

# THE ROLE OF THE PUBLIC IN THE IMPLEMENTATION OF NATIONAL ENERGY POLICY OBJECTIVES

ANZHELIKA KARAEVA<sup>1</sup>, LARISA IVASCU<sup>2</sup>, ATHANASIA K. TOLKOU<sup>3</sup>,  
VINCENZO TORRETTA<sup>1</sup> & ELENA CRISTINA RADA<sup>1</sup>

<sup>1</sup>Department of Theoretical and Applied Sciences, University of Insubria, Italy

<sup>2</sup>Faculty of Management in Production and Transportation, Politehnica University of Timisoara, Romania

<sup>3</sup>Department of Chemistry, International Hellenic University, Greece

## ABSTRACT

Despite the consolidation of the need for the development of green energy and the abandonment of fossil energy sources in the energy policies of most developed and developing countries, the global pace of the introduction of renewable energy sources into energy infrastructure remains relatively low. The programmes being developed for economic support of renewable energy facilities, encouraging the purchase of 'green' electricity by enterprises, the introduction of green certificates, increasing the fiscal burden on traditional energy facilities – all these measures, despite their potential effectiveness, do not accelerate the process of replacing traditional energy sources with renewable ones. One of the possible reasons for limiting the pace of development of the new energy industry may be the lack of public support, caused primarily by a lack of knowledge and awareness in the field of renewable energy. Public acceptance of various state initiatives and awareness of strategic development national programmes, especially by the younger generation, is an important component of their successful implementation, including in the energy sector. This paper provides the analysis of the awareness level of the younger generation about the adopted national energy policy and their attitudes towards it. The study analysed the results of a survey conducted among students from universities in Romania, Italy and Greece. Modern students have demonstrated a relatively low level of awareness of the issues of energy policy being implemented and an ambiguous level of government support, which may be one of the central reasons for the insufficiently high rates of green energy development.

*Keywords: energy policy, renewable energy sources, environmental awareness, social acceptance, public perception.*

## 1 INTRODUCTION

The energy sector will undergo substantial structural changes soon primarily related to the current international environmental and climate agenda [1]–[4]. According to the data for 2022, 38.1% of global CO<sub>2</sub> emissions were from the power industry; in 1970, the sector's share in the emission structure was 24.2%, and in 2000 it was already 36.6% [5]. Despite the measures and initiatives being taken, a major part of global electricity (61%) is produced at conventional energy facilities which use fossil fuels for energy production [6]. Coal-fired power is one of the largest branches of the energy sector both in terms of coal mining and transportation, and in terms of electricity production: 35.38% of global electricity was produced at coal-fired power plants in 2022. Moreover, more than 78% of electricity from coal is produced in the countries of the Asia–Pacific region (APAC); 22.7% of the world's electricity is produced using natural gas as fuel and 2.5% from petroleum products. Among renewable energy sources (RES), the leading sector is the hydropower that accounts for 14.86% of global electricity production. The leading regions to produce electricity from RES are APAC (47.6%) and European countries (24.7%) [6].

Thus, traditional energy continues to lead the structure of global energy production and consumption, which contradicts internationally accepted agreements on decarbonization of the economy, reduction of CO<sub>2</sub> emissions and abandonment of fossil fuels in the upcoming decades. Among the reasons for the slow pace of development and integration of RES into



national energy systems, it can be noted (i) the need for a complete reformation of the energy sector and the corresponding energy infrastructure, which requires significant financial, labour and intellectual resources; (ii) lack of technology and with the necessary professional skills and qualifications; (iii) the lack of stimulating factors for the abandonment of fossil fuels and the transition to renewable energy; (iv) the unprofitability of heat and electricity production from renewable energy in comparison with traditional sources (coal, oil and natural gas); and (iv) geopolitical instability, etc. [7]–[12]. Another possible factor in slowing down the reformation of the energy sector is the public and its perception of new energy realities.

