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A REVIEW OF THE ADOPTION OF GREEN ENERGY IN HOUSEHOLDS FOR SUSTAINABLE DEVELOPMENT

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Abstract: *This review study investigates the issue of consumer behavior and attitudes toward green and renewable energy consumption. The relevance of the European Green Deal goals is expressed in making the EU climate neutral by 2050 through the use of green energy in energy and electricity supply. Moreover, it is crucial to know the green and renewable energy potential in our country and region, the consumers' knowledge about them, and their attitudes toward them. In this study, the main factors that can influence consumer behavior are collected, such as income, age, educational level, environmental awareness, and the cost of technology. This summarizes the main barriers to the adoption of green energy. The results show that some influencing factors appear in Willingness to Pay (WTP) process, regardless of whether the country is developed or developing. The most common problems with the adaptation of renewable energy at the household scale are the low potential of investment priorities of the national energy strategy, the high costs of modernizing the electricity grid to ensure decentralized energy production.*
Key words: *Green energy, energy consumption, renewable energy sources, WTP*

1. INTRODUCTION

The use of green energy became a critical topic in the European Union. The European Parliament and European Commission adopted some Directives to increase the proportion of energy from green energy sources in the whole EU. The Directive 2018/2001/EC (RED II) on the promotion of the use of electricity from renewable energy sources sets a binding target for 2030 for a proportion of energy from renewable sources of 32% of the European Union's gross final consumption of energy, collectively ensured by Member States with the possibility of being increased by the European Commission in 2023 [1].

With the ultimate goal of making the EU the first climate-neutral zone by 2050 and setting separate objectives for sectors such as transport, construction, or energy, the European Green Deal aims to goal reduce net greenhouse gas emissions to zero and transform the EU economy into a more sustainable, resource-efficient and circular one [2-4]. As renewable sources only accounted for 23% of total EU energy consumption in 2022 [3], the EU set a new mandatory target for 2030, i.e., 42.5% [5,6]. Green energy is considered a vital tool in carbon footprint reduction. In the literature, most find the expression of" green energy" as a synonym for renewable energy, but some papers include nuclear energy too since it does not emit CO2 either [7-9]. If economic actors start using green energy (renewable energy), we can produce our energy and be independent from other countries' resources. Increasing the domestic renewable energy supply will be beneficial to the entire EU economy, which currently sources about 40% of its gas imports and 25% of its oil imports [10].

Regarding renewable energy sources, we can talk about solar power, wind energy, hydropower, geothermal energy, and energy from biomass and biofuels [11-13]. Romania has outstanding potential for most of them [14-16]. For example, according to Romania's favorable geographical location, it was among the countries with the greatest wind energy potential in South-East Europe [17-19].

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In the EU, the share of renewables in the total energy consumption in 2022 was 23%, a significant increase from 2021's share of 21.9%. To reach the new EU target, set in the 2023 Renewable Energy Directive, of 42.5% by 2030, i.e., nearly double the EU's 2021 share, a substantial transformation of the European energy system is needed [20].

In 2022, Sweden was the EU country that had the highest share of energy from renewable energy sources (66%), and Finland came in second place with 47.9%. According to Eurostat (2024), Iceland ranked first, with a share of 79.47%, followed by Norway (75.82%). Romania had a share of 24.14%, and the last one on the list was Ireland, with a share of 13.10% [21].

This study deals with the adoption of green energy by urban and rural households. More precisely, it focuses on the consumers' knowledge about green energy, their perceptions, motivations, and attitudes towards the use of green energy, as well as on the barriers that can influence their decision to adopt or not the green energy solutions in their households. Also, it evaluates the effectiveness of the existing policies and programs meant to encourage the development process regarding household energy consumption.

2. METHODOLOGY

To understand the consumer's attitudes and motivations toward using green energy in their households, the barriers to it, reported in Figure 1, such as the higher price, the lack of experience, and the lack of technical skills, should be addressed.

