RENEWABLE ENERGY SOURCES: PUBLIC OPINIONS, ATTITUDES AND INTERESTS

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Abstract: The modern world is facing increasingly pronounced environmental challenges and the urgent need for sustainable development. In this context, renewable energy sources have become a key element of the energy transition and environmental protection. Although technological solutions for their utilization are advancing, their success largely depends on the knowledge, attitudes, and perceptions of citizens. This paper analyzes the awareness and attitudes of respondents in Serbia regarding renewable energy sources, with special attention to the perception of climate change and the potential of an increased number of sunny days for the development of solar energy. The findings highlight the importance of education and the internet as the main sources of information, as well as the need for additional education in schools and universities to enable more effective implementation of renewable energy sources.

Key words: energy, renewable energy sources, environment, education and information about renewable energy sources

1. INTRODUCTION

Energy is a physical quantity that represents the ability of a body to perform work. Energy sources are divided into renewable and non-renewable**.** A characteristic of renewable energy sources is that they are inexhaustible, meaning they are continuously replenished in nature. Renewable energy sources include solar energy, wind energy, hydropower, and geothermal energy**.** Energy obtained from biomass is also considered a renewable energy source. In contrast, non-renewable energy sources consist of fossil fuels (coal, oil, and natural gas) and nuclear fuels (uranium, plutonium), whose deposits and reserves are limited and subject to eventual depletion. The negative impacts caused by the irrational use of energy at a global level can only be mitigated through the collective action of all countries.

In terms of its potential impact on the environment, the energy sector is one of the most significant. Environmental and energy-related issues need to be considered from a global perspective. It is well known that the use of conventional energy sources contributes to environmental pollution, and efforts should be made to transition as much as possible to renewable energy sources. A priority is sustainable energy consumption, achieved through rational planning and increased energy efficiency across all components of a country's energy system.

All European countries have committed to incorporating plans for improving energy consumption efficiency and the use of renewable energy sources into their energy development and environmental protection strategies, supported by legislative regulations to ensure the implementation of these plans. In the Republic of Serbia, the use of renewable energy is regulated by law [1]. Utilizing renewable energy is considered to be in the public interest of Serbia and is of particular importance. The country has a clearly defined system that regulates incentives for electricity production from renewable energy sources. Renewable energy is considered the energy of the future, or clean energy, and efforts should be made to replace fossil fuels and their harmful environmental impact.

Various estimates suggest that renewable energy sources are capable of meeting a significant portion of energy demand**,** even at the current level of technological development [2].

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2. PERSPECTIVES AND BENEFITS OF RENEWABLE ENERGY

The use of fossil fuels has caused global climate changes that humanity has been facing over the past several decades. The combustion of fossil fuels worldwide has led to an increase in carbon dioxide and other greenhouse gases. The effects of climate change are already noticeable, including glacier melting, rising sea levels, and changes in ecosystems. These developments are considered to be a direct consequence of global fossil fuel use. Consequently, humanity — and the governments of almost all countries — are compelled to seriously consider and implement policies aimed at developing and transitioning from fossil fuels to renewable energy sources [2].

At the global level, numerous energy efficiency programs are being implemented with the aim of reducing energy consumption while maintaining current levels of comfort. The energy sector development strategy until 2050 envisions that renewable energy sources will become a dominant and mandatory component of total energy production. This approach not only supports the transition to cleaner energy but also contributes to sustainable development goals, helping countries worldwide reduce greenhouse gas emissions and mitigate the impacts of climate change.

The regulation of renewable energy use encompasses measures and activities undertaken to achieve long-term objectives, including [1]:

- Reducing the use of fossil fuels and increasing the use of renewable energy sources to protect the environment;
- Long-term reduction of dependence on energy imports;
- Creation of new jobs and the development of entrepreneurship in the field of renewable energy;
- Promotion of research, innovation, and competitiveness in the use of renewable energy sources;
- Integration of electricity from renewable sources into the electricity market**;**
- Ensuring stability of the electricity market**;**
- Regional development of renewable energy utilization.

