Investigation of Citizens' Attitudes towards Energy Transition. Evidence from the Region of Western Macedonia - Greece

Maria Spyraki, Europarliament and Prism-Sorbonne, Maria.Spyraki@etu.univ-paris1.fr
Constantin Mellios, Prism - Sorbonne, constantin.mellios@univ-paris1.fr
Kostas Andriosopoulos, Audencia Business school, kandriosopoulos@audencia.com
Nikolaos Papadopoulos, International Hellenic University, nikospapadopoulos2010@gmail.com
Sofia-Natalia Boemi, Aristotle University of Thessaloniki, nboemi@auth.gr

Overview
Energy transition is a multidimensional concept and an important element of transforming the global energy sector from fossil-based to zero-carbon situation. The purpose of this study is to investigate the perceptions of citizens of the Region of Western Macedonia in Greece about energy transition. The methodology chosen was quantitative research, which measured via questionnaire, citizens' attitudes about energy transition, social and work aspects, the role of the state and renewable energy sources. The results showed that citizens need to gain more knowledge about what energy transition is, having reservations about the economic and social consequences. But they believe that energy transition will have positive consequences for the environment

Keywords: *Energy transition, Citizens' attitudes, Social equity, Western Macedonia*

Introduction
The energy transition is a multidimensional, complex, non-linear, non-deterministic, and uncertain phenomenon and, therefore, it is not easy to characterize (Blazquez et al., 2020). According to IRENA (2021), energy transition is the pathway toward transforming the global energy sector from fossil-based to zero-carbon by the second half of this century. It requires a holistic, top-down transformation of actors and markets, as well as a change in the existing regulations and policies.
In Europe, rapid population growth and industrialisation increase the demand for energy along with health and environmental risks associated with traditional means of energy generation, raising questions about how conventional methods can meet long energy demand. The decarbonisation process is not straightforward. It involves a set of parameters and processes such as information technology, smart technology, policy frameworks and market instruments (Ioannidis et al., 2019).
The first key for energy transition is policies, including motivators and barriers. Policy makers promote the electrification of industries, transport and buildings to reduce carbon emissions and local pollution. To achieve decarbonisation goals, a set of drivers is needed to affect the pace and success of the energy transformation process (Biresselioglua et al., 2020). These drivers are not necessarily designed components of the transformation process, but they can equally be catalysts with positive or negative impacts on the decarbonisation process (Biresselioglua et al., 2020).
Moreover, electricity systems are switching from centralised systems controlled by central operators to decentralised systems with potentially millions of different small generators that use renewable energy. A complete transition based on renewable energy may be technically feasible but politically difficult to manage in liberalised markets. Thus, these markets need a holistic transformation. That raises the provocative question of whether public monopolies are better equipped to deal with the energy transition in the electricity sector. In addition, system change needs changes in consumers' preferences towards decarbonised energy, creating new business opportunities and jeopardising traditional business models. Finally, the new electricity production by renewables might transform the energy market and downsize energy

prices since other strategic players outside the EU will not affect them. Still, it will depend on the policies that vary between countries (Tziogas et al., 2019). Moreover, new technologies like storage will emerge and transform electricity markets, making it unnecessary to run an instantaneously balanced market. All the above calls for harmonised actions of many stakeholders and decision-makers who often have conflicting interests and goals (Weber and Cabras, 2017).
Additionally, the coronavirus crisis along with Russia's war on Ukraine has revealed a variety of risks that has to do mainly with energy and showed the added value of concerted action by the Union but also the ability of EU institutions and Member States to find new and effective solutions to deal with major shocks. Moreover, OPEC's decisions depend on the exploration and extraction cost of more expensive/unconventional oil resources (Loutia, et al., 2016).