The approach proposed for this paper was comprehensive and systematic. It consisted of a multi-step process to ensure a thorough review of existing literature and data on household green energy adoption. The stages were as follows:

- Literature search. We performed an in-depth search of academic databases such as Web of Science, Google Scholar, ResearchGate and Elsevier. The search keywords were: "green energy" and "consumer behavior".
- Screening criteria. We applied specific screening criteria to improve the search results. To begin with, we identified 64 open-access scientific articles. We then excluded those articles with African and Asian contexts to focus on articles relevant to European Union parties.
- Selection of articles. After applying the screening criteria, 24 scientific articles remained. Articles that we found very relevant to the analysis we did, specifically analyzing consumer behavior and attitudes related to the adoption of green energy.
- Structure of the analysis. The selected articles were analyzed based on a con-textual framework, including factors such as income, age, educational level, environmental awareness, and knowledge related to the cost of technology.
- Findings. Findings from the literature were synthesized in such a way as to identify common themes. This synthesis guided the understanding of the key factors in the analyzed field and the awareness of the obstacles to adopting green energy at the household level.

With this structure that we followed, the authors managed to carry out a comprehensive and concentrated analysis of the specialized literature in the analyzed field, offering valuable perspectives on the factors that influence the adoption of green energy at the household level.

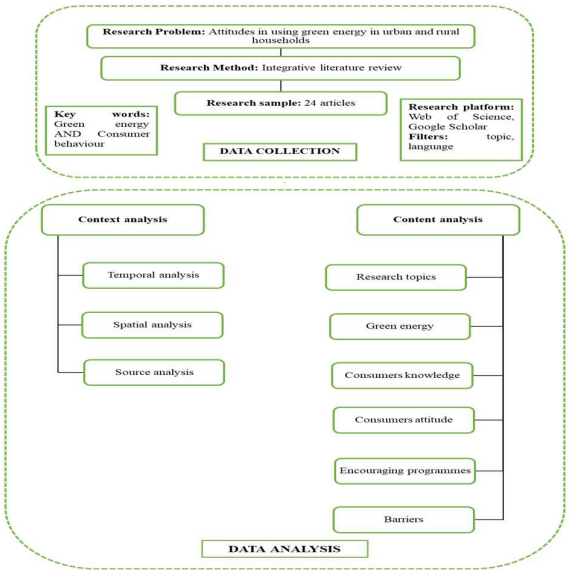

Fig. 1. The methodological process

3. RESULTS

3.1. Context analysis

The selected articles give a complex view of the evolution of the research process on the examined concept. The context of these publications describes how the scientific community approaches the topic. The context was created based on the criteria, spatial, temporal and data sources.

As Figure 2 shows, the interest in the research about green energy, the consumer's attitudes, concerns towards it, and the barriers in the green energy supply increased in the last couple of years, as evidenced by the increasing number of articles published on these topics since 2021. There are several reasons for this trend. Maybe the most important one is the sense of duty towards the European Green Deal, which cannot be implemented without the consent of consumers since household-scale green energy consumption is often done privately, just for a particular household, or even if not, everyone should be able to decide if they want to pay more for green energy or not.

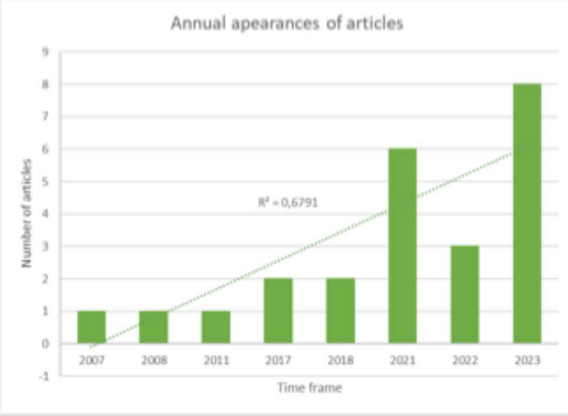

Fig. 2 Annual appearance of articles

As shown in Figure 3, the main data result from research articles, articles that indicate that the studied research field is still at the beginning and that it is necessary to offer practical solutions regarding efficiency and sustainability in the socio-economic environment.

