only environmental identity has an influence on risk perceptions regarding renewables.

5. Discussion

An energy transition remains central to the social development agenda, so there is a need to understand the public's attitudes, potential behavioural changes and underlying value orientations. Overall, the social acceptance of renewable energy technologies is very high in Lithuania, with only low risks perceived to be related to these technologies. Especially positive are attitudes towards wind and solar power. Nevertheless, these technologies constitute a very low share of total energy production in Lithuania (5.31% from wind and 0.33% from solar power in 2019 [46]). Moreover, the energy sources that constitute the highest shares (33% from oil and 27% from coal [46]) are perceived as quite risky. Therefore, the further expansion of renewables could put forward new social concerns and social conflicts that are not visible yet (for example, the question of energy prices or the scope of governmental subsidies for renewables).

Environmental identity and ecological consciousness have historically been strong drivers of societal changes in Lithuania, especially for the independence movement. Therefore, the challenges raised by the Green Deal and the shift towards climate-neutral solutions should presumably be related to a strong manifestation of environmental attitudes.

There is a general positive attitude towards renewable energy technologies in Lithuania, compared to non-renewable energy sources, and adequately risk is perceived as significantly lower from renewable sources. Still, such source of energy, like natural gas, has positive image in the public, as it is the most commonly used source for heating in Lithuania. The prevailing positive attitude may be a significant obstacle in the energy transition, especially in the private household sector. Furthermore, our data showed that public concern with climate change is not very high in Lithuania, therefore climate neutral energy solutions presumably will not be supported if economic sacrifices are to be made. There are increasing possibilities of household electricity consumers to become producers (active prosumers) that can generate electricity, in that way end-consumers become active energy citizens [47]. This electricity market transformation can significantly increase the social acceptance and support for renewable energy technologies, especially in Baltic region, where economic incentives are important factors in policy support,

The NEP is an attractive tool to measure public environmental attitudes and identify the shift from anthropocentric towards ecocentric worldviews that are crucial for sustainability goals. From general environmental attitudes, measured by NEP scale, the idea that the balance of nature is very sensitive is mostly supported. Still, there is a significant part of population that supports the idea of *humans' right to rule* over nature in terms of economic growth. This supports the assumption about conflicting motives of economic growth and sustainability goals in Lithuanian public.

This study revealed that environmental attitudes are significant, yet, not strong factors, influencing the public attitudes and perceptions of energy technologies. Individual environmental identity is a stronger predictor of risk perception and attitudes towards renewables than attitudes towards human–nature relationship, measured by NEP scale.

In numerous studies the NEP scale has been identified as a good predictor of risk perceptions regarding energy technologies. However, in Lithuania this relationship is rather weak. The data from the Lithuanian sample do not correspond to the findings of other similar studies, as the explanatory power of the NEP scale combined with the environmental identity scale is quite low (11% and 8% for risk perceptions and general attitudes towards renewable technologies, respectively). We should note that the conceptualisation of environmental attitudes in this study was limited to NEP and environmental identity items, as this was part of a larger study and there were no possibilities to include more comprehensive scales, for example a NEP scale including more statements.

There are a few possible directions of explanation for these results.

First, the NEP scale for the Lithuanian sample does not have good internal consistency (Cronbach's alpha = 0.595). Presumably, in the Lithuanian context, where environmental concerns are strongly intertwined with economic rationalities, the dichotomy between human exceptionalism and the new environmental paradigm is not strongly revealed.

Another explanation is related to the results, whereby the different statements of the NEP work in different directions to the risk perceptions of and general attitudes towards renewable energy technologies. From the NEP scale, as the data indicate, the dimension of *balance of nature* is most significant in predicting risk perceptions regarding different technologies. Understanding and perceptions of energy technologies are presumably more closely related to natural resources than to humans' right to rule over nature. Indeed, the higher the score of the balance of nature questions in the NEP scale, the more positive the attitude towards renewable technologies. However, the statements of the *limits to growth* dimension influence attitudes towards renewables in the opposite direction: the higher the support for the idea that there are limits to economic growth, the lower the support for renewables.