Literature Review

Under the Third Energy Package Directives 2009/72/EC and 2009/73/EC, European energy networks are subject to unbundling requirements which oblige Member States to ensure the separation of vertically integrated energy companies, resulting in division of the various stages of energy supply (generation, distribution, transmission and supply) (Amoiralis & Andriosopoulos, 2017) .
It is important to assess the risks to, and capabilities and resilience of other European countries under transition and to summarise different aspects of the energy transition admitting that energy transitions are complex processes and it is not possible to make accurate predictions on this phenomenon (Kuittinen and Velte, 2018).
Coal accounts for about a fifth of total electricity production in the EU. It is also a significant economic driver, providing jobs to around 230,000 people in mines and power plants across 31 regions and 11 EU countries with coal activities providing jobs to about 230,000 people. Around 18 % of the European power generation mix was based on coal in 2019.
While coal remains a central fuel in the European energy mix, the transition to cleaner forms of energy and innovative technologies, such as carbon capture and storage, is imperative to meet the EU's commitment to reduce CO2 emissions by at least 55% by 2030 and to become the world's first climate-neutral bloc by 2050.
The decline of coal-based energy production is an ongoing reality in Europe. Since 2012, total coal power generation has dropped by almost a third in the EU. The declining use of coal has led to mines closing down and power plants being decommissioned in a number of regions across Europe (Inderberg et al., 2018).
The European Green Deal aims at making Europe the first climate-neutral bloc in the world by 2050. To help to achieve this goal, the Commission introduced the Just Transition Mechanism (proposal for Regulation COM/2020/22) which, alongside tailored financial and practical support, will help workers and generate the necessary investments to areas particularly affected, like the EU coal regions (European Parliamentary Research Service, 2022).
Furthermore, the Commission provides tailored support to coal regions, peat and oil shale regions, either in the form of operational country teams or bilateral discussions with Commission experts. This support can help national and regional authorities to identify ways to initiate and implement the transition. This support is accompanied by existing EU funds, financing tools, and programs. The country teams work with national and regional authorities in regions chosen by EU countries to encourage the preparation of transition strategies and support the identification of priority projects (Cheung et al., 2019).
To ensure that no region is left behind in this transition, the Commission also launched the Initiative for coal regions in transition to help mitigate the social consequences of the low-carbon transition in coal, peat and oil shale regions of the European Union (Hass, 2019).
The Initiative for coal regions in transition works as an open forum, which has gathered all relevant parties, local, regional and national governments, businesses and trade unions, NGOs and academia since 2017. It promotes knowledge-sharing and exchanges of experiences between EU coal regions, and represents a unique, bottom-up approach to a just transition,

enabling regions to identify and respond to their unique contexts and opportunities. All EU coal regions are invited to participate (European Parliamentary Research Service, 2022).

Figure 1: Coal phase-out commitment in the EU

Methodology

A quantitative survey was held by 858 questionnaires, which were gathered via telephone audits between November and December 2021, using random sampling, in the Region of Western Macedonia.. The questionnaire included 59 closed questions, divided into 6 sections (energy transition, social and work aspects, the role of the state, RES, demographic and Residency Data). The questions apart from demographic data concerned the energy, social and work aspects of the energy transition. About the descriptive statistics tools, they include the presentation of the frequencies and relative frequencies of the demographic characteristics of the sample.

Results

Starting with the citation of the survey results, first the demographic data of the respondents are presented. The sample consists equally of people of both genders and an extended age distribution, with the age groups between 40 and 75 years old covering over 75% of the respondents. About 3 in 4 respondents are married, while there is a significant percentage of higher education graduates (36.1%) and compulsory education graduates (27.3%) in the sample (Table 1).

The majority of the sample consists of employees, self-employed and retirees at a rate of 76.8%, while the rest includes the unemployed and those who do not participate in the production process, such as students. The distribution of the annual family income of the respondents is also expanded, of which the majority 32% earns € 10,000 to € 20.000 per year. In addition, about 54% of the sample answer that they have a decrease in their income in the previous period, from 2019 onwards.

Table 1: Demographics

		N	%
Gender	Male	417	48.6%
	Female	441	51.4%
Age	19-29	67	7.8%
	30-39	98	11.4%
	40-49	176	20.5%
	50-59	219	25.5%
	60-75	262	30.5%
	75+	36	4.2%
Marital status	Single	154	17.9%
	Married	629	73.3%

	Widowed	41	4.8%
	Divorced	34	4.0%
Educational level	Illiterate	91	10.6%
	Secondary School – Obligatory education level	50	5.8%
	High School - Compulsory education	234	27.3%
	Post-Secondary graduate (Vocational training)	105	12.2%
	Undergraduate education- BSc	310	36.1%
	MSc – Ph.D	68	7.9%

Regarding the residence details of the respondents, appears that 50.5% of them live in the prefecture of Kozani, 19.2% in the prefecture of Florina, 19.0% in the prefecture of Kastoria and 11.3% in the prefecture of Grevena. At the same time, the percentage of those who live in an apartment building is equal to 47.7%, with 52.6% of the houses being insulated. 83.7% of respondents live in their own home, with 24.8% stressing that they have a problem with noise and 23.4% with mold or moisture inside the house.