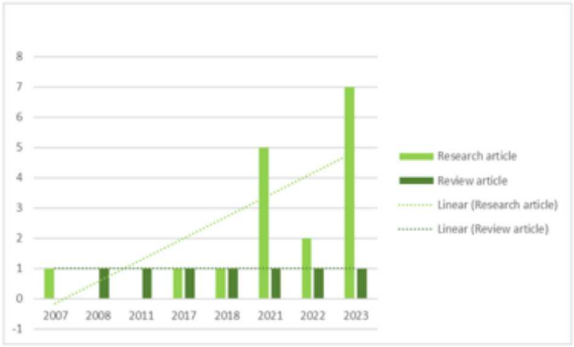

Fig. 3 Reviewed articles by type of the document

After the time-based and source analysis (Figure 4.) of the reviewed articles, a mapping process was carried out which is pointing out that on which system level happened the research in the sample articles.

Fig. 4 Number of articles in scientific journals

Figure 5 describes the reviewed articles on specific geographic or administrative levels. Most of these studies, 60%, are focused at different national levels; half are about Romanian situations connected to using green energy. Also, at the country level, there are two studies from the United States and one from Finland, Lithuania, China, and Taiwan. Then, these are followed by those describing consumer behaviour on a regional level, both in clusters in the European Union (created on the consumer's attitude towards environmentalism from the EU countries) and the North-Western and North-Eastern Development Regions of Romania.

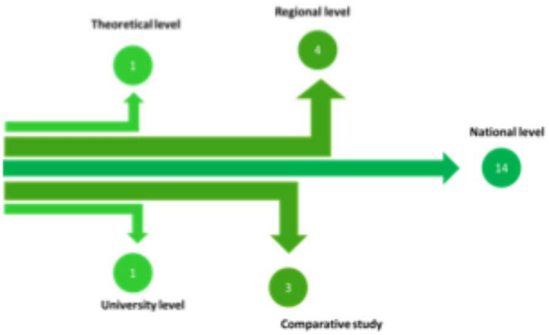

Fig. 5 System level approach of relation of the consumers and green energy

The comparative studies compare some European countries, and one of these studies compares the public's attitude towards green energy in rural and urban areas. Moreover, in the university-level article, the researchers applied an online questionnaire to the Politehnica University of Timișoara students to survey their electricity consumption behaviors.

3.2. Content analysis

The concerns about accelerated Global Climate Change, related to the high amount of released greenhouse gases, drove the European Union to create the European Green Deal. All these topics increased environmental awareness in most of the population, and green energy has started to be used instead of burning fossil fuels in some countries to a greater extent than in others. This is a massive step towards a climate-neutral European Union and achieving the Sustainable Development Goals. In adopting green energy on a household scale, we always have to pay attention to the population, their needs, their attitude towards these energy sources, and the possible barriers to their adoption. This is why the main topics of the reviewed articles are highlighted in Table 1.

Table 1: Main topics in the research field of the attitudes and barriers in the adaptation of green energy

Topics	References
Consumer attitudes and behaviours, public acceptance	[9, 12, 20, 21-31]
Challenges and barriers for green energy	[7,32,33-35]
Willingness to pay for renewable energy	[36-41]
Renewable energy, green energy	[9, 42-48]
Sustainable behavior	[49-51]

Regrading, Romanian authors wrote that we need help finding the expression of green energy; they mostly use the phrase renewable energy. However, as mentioned before, the term green energy is equal to the term renewable energy, or sometimes it is more if nuclear power is included in the green energy sources since it does not have greenhouse gas emissions [7]. Romania has significant potential for some types of renewable energy, such as hydropower, solar, wind, and biomass [45, 52-56]. Regarding wind energy, Romania is one of the Southeastern European countries with the highest wind energy potential. In Dobrogea region, the wind turbines can reach 7 m/s at 100 m altitude [42]. In 2016, 23% of the total energy generated in the country came from wind turbines sourced in the Dobrogea area.
Moreover, on the 12th of April, 2024, 17.81% of Romania's electricity production came from wind energy (Figure 6). Also, hydropower is a renewable energy source that has the most significant proportion in the energy mix of Romania, which was 23.49% on the 12th of April 2024, 1328 MW, which was just 22 MW (0,49%) less than the proportion of the nuclear energy. The country has significant potential for further hydro expansion, mainly small-scale hydroelectric power plants, such as those in Moldavia, the Carpathian Mountains, Transylvania, and the Sub-Carpathian area [42]. Romania has a favorable geographical position for photovoltaic energy production, especially the Romanian Plain, the Danube Delta, and Dobrogea [44], and it has about 210 sunny days per year [43]. Between 2012 and 2016, the storage capacity increased exponentially from 29 MW to 1300 MW. As we can see in Figure 6 its proportion in the energy mix was more than the wind power on the day when the data was registered. It was 18.15% of the total electricity production in April, which should be only higher as we are closer to the summer because it is well-known that photovoltaic panels produce way more energy in the summer than in other seasons.