Public awareness and acceptance could play a key role in changing the economic paradigm and in the transition to green energy [13]–[18]. In Wüstenhagen et al. [19], the authors examined the impact of public perception on the implementation of renewable energy projects and developed the concept of social approval that includes three main components: social acceptance, socio-political acceptance of technologies and national policies and market acceptance. Achieving objective approval or rejection of certain initiatives by the public directly depends on the level of knowledge in the required issues. For example, the start of a sharp and large-scale construction of renewable energy facilities can lead to a contradictory reaction of the population if awareness of their advantages in comparison with the usual traditional energy facilities is at a low level [20]–[23].

The assessment of the public knowledge level in energy issues was carried out by many groups of scientists [3], [17], [23]–[25]; in most cases respondents from countries with a relatively large share of RES in the structure of electricity production demonstrated sufficient knowledge in this matter. However, the assessment of knowledge in the field of environmental and energy policies has been poorly studied despite the fact that knowledge of current state initiatives, the international agenda in the field of climate conservation and environmental protection, the availability of basic knowledge has a role to play in the formation of an unbiased worldview. In addition to the implementation of priority tasks for the energy sector's eco-modernization, it is necessary to carry out in-depth educational work with the population, especially with the younger generation, to form an adequate environmental worldview [26], [27].

Timely achievement of the goals set at the state level is impossible without the participation of the public, in particular, the youth [28], [29]. The younger generation, from 14 to 35 years old, will be responsible for the implementation of more energy projects in the near future; in addition, it is the period of maturity of current youth that falls in 2040–2050 – the period for which the implementation of most goals for decarbonization of the economy, achievement of sustainable development goals and the considerable reduction of environmental impact is planned. Thus, the implementation of energy policy should involve not only the technical and economic aspects of the eco-modernization of the sector and the implementation of measures to achieve priority strategic goals in the field of national energy security, but also a cycle of work with the population and the formation of the necessary environmental outlook. The social factor plays an important role in the overall development of the state, since human and intellectual capital are key components of scientific and technological progress.

The purpose of this study is to analyse the awareness level of the younger generation in the current energy policies and their attitude towards them. The paper provides the analysis of the awareness level of the younger generation about the adopted national energy policy and their attitudes towards it. The study analysed the results of a survey conducted among students from Romania, Italy and Greece.



## 2 MATERIALS AND METHODS

In order to analyse the awareness level of the younger generation about the adopted national energy policy and their attitudes towards it, the survey was conducted among students from three European universities: University of Insubria, Italy (70 respondents), Politehnica University of Timisoara, Romania (104 respondents) and International Hellenic University, Greece (84 respondents).

The initial questionnaire included three sections: (i) basic knowledge in the field of energy and environment; (ii) attitude towards different types of energy; and (iii) attitude towards national energy policies. The final question of the questionnaire was aimed to determine the proportion of students whose academic or professional activities are related to energy. According to the results obtained, 44% of Greek students, 53% of Romanian students and 77% of Italian students conduct energy-related activities.

The purpose of the developed questionnaire was to collect general information about the awareness of the younger generation in the current environmental agenda and national energy policy, about the level of knowledge and attitude to various types of energy resources, as well as about the representation of the role of the energy sector in environmental pollution. The answer options were designed using a 5-point Likert scale where '1' means absolutely no concern/absolutely not agree/no knowledge/definitely no and '5' means strong concern/absolutely agree/high level of knowledge/definitely yes. In the framework of the current research authors analysed results obtained from the third section of the survey and from the two questions of the first section (Table 1).

The survey was conducted online in the period from October 2022 to December 2022 by using Google Forms toolkit. The results of the study were processed using MS Excel software. To determine the main trends and correlations of students' responses, the structure of responses and their average value (mean) was calculated.

## 3 RESULTS AND DISCUSSION

Public acceptance of energy initiatives is one of the driving factors behind the transition to a circular economy and the achievement of the goals of global economy decarbonization. To increase the level of public interest and awareness in these issues, it is necessary to develop various educational programmes and activities for all population groups.