Renewable energy sources are increasingly recognized as a key opportunity for achieving energy independence. It is particularly noteworthy that almost every country has the potential to utilize multiple types of renewable energy sources. This is especially evident in the case of solar energy, which is increasingly being used even in countries with a lower number of sunny days, such as those in northern Europe.

A good example is Norway, which, despite geographical limitations, demonstrates a high level of advancement in solar energy utilization. This is evidenced by the implementation of floating solar power plants along its coastline, highlighting the country’s innovative approach and readiness to exploit every available energy potential [3].

Figure 1: Floating solar plants along Norway’s coastline [3]

Fossil fuel consumption is responsible for roughly 75% of global greenhouse gas emissions and around 90% of total carbon dioxide emissions. These data clearly highlight the need for more intensive development and implementation of renewable energy sources in the future. Even now, numerous negative effects of greenhouse gas emissions on the environment can be observed — from climate change and threats to flora and fauna to an increasingly significant impact on human health and quality of life. In 2023, the power sector was the largest source of global greenhouse gas emissions. Between 2015 and 2024, the annual electricity capacity from renewable sources increased by approximately 2,600 gigawatts (GW), representing a 140% increase. In the same period, electricity capacity from fossil fuels grew by only about 640 GW (16%) [4].

The International Renewable Energy Agency (IRENA) estimates that 90 % of the world's electricity can and should come from renewable energy by 2050. [4].

In addition to solar energy**,** wind energy is increasingly used and recognized as a renewable source with significant potential. However, its implementation also presents certain challenges. The construction of wind farms and similar facilities requires a high financial investment, while an additional challenge is the identification of suitable locations, which is essential for the efficient and sustainable deployment of wind power plants.

Wind energy is one of the most desirable renewable energy sources, offering numerous benefits. It is cost-effective, especially given the various incentives and support programs available worldwide. Wind farms contribute to job creation at all stages, from construction to monitoring and maintenance. As a domestic resource, wind energy reduces the need for imports and strengthens a country's energy independence. It is also environmentally friendly, producing clean energy without polluting the surroundings. Furthermore, wind farms can be installed on various types of land, often utilizing areas that are otherwise unused, thereby maximizing the exploitation of available land [5].

According to the World Health Organization (WHO) [6], about 99 percent of people in the world breathe air that exceeds air quality limits and threatens their health. Air pollution is associated with 7 million premature deaths every year. The unhealthy levels of fine particulate matter and nitrogen dioxide originate mainly from the burning of fossil fuels. Switching to clean sources of energy, such as wind and solar, helps address not only climate change but also air pollution and health **[7].**

The renewable energy sector offers a wide range of employment opportunities across various fields, including research, design, production, installation, and maintenance of facilities. In addition to technical and engineering positions, jobs are also created in project management, education, consultancy, and administrative services. The further expansion of renewable energy in the coming decades is expected to increase employment and contribute to sustainable economic development.

According to the latest data from the International Renewable Energy Agency (IRENA**)** and the International Labour Organization (ILO)**,** the number of jobs in the renewable energy sector reached 16.2 million worldwide in 2023, representing an 18**%** increase compared to the previous year [8].

Understanding the public perception and willingness to support the transition to renewable energy sources can contribute to the more effective development of policies and incentive measures in this field. The following chapters present the results of a survey on people's attitudes toward renewable energy, its implementation, and public education**.**

3. RESEARCH METHODOLOGY

In order to collect data on citizens' level of knowledge, attitudes, and interest in renewable energy sources, a quantitative survey was conducted. The questionnaire was author-designed and consists of eight questions, some with a single-choice response and others allowing multiple selections. The questions were formulated to cover various aspects of the topic: basic knowledge of renewable energy sources, perception of their use in Serbia, citizens' willingness to utilize them, and preferred methods for learning about this subject**.**

The survey was conducted from May 1 to June 30, 2025, and distributed via a Google Forms link**.** The study was anonymous. The sample consisted of 74 respondents of varying age groups, genders, and education levels. Of the total number of respondents, 46 were female and 28 were male. The data were statistically processed, and the results are presented graphically through percentage responses to provide insight into the dominant attitudes and patterns of opinion within the surveyed group.