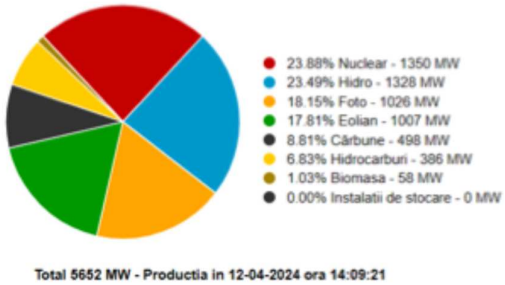

Fig. 6. Distribution of electricity production in Romania by energy source on the 12th of April, 2024 [57]

Also, as shown in Figure 6, only approx. 15% of the electricity production is from coal (on the figure: cărbune) and hydrocarbons (on the figure: hidrocarburi). The consumers' behaviors, attitudes, the public acceptance towards the green/renewable energy, the WTP (willingness to pay) more for green energy, the sustainable behavior, and the challenges and barriers in the adaptation of green energy according to consumers were surveyed in the reviewed articles.

The methods by which the consumers were surveyed in the reviewed articles are reported in Table 2. Most of them used questionnaires as a survey method since they wanted to survey bigger groups of consumers and the questionnaires were taken online and via mail.

Table 2: Studies based on consumers' involvement

Method for the consumer involvement	References
Questionnaire	[21-29, 36,37,39,49]
Interview	[7]
Interview and questionnaire	[38]

In Drăgoi et al. [7], the researchers used interviews as survey methods. Within these questionnaires, 10 questions were found, 2 of them were identification questions or the other 8 were questions regarding green energy practices in Romania. This questionnaire was distributed by email to 6 energy specialists in Romania, in February 2023. The specialists who examined this questionnaire were of the opinion that there are some challenges for the adoption of renewable energy on a household scale, such as the absence of priorities of investments simultaneously with the postponements regarding the modernization of electrical networks that can receive decentralized energy production. Another comment made by the experts was that given the need to access projects that are financed from EU funds, and another essential thing is that the National Environmental Fund must be supported by directing the financial resources available from the Romanian economy.

The Prosumer program was also commented on, a program that experts claimed can bring net benefits, such as the sale of electricity produced by the supplier, thus being exempt from fiscal obligations regarding the amount of electricity produced and used for own consumption. They also have the fact that the program has the ability to considerably reduce energy bills in any place of consumption where green energy is produced and at the same time offering attractive prices for the integration of green energy into the National Energy System (SEN). Finally, it was concluded that nuclear energy has an increased potential to contribute to the energy system in Romania, with a low pollution effect.

Tan et al. [38] used a combination of the two previous methods. Before the interviews, they conducted a pre-survey to determine the range of the bidding value of WTP for retrofitting rooftops with solar photovoltaic tiles, and to adjust the questionnaire items for the improving the measurement accuracy. After that, the interviews were conducted face-to-face, with a sample aged 18-65. The respondents answered on behalf of their families. They were taken in the rural areas of 16 municipalities of Shandong Province, China. The results of these interviews show that the WTP is higher in rural households for the modernization of roofs with SPVT in favor of solar technology, which represents a theoretical aspect, while the first aspect is encountered more often. The educational level and income also affect the consumer's WTP, and 73.1 % of the respondents are willing to pay for retrofitting rooftops with SPVT.