Subsequently, the largest percentage of homes use heating systems such as district heating (28.6%), oil (23.8%) and wood/pellet (20.2%), while the percentages of homes heated by electricity (3.3%) and gas (2.3%). At the same time, more than one heating system is used in 21.6% of homes. In 57.0% of the houses air conditioning is not used or there is no air conditioning, while 28.9% of them are cooled with a conventional air conditioner or an inverter. In 10.2% of the houses there is a floor fan, 3.2% a ceiling fan and in 0.8% of them a heat pump.

Regarding the importance of the energy transition for the respondents, the largest percentage of them (23.4%) consider it to be linked to the reduction of the carbon footprint of an area. 17.0% answer that it concerns the development of new technologies, 13.9% the adaptation to new policy mandates, 13.1% the increase in energy efficiency and the decarbonization of energy sources and 4.9% the identification of new investment priorities. 14.6% of the respondents answered that it concerns other elements or they do not know the importance of the energy transition.

Regarding the knowledge of the concept of a just transition on the part of the respondents, it appears that 41.0% of them answer positively, while the percentage of those who know the Green Fund is equal to 51.3%.

42.7% of the respondents answered that they do not know what the energy transition is. The percentage of those who think it concerns the citizens is equal to 18.3%, while 12.4% answer that it concerns the Government. Lower are the percentages of survey participants who consider that the energy transition concerns PPC (7.7%), the Region and Municipalities (7.6%) and businesses (6.8%), with 4.7 % of the sample to answer that it concerns all of the aforementioned.

As the most important elements in a just transition governance system, participation in decision-making and effective management of resources are judged, followed by consultation, synergies between agencies, the creation of energy communities and access to information.

It is also observed that the percentage of respondents who need more information about the energy transition is high, as it equals 45.6%, with 21.7% of the sample answering that they would like more opportunities to participate in it at the local level. 19.9% require more possibilities in decision-making, 7.7% more consultation, while 5.1% do not consider it necessary to make changes to the current process.

In addition, the percentage of people who see the energy transition positively is equal to 34.1%, with 23.4% believing that it will help the area where they live. On the contrary, 36.7% of respondents do not consider that the system is ready for the energy transition. At the same time, the knowledge of the concept of the energy community, it appears that is low as only 27.9% of the sample shows relative familiarity.

To present the results of the answers determined through Likert hierarchical scales, measures of central tendency included the mean (M), while measures of variability included the standard deviation (SD). The five-point Likert Attitude Scale was used to measure the variables ranging from “strongly disagree” (1) to “strongly agree” (5). The mean (M) of a set

of observations is their average. It is the sum of all observations divided by the number of observations in the total. The standard deviation (SD) is a measure of the amount of variation or dispersion of a set of values. A low standard deviation indicates that the values tend to be close to the mean (also called the expected value) of the set, while a high standard deviation indicates that the values are spread out over a wider range (Zafiropoulos, 2012).
Observing the average scores of the respondents' views on the effects that the energy transition will have on employment, the results that are obtained are below average (M: 2.27, SD = 1.61) (Table 2).

Table 2: Job and economic aspects

	Strongly disagree (1) %	**Disagree (2) %**	**Neither agree nor disagree (3) %**	**Agree (4) %**	**Strongly agree (5) %**	**Sum %**	**M**	**S.D.**
I feel insecure about my job	38.00	5.13	21.68	8.97	26.22	100.00	3.20	1.64
I believe that jobs will be reduced	9.21	5.36	9.32	12.82	63.29	100.00	1.84	1.32
I believe that it will lead to reduced economic growth or no growth	17.60	8.62	14.34	13.29	46.15	100.00	2.38	1.55
Employment							**2.47**	**1.61**

Regarding the effects of the energy transition on the environment and the inhabitants, the answers score a higher degree of taking the view that the energy transition will reduce carbon dioxide emissions (M: 4.26, SD: 1.16). The answers of the respondents about the country's energy planning policy tend from disagreed to neutral attitudes (M: 2.26, SD = 1.43), It is noteworthy that the participants in this research, urge to a great extent, the Municipalities and the Region of Western Macedonia to cooperate with the Universities, in the field of energy transition (M: 4.61, SD = 0.87).

Table 3: Carbon emissions, state policy.