Greece, Romania and Italy are EU Member States and their energy policy should correspond the strategic goals of the EU which are the following: (i) reducing energy dependence on hydrocarbon imports; and (ii) increasing the share of RES in the structure of energy production and consumption [30]. The key documents regarding energy policies in considered countries are presented in European Commission [30] and Ministry of Economic Development [31]–[33]. Despite the rather ambitious goals for the development of renewable energy and the results already achieved, fossil fuels still predominate in the structure of primary energy consumption in the countries under consideration. In Greece, oil, natural gas and coal account for 80% of primary energy consumption, 74.29% in Romania, 81.6% in Italy. However, at the same time, countries demonstrate a high share of RES in the structure of electricity production, which generally corresponds to the current EU energy policy: 100% of electricity produced in Italy is obtained at renewable energy facilities, in Romania 48% of electricity is obtained from RES, 42% in Greece [34]–[36].

Greece is the leader in the production and consumption of electricity from fossil fuels among the countries under consideration, 58% of electricity is produced from traditional energy sources. In Romania, the share of natural energy carriers in the structure of electricity production is 33% [33]–[36]. This structure is due to the significant presence of mineral



Table 1: The structure of the questionnaire.

| Question                                                                                                                                                                                                                                             | Answer option                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <i>The first section: Basic knowledge in the field of energy and environment</i>                                                                                                                                                                     |                                                                                                                            |
| 1. Are you aware of government initiatives in the field of green energy development?                                                                                                                                                                 | 5 – Definitely yes<br>4 – Probably yes<br>3 – Undecided<br>2 – Probably no<br>1 – Definitely no                            |
| 2. Please evaluate your awareness level in the following issues:<br><ul style="list-style-type: none"> <li>the world agenda in the field of environmental conservation and climate change.</li> <li>- the current national energy policy.</li> </ul> | 5 – High level of knowledge<br>4 – Sufficient knowledge<br>3 – Moderate knowledge<br>2 – Low knowledge<br>1 – No knowledge |
| <i>The third section: Attitude towards national energy policies</i>                                                                                                                                                                                  |                                                                                                                            |
| 3. Do you support current energy policy in your country?                                                                                                                                                                                             | 5 – Definitely yes<br>4 – Probably yes<br>3 – Undecided<br>2 – Probably no<br>1 – Definitely no                            |
| 4. Do you think the government in your country provides an effective programme of green energy development for the next decades?                                                                                                                     | 5 – Definitely yes<br>4 – Probably yes<br>3 – Undecided<br>2 – Probably no<br>1 – Definitely no                            |
| 5. Do you think your country has a high level of energy security?                                                                                                                                                                                    | 5 – Definitely yes<br>4 – Probably yes<br>3 – Undecided<br>2 – Probably no<br>1 – Definitely no                            |

reserves: Greece and Romania, unlike Italy, have certain hydrocarbon reserves, which affects the structure of the energy industry.

Nowadays, the EU's plans to reduce dependence on energy imports and increase the share of renewable energy in the structure of energy production are actively discussed and covered by the media in all participating countries. Therefore, it can be assumed that the level of awareness of the population, in particular the younger generation, will be quite high. Table 2 shows the respondents' answers to the question 'Are you aware of government initiatives in the field of green energy development?', the purpose of which was to assess the level of knowledge of the younger generation about the government's plans for the greening of the energy sector.

More than 50% of students in every considered country are well aware of current programmes and plans for the development of green energy. In Italy, more than 21% of respondents noted their high level of awareness, and the average response rate was 3.76, while in Greece the number is 10.71%, and in Romania 12.5%. This may be due to the fact that in Italy most of the heat and electricity is produced at renewable energy facilities (solar power plants, hydropower plants, geothermal power plants, etc.), which is actively covered in the media, social networks and educational institutions.