As a result of these surveys, the following conclusions can be drawn: Those households where younger people live have higher relative WTP for renewable energy sources than older people. This is because they are more concerned

about environmental problems related to non-renewable energy sources. Households with higher education and higher income have enhanced WTP for renewables, primarily for solar and wind energy [22]. Usually, people with lower incomes are also the ones who are most interested in keeping energy costs as low as possible, concomitantly with people with less education, they are more reserved in supporting alternative energies [23].

Lin and Dong [58] found that, in Taiwan, the most common factor affecting the consumer's attitude towards the purchase of electronically efficient electrical and electronic equipment is price. In return, people are aware that this equipment have a positive effect and that they lead to the mitigation of environmental problems and that taking ecological decisions can reduce the depletion of resources.

Perceived behavioral control, subjective norms, and functional value have a significant positive influence on consumers' intention to purchase energy-efficient home appliances. At the same time, the emotional and social values do not affect significantly the respondents' attitudes.

Gârdan et al. [22] found strong correlations between Concern for the Environment and Knowledge about Renewable Energy, which means that if someone shows more significant interest in environmental issues, the information within that specific Knowledge will be relevant to that person's interest. Knowledge did not have an intense relationship with Perceived Utility regarding Renewable Energy usage, which is interesting because it mainly increases the perceived utility of new technology (in this case, renewable energy); the individual needs a large amount of information regarding the technology. The Social influence is weak in this case, just like in the previous case [58]. Bergmann et al. [25] used the Choice Experiment (CE) to investigate differences in preferences between urban and rural residents in Scotland. The aspects of some renewable energy technologies, such as biomass projects that may lead to long-term jobs in rural areas, are motivating the rural residents to support renewable energy projects, and this reflects the perception that the majority of these kinds of projects will be constructed in rural areas. Also, urban residents prefer projects which do not have a high impact on the landscape and do not harm wildlife. They placed insignificant value on creating new permanent jobs from the renewable projects.

Maxim et al. [59] did something similar in the North-Eastern Development Region of Romania sampling 602 households in rural and urban areas using 5 variables: INDEP (= Romania's independence from energy imports—coal, gas, oil), JOBS (=new jobs created at the county level), POL (=reduction of pollution effects—air, water and soil), COST (=additional cost of the monthly electricity bill) and RURAL (increased revenue for rural localities from taxes paid by new energy companies). From these 5 variables, the INDEP, JOBS, and POL have a positive influence on the available portions of the electricity supply. In contrast, COST and RURAL have a negative impact. In other words, renewable energy projects can get the country's independence from energy imports, create new job opportunities, and reduce air, water, and soil pollution, positively impacting the consumer's attitude towards WTP more for renewable energy. The last one is surprising, but the respondents may perceive the new taxation negatively.

Jijie et al. [26] also conducted a study on the residents living in the North-Eastern Region of Romania. For the question “From this point of view, should Romania give up traditional electricity production (coal, fossil) and move towards production out of renewable energy sources (aeolian, photovoltaic, biomass)”, approximately 70.60% of the respondents (649 people) answered Strongly Agree, 17.80% Agree, 8% Disagree, and 3.60% Strongly disagree. This shows a high level of awareness regarding environmental issues and the willingness among consumers to change the type of electricity production. The Lithuanian residents' environmental concerns negatively and insignificantly influence the WTP for green energy.

The knowledge about green energy's positive outcomes on a country's development level insignificantly motivates people to pay more for green energy [37]. Also, the study in the United States residential sector found that the individuals' average household income positively influences the consumers' intentions to use

renewable energy, their attitudes toward using renewable energy, the WTP, their perceived behavioral control and the subjective norms [27]. According to He et al. [28], gender and income do not have significant impact on the consumers' GH (Green Housing) purchasing behavior and green consumption behavior; on the contrary, age and attitude toward environmental protection are determinants of significant impact.