	Strongly disagree (1) %	**Disagree (2) %**	**Neither agree nor disagree (3) %**	**Agree (4) %**	**Strongly agree (5) %**	**Sum %**	**M**	**S.D.**
Energy Transition will reduce carbon dioxide emissions	5.83	3.73	11.31	16.90	62.24	100.00	4.26	1.16
I'm happy with the country's energy planning policy	48.37	9.56	21.33	9.21	11.54	100.00	2.26	1.43
Local Government should cooperate with the university	2.45	0.93	8.51	9.56	78.55	100.00	4.61	0.87
Awareness of methane binding technologies	44.99	26,22	7,81	8,74	12,82	100.00	2.47	1.52

Discussion - Conclusions

From the results, it appears that there is a lack of information among the residents about the energy transition and they do not know the exact advantages of the energy transition, that's why they want more information. Many believe that it concerns the residents themselves, while a smaller part believes that it concerns the state, local government and PPC. 6 out of 10 residents believe that the energy transition will have a negative impact on the economic development of the region and about 7 out of 10 that it will reduce employment; while on the other hand, most are not afraid of losing their jobs.

The respondents, in an overwhelming majority, believe that the energy transition will reduce carbon dioxide emissions and in an overwhelming majority also, want the local government to cooperate on the matter with the university. Concerning the descriptive presentation of the average scores of the data under consideration and focusing on residents' views on renewable energy sources and new technologies; it initially appears that there is a need for investments.

Those results can help policymakers, energy companies, and investors to implement practices to better inform residents about the energy transition. Residents will thus better understand the positive effects of the energy transition. The conditions must be in place to avoid negative economic consequences and especially support for employment.

In a future study, differences that may exist between demographics and residents' views on energy transition should be explored with the help of further statistical processing. By gathering an expanded number of variables, like economic consequences, increase investments and collaborations, knowledge of pollutant capture technologies, reduction of pollutant emissions due to energy transition, satisfaction with energy planning, need to invest in alternative energy sources, deficiencies in energy transition policies, as it will be able to examine the correlations of these variables, for better reliability and conclusions.

References

Amoiralis E.I. and Andriosopoulos K. (2017). Challenges for a compliance officer in the liberalised EU energy market: A case study on the Greek gas transmission system operator. *Energy Policy* 110, pp 117-125

Biresselioglu, M. E., Demir, M. H., Kaplan, M. D., & Solak, B. (2020). Individuals, collectives, and energy transition: Analysing the motivators and barriers of European decarbonisation. *Energy Research & Social Science*, *66*, 101493.Blazquez J, Fuentes R. and Manzano B. (2020). On some economic principles of the energy transition. *Energy Policy* 147, 111807.

Cheung G., Davies P.J. and Bassen A., (2019). In the transition of energy systems: What lessons can be learnt from the German achievement? *Energy Policy* 132, pp 633-646.

European Parliamentary Research Service, (2022). Future Shocks 2022 - Addressing risks and building capabilities for Europe in a contested world (PE 729.374)

Hass T. (2019). Comparing energy transitions in Germany and Spain using a political economy perspective. *Environmental Innovation and Societal Transitions* 31, pp 200-210

Inderberg T.H.J., Tews K., Turner B. (2018). Is there a Prosumer Pathway? Exploring household solar energy development in Germany, Norway, and the United Kingdom. *Energy Research & Social Science* 42, pp 258-269

Ioannidis F., Kosmidou K., Makridou G. and Andriosopoulos K. (2019). Market design of an energy exchange: The case of Greece. *Energy Policy*133, pp 110887

IRENA, (2022). Energy transition. Url: https://www.irena.org/energytransition (Retrieved at 27.04.2022)

Kuittinen H. and Velte D. (2018). Mission-oriented R&I policies: In-depth case studies, Case Study Report Energiewende, European Commission.

Loutia, A., Mellios, C., and Andriosopoulos, K. (2016). Do OPEC announcements influence oil prices?. *Energy Policy*, *90*, 262-272.

Tziogas Ch., Georgiadis P. and Papadopoulos A. (2019). Fostering the transition to sustainable electricity systems: A hierarchical analysis framework. *Journal of Cleaner production* 206, pp 51-65.

Weber G. and Cabras I. (2017). The transition of Germany's energy production, green economy, low-carbon economy, socio-environmental conflicts, and equitable society. *Journal of Cleaner Production* 167, pp 1222-1231

Zafiropoulos, K. (2012). *Quantitative Empirical Research and Creation of Statistical Models*, Athens, Kritiki, [in geek].