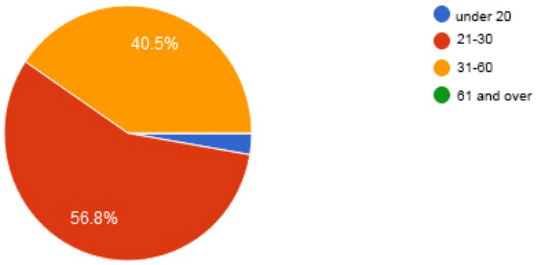

Figure 2: *Age structure of respondents*

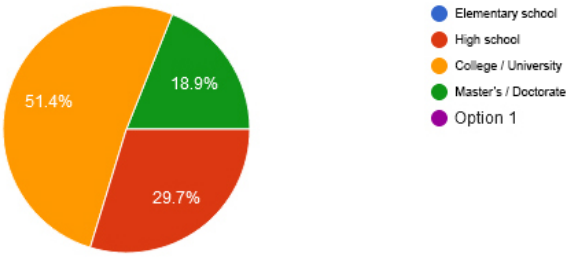

Figure 3: *Education of the respondents*

4. RESULTS AND DISCUSSION

This chapter presents the results of the conducted study, which aimed to examine citizens' level of knowledge, attitudes, and interest in renewable energy sources. By analyzing the collected data, the study seeks to identify the dominant opinions of respondents regarding the significance and use of renewable energy, as well as potential differences in perception based on gender, age, and education level**.**

Figure 4 shows the results of the survey question: "Which of the following energy sources are classified as renewable?"

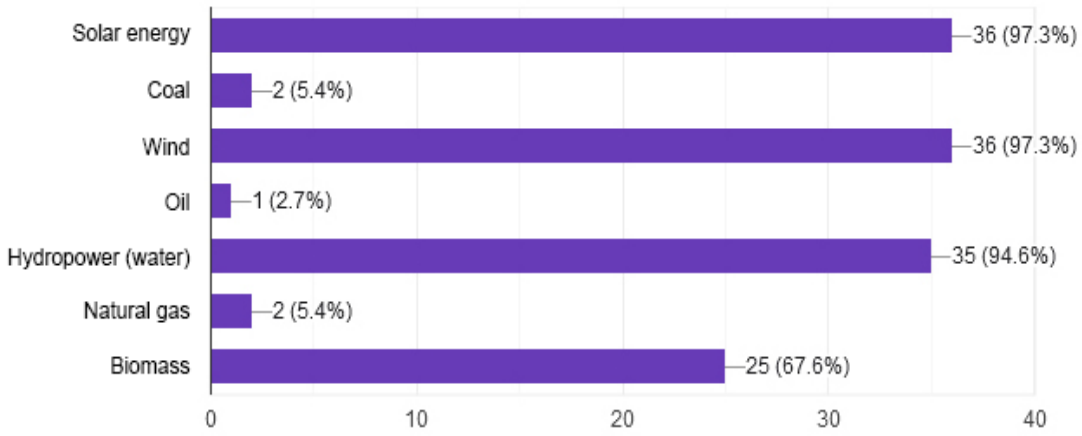

Figure 4: *Responses to the question: "Which of the following energy sources are classified as renewable?"*

Based on the survey results regarding the knowledge of the difference between renewable and non-renewable energy sources**,** it can be seen that the majority of respondents are aware of which energy sources are classified as renewable. Only a small number of respondents (up to 5%) did not know that coal and oil are non-renewable energy sources**.**

Figure 5 shows the results of the survey question: "Do you think renewable energy is used sufficiently in Serbia?"
Figure 6 shows the results of the survey question: "Which renewable energy sources do you consider the most promising for Serbia?"