Table 2: The structure of the students' responses to the question 'Are you aware of government initiatives in the field of green energy development?'

| Country | Mean value | The structure of the responses (%) |              |           |             |               |
|---------|------------|------------------------------------|--------------|-----------|-------------|---------------|
|         |            | Definitely yes                     | Probably yes | Undecided | Probably no | Definitely no |
| Greece  | 3.65       | 10.71                              | 57.14        | 19.05     | 13.10       | 0.00          |
| Romania | 3.66       | 12.50                              | 50.96        | 27.88     | 7.69        | 0.96          |
| Italy   | 3.76       | 21.43                              | 41.43        | 30.00     | 5.71        | 1.43          |

In addition, more than 75% of Italian respondents noted their involvement in energy-related activities. In Greece and Romania, the level of renewable energy development is lower, and the energy complex is dominated by traditional energy facilities using coal, oil and natural gas as fuel [34], [35]. Thus, it is possible to trace the relationship between the level of development of renewable energy and the level of awareness of the population (mainly the younger generation) on this issue.

Next, the students were asked to evaluate their level of knowledge on the issues of the current environmental and climate agenda and awareness of the energy policy of the country in which they receive their education (Table 3).

Table 3: Mean value of the students' responses to the question 'Please evaluate your awareness level in following issues: (i) Awareness level in the world agenda in the field of environmental conservation and climate change; (ii) Awareness level in the current national energy policy'.

| Please evaluate your awareness level in following issues:                                         | Mean value |         |       |
|---------------------------------------------------------------------------------------------------|------------|---------|-------|
|                                                                                                   | Greece     | Romania | Italy |
| Awareness level in the world agenda in the field of environmental conservation and climate change | 3.12       | 2.88    | 2.99  |
| Awareness level in the current national energy policy                                             | 3.04       | 2.78    | 2.87  |

Despite the high level of awareness among Italian students regarding government initiatives in the field of green energy, they rated their knowledge of the world agenda in the field of environmental conservation and climate change by an average of 2.99 and current national energy policy by 2.87. Students from Romania showed even lower results – 2.88 and 2.7, respectively. Thus, the level of awareness of the stated issues among students in Italy and Romania is between the values of 'Moderate knowledge' and 'Low knowledge', which is insufficient for the implementation of a successful policy to reduce the negative impact on the environment and eco-modernization of the energy complex, especially taking into account the fact that 53% of Romanian students and 77% of Italian students conduct energy-related activities. The revealed dynamics indicates that people whose activities are related to the energy industry do not have a sufficient level of knowledge in topical issues, which in the long term may negatively affect the results of decarbonization of the sector. The students at the Greek university demonstrated a higher assessment of their knowledge – 3.12 and 3.04, respectively. However, it is still a negative trend in general as it indicates that they have only 'Moderate knowledge' level. Then, the students were asked to assess the level of support for the national energy policy (Table 4).

Table 4: The structure of the students' responses to the question 'Do you support current energy policy in your country?'

| Country | Mean value | The structure of the responses (%) |              |           |             |               |
|---------|------------|------------------------------------|--------------|-----------|-------------|---------------|
|         |            | Definitely yes                     | Probably yes | Undecided | Probably no | Definitely no |
| Greece  | 2.89       | 9.5                                | 17.9         | 34.5      | 28.6        | 9.5           |
| Romania | 3.57       | 14.4                               | 46.2         | 24.0      | 12.5        | 2.9           |
| Italy   | 3.31       | 12.9                               | 30.0         | 37.1      | 15.7        | 4.3           |

The highest level of support for the national energy policy is observed among students from Romania: the average value is 3.57, more than 60% of all respondents chose the options 'Definitely yes' (14.4%) and 'Probably yes' (46.2%). Next are students at an Italian university, where the average was 3.31 and students at a Greek university with a mean value of 2.89. It should be noted that among respondents from Italy and Greece, the most common answer option was 'Undecided' (37.1% and 34.5% respectively). Given the high pace of renewable energy development in Italy [33] and a fairly high level of awareness among young people about green energy initiatives (Table 2), this trend is ambiguous.