The attitude of Finnish residents in rural areas toward wind power is influenced by their attitude toward anthropogenic changes in the landscape - because wind turbines destroy the view. So, their solution was to use the trees' protective effect as a landscape shield, which could prevent the wind turbines from being visible to their homes. In this case, the forest owners could reduce the negative impact of the wind parks, and the landscape shield could provide nature protection values, too [39].

Aral and López-Sintas [29] studied the attitude-behavior-conditions (A-B-C) relationship. refers to The A-B-C shows that the relationship between attitude and behavior depends on the context, but it also systematically differs among groups of individuals, resulting in a set of A-B-C relationships. They focused on the environmental behavior patterns and identified 4 clusters of EU countries, according to the distribution of these patterns:

- Cluster 1: Green countries (Belgium, Luxembourg, the Netherlands, Sweden);
- Cluster 2: Yellow-green countries (Austria, Denmark, Finland, France, Germany, Malta, Slovenia);
- Cluster 3: Brown countries (Czech Republic, Estonia, Italy, Ireland, Hungary, Latvia, Poland, Spain, Slovakia, United Kingdom);
- Cluster 4: Gray countries (Romania, Bulgaria, Greece, Portugal, Lithuania, Croatia and Cyprus).

The green cluster comprises 53% environmentalists and 47% pre-environmentalists, the yellow-green cluster is formed mainly of pre-environmentalists (77%) and environmentalists (18%), and the brown cluster is the largest. Formed mainly of pre-environmentalists (50%) and less-environmentalists (39%), and the grey cluster formed mainly of less-environmentalists (75%), non-environmentalists (11%) and pre-environmentalists (12%). In other words, green countries have the highest socioeconomic development scores, income equality, educational scores, and individualism scores.

Nevertheless, they maintain the lowest environmental performance scores. The countries represented by yellow-green have the highest scores regarding educational performance in the field of the environment, followed by the second highest score in socio-economic development.

The lowest score being assigned to income inequality and the highest score being determined by individualism. Low scores regarding socio-economic and educational desolation are represented by the brown countries, but they maintain a greater inequality regarding incomes and environmental performance scores. The lowest socio-economic and educational development scores are represented by the gray countries that also have the lowest individualization score and high income inequality score.

Gherheș and Fărcașiu [49] studied a group of students of the Politehnica University of Timișoara for learning whether their electricity behavior within households is sustainable or not. The study results show that:

- 94% of the respondents “always” or “often” turn off the light when they leave the room;
- 89.6 % “always” or “often” air-dry their clothes instead of using the drier;
- 89.2% “always” or “often” open the blinds and let natural light come into the room.
- 76.5% of the respondents “always” or “often” turn off the light when they watch TV;
- 76.4% “always” or “often” shut down the computer instead of leaving it in sleep or hibernate mode;
- 64.7% “always” or “often” replace traditional light bulbs with energy-saving ones;
- 55.1% “never” or “rarely” leave the TV on even if they do not watch it.

For another set of questions, the answers were more different. 59.4% of the studied population “never” or “rarely” read the hours on the light

Table 3: Barriers in renewable energy investments

Category	Barriers
Administrative barriers	Insufficient spatial planning
	NIMBY attitude
	Troublesome procedures
	Too many authorities involved
	Local government
	Lack of experience
	Uneven application of law
	An unclear administrative framework
	Government attitude
Technological and technical barriers	Lack of economies of scale in production of technology for obtaining renewable energy
	Infrastructure
	Lack of technical skills
	Lack of information on new technologies
	Inadequate technical studies
Market barriers	The size of the investment projects
	Cost of transportation for energy from renewable sources
	Consumers' choices
	Price formation rule
	Restricted access for new competitors
Economic barriers	High economic risk
	Obtaining financing
	Higher initial investment

bulb packs before purchasing them, 37.2% "always" or "often" put their mobile in the power saving mode so it does not have to be charged so often. 35.2% "never" or "rarely" unplug the electrical and electronic equipment that they do not use, 33.1% "always" or "often" set the air conditioning at a temperature no more than 10 degrees lower than the outside temperature in summer, 45.9% "always" or "often" set the thermostat temperature at 20–22 °C in the cold season and, if they feel it is too cold, they dress

more warmly", 42.4% "always" or "often" purchase energy-efficient home appliances, and 43.3% "always" or "often" use low washing temperature (max 40 degrees).