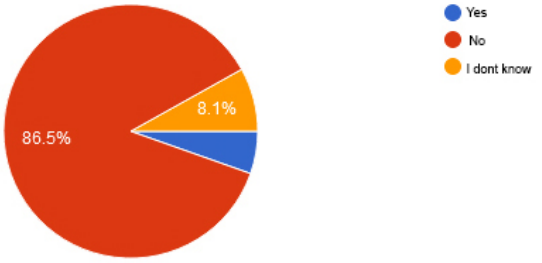

Figure 5: *Responses to the question: "Do you think renewable energy is used sufficiently in Serbia?"*

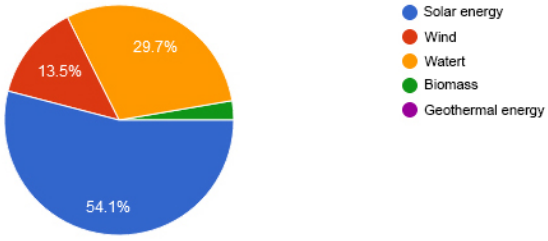

Figure 6: *Responses to the question: "Which renewable energy sources do you consider the most promising for Serbia?"*

Figures 5 and 6 present the survey responses regarding the prevalence, potential, and prospects of renewable energy use in Serbia. 86.5% of respondents believe that renewable energy sources are not sufficiently utilized in Serbia. However, the majority of respondents consider that services for using renewable energy are available in the country. 54.1% of respondents think that solar energy has the greatest potential for use in Serbia. Climate change in Serbia is particularly noteworthy, with higher temperatures, a greater number of sunny days, fewer cloudy days, and milder winters recorded in recent years. 29.7% of respondents believe that hydropower also has promising prospects in Serbia. Respondents noted that there appears to be limited potential for the use of wind, biomass, and geothermal energy**.**

Figure 7 shows the results of the survey question: "Where did you learn the most about renewable energy sources?"
Figure 8 shows the results of the survey question: "Do you think it is necessary to introduce more education about renewable energy sources in schools and universities?"

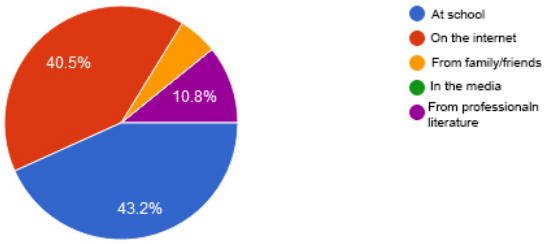

Figure 7: *Responses to the question: "Where did you learn the most about renewable energy sources?"*

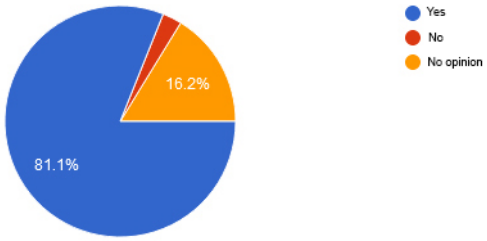

Figure 8: *Responses to the question: "Do you think it is necessary to introduce more education about renewable energy sources in schools and universities?"*

Figures 7 and 8 present the survey results regarding where respondents learned about renewable energy sources and whether more education on this topic should be introduced in schools and universities**.** 43.2% of respondents learned about renewable energy during their schooling, slightly fewer, around 40.5**%**, through the internet, while very few gained knowledge from family, friends, or reading specialized literature. However, the majority of respondents, 81.1**%**, believe that it is necessary to introduce more educational units in schools and universities that present the importance and methods of using renewable energy sources.

Figure 9 shows the results of the survey question: "How important is it to you that the energy you use is environmentally friendly?"
Figure 10 shows the results of the survey question: "How interested are you in learning more about the use of renewable energy sources?"