A similar trend is observed among students at the Greek university, who previously demonstrated the highest awareness of the current environmental and climate agenda and issues of current energy policy. It should be noted that less than 25% of Greek students express support for the current energy policy, while more than 35% of respondents, the largest figure among all the surveyed groups of students, do not support it. This may be due to a potential decrease in the level of energy security in the coming years: the Greek government refuses to use coal as fuel and intends to develop green energy [37], which may be accompanied by several short-term negative consequences. Energy security is a central priority of the energy policy and economic development strategy of any state [38]. Due to certain geographical, political and socio-economic features, some States are forced to import electricity or natural energy resources, which affects energy and economic security. An analysis of the younger generation's perception of the energy security of the country in which they live is presented in Table 5.

Table 5: The structure of the students' responses to the question 'Do you think your country has a high level of energy security?'

| Country | Mean value | The structure of the responses (%) |              |           |             |               |
|---------|------------|------------------------------------|--------------|-----------|-------------|---------------|
|         |            | Definitely yes                     | Probably yes | Undecided | Probably no | Definitely no |
| Greece  | 2.54       | 3.6                                | 11.9         | 29.8      | 44.0        | 10.7          |
| Romania | 2.88       | 5.8                                | 22.1         | 30.8      | 36.5        | 4.8           |
| Italy   | 3.14       | 7.1                                | 32.9         | 34.3      | 18.6        | 7.1           |

In general, all groups of students assess the energy security of their countries at a fairly low level. At the same time, the most positive dynamics is observed among Italian students: 25.7% of respondents do not believe that Italy has a high level of energy security, while 40% have the opposite opinion and note the high level of energy security of the country. This may also be due, first of all, to the high level of renewable energy development, however, Italy is the leader in imported electricity among the countries under consideration, which contradicts the results obtained during the survey.



The majority of Romanian students (41.3%) assess national energy security at a low level: the average value was 2.88. The current dynamics is generally consistent and corresponds to the previously identified trends and specifics of the Romanian energy sector, where energy imports are a key factor in the normal functioning of the industry. The lowest result is shown by students from Greece: the average response value was 2.54, about 45% believe that the country does not have a sufficient level of energy security, which also corresponds to previously identified trends. Due to a number of economic and political challenges, a sharp transition from traditional to renewable energy can be accompanied by traumatic economic phenomena for the population (for example, an increase in the cost of electricity for the end user). In addition, students at the Greek university demonstrated the lowest level of assessment of the effectiveness of the current state policy in the field of green energy development in the long term: 36.9% noted the option 'Probably no' and 19.05% the option 'Definitely no', and the average value was 2.54 (Table 6).

Table 6: The structure of the students' responses to the question 'Do you think the government in your country provides an effective programme of green energy development for the next decades?'

| Country | Mean value | The structure of the responses (%) |              |           |             |               |
|---------|------------|------------------------------------|--------------|-----------|-------------|---------------|
|         |            | Definitely yes                     | Probably yes | Undecided | Probably no | Definitely no |
| Greece  | 2.54       | 2.38                               | 23.81        | 17.86     | 36.90       | 19.05         |
| Romania | 3.12       | 6.73                               | 32.69        | 31.73     | 23.08       | 5.77          |
| Italy   | 3.20       | 7.14                               | 38.57        | 30.00     | 15.71       | 8.57          |

At the same time, Greek students show the lowest level of uncertainty: only 17.86% of all respondents noted the 'Undecided' option, which may indicate a well-formed opinion, and which is confirmed by the previously identified high level of their awareness of the analysed issues. One of the reasons for the low approval may be the 'lag' of Greece from the pan-European goals for the development of green energy in comparison with countries such as Germany or Italy, the prevailing economic specifics and peculiarities of the Greek energy sector.

More positive results were demonstrated by students at the Italian university: the average value was 3.2, while more than 45% of students consider current initiatives effective, about 24% ineffective and 30% undecided. The current dynamics is associated with: (i) a high level of renewable energy development in Italy; and (ii) an appropriate level of coverage of the successes achieved in this area at the national level.