Ecocentric attitudes, based on the idea of nature's fragility, are the most influential attitude aspects in increased risk perceptions regarding non-renewable technologies like coal, nuclear power, oil and hydraulic fracturing. The idea based on existing environmental health safety concerns connected with the entire process of non-renewable energy production [48] increases perceptions of these technologies' riskiness. These perceptions

could lead to higher support for environmental protection as well as the need for stricter regulations of further developments.

Future research into public acceptance and risk perceptions of renewables should include a more comprehensive list of factors that can shape these attitudes. Furthermore, more nuanced questions could be used to understand what kinds of threats people associate with renewable technologies, in order to propose targeted policy solutions.

6. Conclusions

This study's results have revealed that environmental attitudes, measured by NEP statements and environmental identity, are not strong predictors of perceptions of renewable energy technologies. The NEP scale predicts stronger risk perceptions regarding renewable energy sources than non-renewables. The NEP scale items work in different directions in terms of the risk perceptions of renewable and non-renewable energy technologies: people with stronger pro-environmental attitudes perceive the risks from renewables as less risky and the risks from non-renewables as more risky.

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Appendix A

The questionnaire for KLIKS project was developed based on 'The European Perceptions of Climate Change Project' (EPCC) in collaboration with Cardiff University and has been adapted for the Lithuanian context with the additional questions.

References

1. Heberlein, T. *Navigating Environmental Attitudes*; Oxford University Press: New York, NY, USA, 2012.
2. Thøgersen, J.; Olander, F. Human values and the emergence of a sustainable consumption pattern: A panel study. *J. Econ. Psychol.* **2002**, *23*, 605–630. [CrossRef]
3. Neckel, S. The sustainability society: A sociological perspective. *Cult. Pract. Eur.* **2017**, *2*, 46–52.
4. Lockie, S. Sustainability and the future of environmental sociology. *Environ. Sociol.* **2016**, *2*, 1–4. [CrossRef]
5. Eyl-Mazzega, M.; Mathieu, C. The European Union and the energy transition. In *The Geopolitics of the Global Energy Transition*; Hafner, M., Tagliapietra, S., Eds.; Springer: Cham, Switzerland, 2020; Volume 73, pp. 27–46. [CrossRef]
6. Economidou, M.; Todeschi, V.; Bertoldi, P.; D'Agostino, D.; Zangheri, P.; Castellazzi, L. Review of 50 years of EU energy efficiency policies for buildings. *Energy Build.* **2020**, *225*. [CrossRef]
7. Bertoldia, P. Overview of the European Union policies to promote more sustainable behaviours in energy end-users. In *Towards a Low Carbon Future*; Lopes, M., Antunes, C.H., Janda, K.B., Eds.; Academic Press: London, UK, 2020; pp. 451–477. [CrossRef]
8. Schlechtriem, M. Mapped: Impact of Climate Change on European Countries. 2020. Available online: https://www.greenmatch.co.uk/blog/2019/04/climate-change-europe (accessed on 20 February 2021).
9. Norwegian Centre for Research Data (NSD). ESS Round 9: European Social Survey Round 9 Data. 2018. Available online: https://www.europeansocialsurvey.org/about/news/essnews0088.html (accessed on 20 August 2020).
10. Dunlap, R.; Van Liere, K.; Mertig, A.; Jones, R. New trends in measuring environmental attitudes: Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *J. Soc. Issues* **2000**, *56*, 425–442. [CrossRef]