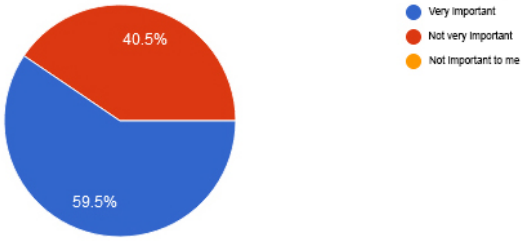

Figure 9: *Responses to the question: "How important is it to you that the energy you use is environmentally friendly?"*

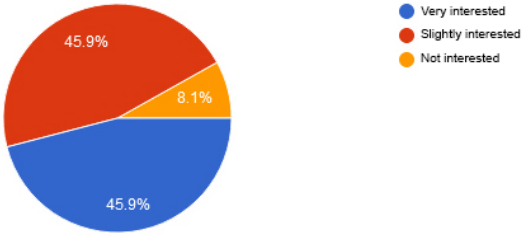

Figure 10: *Responses to the question: "How interested are you in learning more about the use of renewable energy sources?"*

In response to the question of how important it is for individuals to use environmentally friendly energy**,** 59.5% of respondents stated that it is important to them, while around 40**%** indicated that the ecological aspect of energy sources is not important. Regarding their interest in learning more about the use of renewable energy sources, less than half, 45.9%, expressed strong interest, an equal proportion showed very little interest, and about 8% were not interested at all. The responses shown in Figure 10 do not align with those presented in Figure 8, where the majority of respondents indicated that more education on this topic is necessary**.**

Figure 11 shows the results of the survey question: "What do you consider the best method for education about renewable energy sources?"

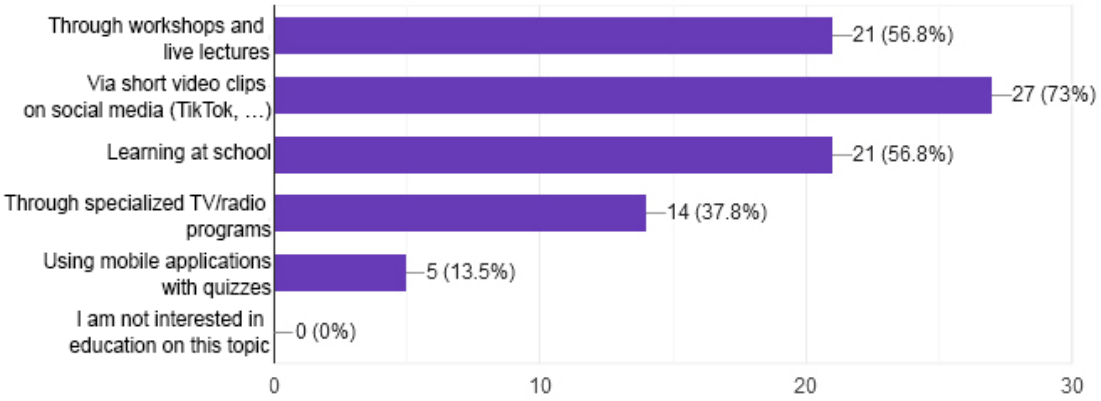

Figure 11: Responses to the question: "What do you consider the best method for education about renewable energy sources?"

Figure 11 presents the survey results regarding suggestions for the best method of education on renewable energy sources. It can be seen that the majority of respondents (73%) consider short videos on social media to be the most effective method. Slightly fewer respondents (56.8%) suggested learning in schools and through workshops or live lectures, while a smaller proportion preferred specialized programs or mobile applications with quizzes**.**

5. CONCLUSION

Based on the conducted survey, it can be concluded that respondents generally understand the difference between renewable and non-renewable energy sources and recognize the importance of using renewable energy in Serbia. The majority believe that such sources are currently underutilized, although they also acknowledge that favorable conditions exist in the country, particularly for solar systems and, to a lesser extent, hydropower, while wind, biomass, and geothermal energy are not seen as areas with significant potential. Respondents also emphasize the importance of climate change, noting that an increase in sunny days and milder winters represents potential for the use of solar energy.

The survey results also indicate that education is a key factor in shaping attitudes. Most respondents encountered the topic through schooling or the internet, while family and specialized literature had minimal influence. At the same time, respondents expressed a need for additional education on renewable energy sources in schools and universities, suggesting modern and accessible methods such as short videos on social media, workshops, and lectures. These findings suggest that a successful transition to renewable energy in Serbia requires not only infrastructure improvement but also continuous public information and education, particularly targeting young people, about the benefits and ways of using these energy sources.

6. REFERNCES

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