Romanian students also show a fairly high level of approval: 6.73% of respondents noted the option 'Definitely yes' and 32.69% the option 'Probably yes', and the average response was 3.12. At the same time, about 28% of students disapprove of the current policy.

Thus, the following conclusions can be drawn:

1. The students at the Greek university demonstrated the highest level of awareness of the current environmental and climate agenda, energy policy and green initiatives in the energy sector. At the same time, they express the lowest level of support for current energy policy, notes the low level of effectiveness of government initiatives in the field of green energy. Moreover, majority of respondents assess the level of energy security in Greece at a low level.



2. Romanian university students rate their awareness level at a low level, but at the same time, the majority of respondents support the current energy policy and consider the government's actions to develop green energy to be quite effective. However, students do not believe that the country has a high level of energy security.
3. The students at the Italian university appreciated the level of their awareness of government initiatives in the field of green energy quite highly, but at the same time they rated the level of their knowledge about the world agenda in the field of environmental conservation and climate change quite low. Most students demonstrate a high level of uncertainty with the support of current energy policy but note the high effectiveness of the government's green initiatives for the development of the energy industry and consider the country's energy security level to be quite high. This trend is contradictory, since Italy imports a significant part of its electricity, i.e. it actually depends on external electricity supplies.

The social component, namely the established ecological worldview of the population, plays an important role in achieving the strategic development goals of the state, especially when it comes to greening the economy and the energy sector. J. Elkington is one of the leading experts in the field of sustainable development and corporate responsibility, considers sustainable development management through the concept of three P's: people (social sustainability), planet (environmental sustainability) and profit (economic sustainability), where the importance of the social component of sustainability comes to the fore [39]. The importance of social aspects in achieving the goals of sustainable development and eco-modernization of energy is also considered by the authors in Wüstenhagen et al. [19] and Walker [40]. The conducted research has demonstrated that the younger generation is not sufficiently interested in the development of energy and government initiatives in this area. In addition, one can note the low degree of formation of the 'correct' ecological worldview and the level of knowledge in energy issues among the population: despite the fact that the prevailing part of the respondents is related to this area, the trend of interest in the current agenda and actions of the government remains ambiguous, and some of the respondents broadcast an unbiased assessment of the level of energy security of the country in which they live there.

In order to solve this problem, it is necessary to develop and distribute special educational programmes and tools among the population, especially among the younger generation. The creation of compulsory educational disciplines in the system of higher and secondary education, the use of social networks to disseminate information about government activities in the field of energy, the involvement of energy companies to conduct socially significant events and provide internships for students of not only specialized specialties – all these tools will make it possible to form the necessary environmental worldview, raise the awareness of the younger generation in energy issues and accelerate the process of achieving the goals stated in the national energy policy.

#### 4 CONCLUSION

The current actions of governments in the field of raising public awareness on energy, renewable energy and the agenda in the field of climate conservation and environmental protection can be described as low-effective. The prevailing part of all respondents notes a low level of awareness of these issues: the average value for all groups of respondents is no more than 3, which is not enough to implement an effective transformation of the sector. Insufficient knowledge can create misconceptions among the population about the real state of affairs in the sector, which, on the one hand, can hinder the development of RES and their





integration into the national energy infrastructure, and, on the other, reduce public pressure on the government about the need for eco-modernization of the sector. In addition, the study revealed the relationship between the current structure and state of the energy sector, the level of awareness and the level of support for energy initiatives and programmes. The students at the Greek university, who demonstrated the highest levels of awareness, do not consider the current initiatives effective and assess the country's energy security at a low level, which is generally true. The majority of Italian students, on the contrary, believe that Italy has high energy security, while a significant part of the electricity is imported.

Thus, it can be concluded that additional work with the population is necessary in order to increase the level of interest and awareness in energy development and energy policy in order to more effectively achieve the set strategic goals and objectives in the energy sector.

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