11. European Commission. 2030 Climate & Energy Framework. 2020. Available online: https://ec.europa.eu/clima/policies/strategies/2030_en#tab-0-0 (accessed on 3 November 2020).
12. Gielen, D.; Boshell, F.; Saygin, D.; Bazilian, M.; Wagner, N.; Gorini, R. The role of renewable energy in the global energy transformation. *Energy Strategy Rev.* **2019**, *24*, 38–50. [CrossRef]
13. Biresselioglu, M.; Demir, M.; Kaplan, M.; Solak, B. Individuals, collectives, and energy transition: Analysing the motivators and barriers of European decarbonisation. *Energy Res. Soc. Sci.* **2020**, *66*. [CrossRef]
14. The European Green Deal. 2019. Available online: https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF (accessed on 3 November 2020).
15. European Environment Agency (EEA). Final Energy Consumption by Sector and Fuel in Europe. 2020. Available online: https://www.eea.europa.eu/data-and-maps/indicators/final-energy-consumption-by-sector-10/assessment (accessed on 30 October 2020).
16. Statistics Lithuania. Annual Energy Indicators. 2018. Available online: https://osp.stat.gov.lt/en/informaciniai-pranesimai?eventId=176195 (accessed on 20 August 2020).
17. Eurostat. Renewable Energy Statistics. 2020. Available online: https://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics (accessed on 10 December 2020).
18. López-Bonilla, L.M.; López-Bonilla, J.M. From the new environmental paradigm to the brief ecological paradigm: A revised scale in golf tourism. *Anatolia* **2016**, *27*, 227–236. [CrossRef]
19. Hawcroft, L.J.; Milfont, T.L. The use (and abuse) of the new environmental paradigm scale over the last 30 years: A meta-analysis. *J. Environ. Psychol.* **2010**, *30*, 143–158. [CrossRef]
20. Pierce, J.; Steger, M.A.; Steel, B.S.; Lovrich, N.P. *Citizens, Political Communication, and Interest Groups: Environmental Organizations in Canada and the United States*; Praeger: Westport, CT, USA, 1992.
21. Bostrom, A.; Barke, R.; Mohana, R.; Turaga, R.; O'Connor, R. Environmental concerns and the New Environmental Paradigm in Bulgaria. *J. Environ. Educ.* **2006**, *37*, 25–40. [CrossRef]
22. Jobin-Poirier, E.; Pickering, G.; Plummer, R. Doom, gloom, or boom? Perceptions of climate change among Canadian winegrowers. *Int. J. Wine Res.* **2019**, *11*, 1–11. [CrossRef]
23. Huijts, N.; Molin, E.; Steg, L. Psychological factors influencing sustainable energy technology acceptance: A review-based comprehensive framework. *Renew. Sustain. Energy Rev.* **2012**, *16*, 525–531. [CrossRef]
24. Stigka, E.; Paravantis, J.; Mihalakakou, G. Social acceptance of renewable energy sources: A review of contingent valuation applications. *Renew. Sustain. Energy Rev.* **2014**, *32*, 100–106. [CrossRef]
25. Walter, G. Determining the local acceptance of wind energy projects in Switzerland: The importance of general attitudes and project characteristics. *Energy Res. Soc. Sci.* **2014**, *4*, 78–88. [CrossRef]
26. Oluoch, S.; Lal, P.; Susaeta, A.; Vedwan, N. Assessment of public awareness, acceptance and attitudes towards renewable energy in Kenya. *Sci. Afr.* **2020**, *9*. [CrossRef]
27. Wang, J.; Li, Y.; Wu, J.; Gu, J.; Xu, S. Environmental beliefs and public acceptance of nuclear energy in China: A moderated mediation analysis. *Energy Policy* **2020**, *137*. [CrossRef]
28. Ntanos, S.; Kyriakopoulos, G.; Chalikias, M.; Arabatzis, G.; Skordoulis, M. Public perceptions and willingness to pay for renewable energy: A case study from Greece. *Sustainability* **2018**, *10*, 687. [CrossRef]
29. Steel, B.; Pierce, J.; Warner, R.; Lovrich, N. Environmental value considerations in public attitudes about alternative energy development in Oregon and Washington. *Environ. Manag.* **2015**, *55*, 634–645. [CrossRef]
30. Mumpower, J.L.; Liu, X.; Vedlitz, A. Predictors of the perceived risk of climate change and preferred resource levels for climate change management programs. *J. Risk Res.* **2016**, *19*, 798–809. [CrossRef]
31. Xue, W.; Marks, A.; Hine, D.W.; Phillips, W.J.; Zhao, S. The new ecological paradigm and responses to climate change in China. *J. Risk Res.* **2018**, *21*, 323–339. [CrossRef]
32. Slimak, M.W.; Dietz, T. Personal values, beliefs, and ecological risk perception. *Risk Anal.* **2006**, *26*, 1689–1705. [CrossRef]
33. Buylova, A.; Steel, B.S.; Simon, C.A. Public perceptions of energy scarcity and support for new energy technologies: A Western U.S. case study. *Energies* **2020**, *13*, 238. [CrossRef]
34. Ntanos, S.; Kyriakopoulos, G.; Skordoulis, M.; Chalikias, M.; Arabatzis, G. An application of the New Environmental Paradigm (NEP) scale in a Greek context. *Energies* **2019**, *12*, 239. [CrossRef]
35. Sapci, O.; Considine, T. The link between environmental attitudes and energy consumption behavior. *J. Behav. Exp. Econ.* **2014**, *52*, 29–34. [CrossRef]
36. Poortinga, W.; Pidgeon, N.; Lorenzoni, I. *Public Perceptions of Nuclear Power, Climate Change and Energy Options in Britan: Summary of Findings of a Survey Conducted During October and November 2005*; Centre for Environmental Risk: Norwich, UK, 2006.
37. Borowski, P. Nexus between water, energy, food and climate change as challenges facing the modern global, European and Polish economy. *AIMS Geosci.* **2020**, *6*, 397–421. [CrossRef]
38. Gifford, R. The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *Am. Psychol.* **2011**, *66*, 290–302. [CrossRef]
39. Lorenzoni, I.; Nicholson-Cole, S.; Whitmarsh, L. Barriers perceived to engaging with climate change among the UK public and their policy implications. *Glob. Environ. Chang.* **2007**, *17*, 445–459. [CrossRef]