All of these aspects can be barriers to limiting the development of renewable energy technologies; they do not always appear all in one case, and these are not all of the barriers which can appear in a specific case. These are just some of the most common challenges which can emerge during renewable energy investment projects [32].

Devine-Wright [30] analyzed the public acceptance of renewable energy technologies at three levels: personal, social-psychological, and contextual factors; results reported in Table 4.

In conclusion the more detailed activities, which require more attention, the students answered "always" or "often" on lower extent.

Relied on these factors, he established that middle-aged people are more aware of green energy technologies, and their income, social level, degree of awareness, and political beliefs also influence

Table 4: Influencing factors of public acceptance of renewable energy technologies

Factors	Components
Personal factors	Age
	Gender
	Social class
	Degree of awareness and understanding
	Political beliefs
Psychological factors	Perceived impacts
	Environmental beliefs and concern
	Place attachment
	Perceived fairness of the development process and levels of trust in key actors
Contextual factors	Technological factors: scale and type
	Institutional factors: the distribution of benefits and the use of participatory approaches to public engagement, ownership structures
	Spatial factors: spatial proximity and NIMBYism, regional and local context

awareness. Environmental concern motivates support for renewable energy technologies. The strength of attachment to places affected by renewable energy power plants has a more significant influence on the developments than age or gender. The perception of equity in the development process and the level of trust play an important role in the public acceptance of renewable technologies. Aspects regarding the way renewable energy technologies are

mentioned. Along with which technologies are mentioned, there are also essential factors in public approval, and the lack of trust that exists in political institutions can erode political support. Also, NIMBYism (NIMBY=not in my backyard) is a way of thinking about the public acceptance of unwanted land-use developments that would prefer to be sited elsewhere, and this could be an explanation for the resistance behaviors towards any renewable energy technology.

Pîrlogea [32] summarized the barriers to the investment of renewable energy sources in 4 categories: administrative, technological and technical, and market and economic barriers; data reported in Table 4.

4. DISCUSSION

For green energy to be widely applied in household energy production, the researchers need to understand consumer behavior, the consumers' attitudes toward green energy consumption, and the technology barriers in a certain area. As in the reviewed articles, this can be done by asking the consumers via questionnaire or interviews to have a picture of their attitude toward green energy/renewable energy. It is not enough to have the potential for renewable energy, as in Romania, we have wind, hydropower, solar, and biomass energy. However, we have to know and, more importantly, we want to use them. For example, on the 12th of April 2024, hydropower was 23.49%, photovoltaics was 18.15%, wind power was 17.81%, and biomass was 1.03% of the total electricity production of Romania; that means that approx. 60% of the total electricity production came from renewable energy.

If nuclear energy is counted in the green energy expression, as Drăgoi et al. state [7], it will have almost 85% of the total production from green energy. From this, it can be concluded that Romania is on a good path to reducing CO_2 emissions, but we need to increase the proportion of renewable in production. For example, we have a Prosumer programme financed by the National Environment Fund for solar power. In this programmer, the consumers become producers too by producing their electricity with photovoltaic panels, and the amount of electricity they cannot use is "feed" in the National Energy System. This programmer can potentially reduce the electricity bills for the consumers significantly involved, but we have to consider the nights when the photovoltaic panels do not produce energy and the winters when they produce much less than from spring to autumn. In most studies, we can find similarities in the consumers' answers regarding some demographical aspects or aspects of environmental awareness and environmental concerns.

Those households where younger or middle-aged people live, households with higher education, higher income, and more knowledge about renewable energy have higher relative WTP for renewable energy. In contrast, lower-income people are usually interested in keeping energy costs low, and less educated people feel less supportive of alternative energy. Also, the concern for the environment and environmental awareness positively affect the support of renewables because they can lead to the mitigation of environmental problems. The high awareness regarding environmental issues can lead to the willingness to change the type of electricity production. Some rural residents support renewable projects because they can lead to long-term jobs, such as biomass projects, but urban residents are usually not interested in this factor. They prefer those projects that do not have a high impact or any impact on the landscape. Also, we can mention the place attachment here: the strength of attachment to places affected by renewable projects strongly influences their development. In the North-Eastern Development Region of Romania, the rural residents support renewable energy because the country can gain independence from energy imports, create new jobs for them, and reduce soil, air, and water pollution.