40. Adzawla, W.; Azumah, S.B.; Anani, P.Y.; Donkoh, S.A. Gender perspectives of climate change adaptation in two selected districts of Ghana. *Heliyon* **2019**, *5*. [CrossRef]
41. Yadav, S.S.; Lal, R. Vulnerability of women to climate change in arid and semi-arid regions: The case of India and South Asia. *J. Arid Environ.* **2018**, *149*, 4–17. [CrossRef]
42. Babacan, H. Women and economic dimensions of climate change. *Econ. Eff. Nat. Disasters* **2021**, *2021*, 77–95. [CrossRef]
43. Horta, A. Energy consumption as part of social practices: The alternative approach of practice theory. In *Oxford Handbook of Energy and Society*; Davidson, D., Gross, M., Eds.; Oxford University Press: New York, NY, USA, 2018; pp. 31–44.
44. Williams, D.J.; Noyes, J.M. How does our perception of risk influence decision-making? Implications for the design of risk information. *Theor. Issues Ergon. Sci.* **2007**, *8*, 1–35. [CrossRef]
45. Clayton, L.W. *Identity and the Natural Environment: The Psychological Significance of Nature*; MIT Press: Cambridge, MA, USA, 2003.
46. Ritchie, H. Lithuania: Energy Country Profile: Our World in Data. 2019. Available online: https://ourworldindata.org/energy/country/lithuania#citation (accessed on 4 November 2020).
47. Borowski, P.F. Zonal and nodal models of energy market in European Union. *Energies* **2020**, *13*, 4182. [CrossRef]
48. Olawoyin, R.; McGlothlin, C.; Conserve, D.F.; Ogutu, J. Environmental health risk perception of hydraulic fracturing in the US. *Cogent Environ. Sci.* **2016**, *2*. [CrossRef]