Conversely, the cost of the monthly electricity bill and the taxes paid by the new energy companies negatively impact WTP's point of view.

As far as Romania is concerned, a study of Aral and López-Sintas and Lakatos [29, 60] showed that Romania is part of a cluster of European countries where people are primarily less-

environmentalist (75%), while non-environmentalist account for 11% and pre-environmentalist for 12%. Unfortunately, Romanians have the lowest scores regarding educational and socio-economic deprivation, followed by environmental performance, and the highest score being assigned to income inequality. Also, many barriers exist regarding renewable energy technologies, projects and consumption. In the group of administrative barriers, Pîrlogea [32] mentioned the insufficient spatial planning for bigger power plants, the NIMBY attitude toward public acceptance, troublesome procedures (much time needed to obtain authorization), too many authorities involved in the process, the local government impact, the lack of experience regarding the renewable energy sources, the uneven application of the law, the unclear administrative framework and the government attitude toward the energy system operation.

Among the technical and technological barriers, we can name the lack of technical skills in installation, operation and maintenance, the lack of economies of scale in the production of technology for obtaining renewable energy, the lack of information on renewable technology and the inadequate technical studies. The market barriers are the previously mentioned consumers' choices, behaviors, price formation, the size of the projects, the cost of the transportation for the energy and the restricted market access for new competitors. The economic barriers can be the high economic risk after implementing the projects, the difficulty of obtaining financing, and the higher initial investment, for example, the photovoltaic panels or the wind turbine.

5. CONCLUSIONS

This study first reviewed the trends in Romanian electricity production from renewable sources. Also, it summarizes the main barriers to the adoption of green energy. The obstacles to implementing a renewable energy project can come not only from the government side but also from other stakeholders.

Then, it explored consumers' attitudes from different countries toward using renewable energy technologies in their homes, the factors influencing the consumers' behavior in green energy consumption, and the barriers to adopting green energy in households. The major willingness-to-pay factors for green energy are the same as those other reviewed studies, i.e., cost, educational level, household income, consumer age, environmental awareness and concern for environmental problems. The results also show that some influencing factors appear in every Willingness to Pay (WTP) process, regardless of whether the country is developed or developing.

Following the analysis, it was found that households with middle-aged residents, higher education, higher incomes, and more knowledge about renewable energy showed higher WTP for renewable energy. Conversely, households of residents with low incomes and less education tended to prioritize keeping energy costs low and being less interested in using renewable energy. Thus, this denotes the fact that increasing awareness and education about the benefits of renewable energy could improve its adoption in different demographics.

Greater environmental protection awareness leads to greater willingness to change types of electricity production and support for renewable energy projects. Also, in the analysis, we found that most respondents (70.6%) from the North-East region of Romania supported the opinion that Romania should move towards producing renewable energy. The high environmental awareness and concern greatly influences consumer behavior and their support for renewable energy initiatives.

6. REFERENCES

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O ANALIZĂ A ADOPTĂRII ENERGIEI VERZI ÎN GOSPODĂRII PENTRU DEZVOLTAREA DURABILĂ

Rezumat: Acest studiu investighează problema comportamentului și atitudinii consumatorilor față de consumul de energie verde și regenerabilă. Relevanța obiectivelor Pactului Ecologic European este exprimată în a face UE neutră din punct de vedere climatic până în 2050, prin utilizarea energiei verzi în furnizarea de energie și electricitate. În plus, este esențial să cunoaștem potențialul de energie verde și regenerabilă din țara și regiunea noastră, cunoștințele consumatorilor despre acestea și atitudinile lor față de acestea. În acest studiu sunt colectați principalii factori care pot influența comportamentul consumatorului, cum ar fi venitul, vârsta, nivelul de educație, conștientizarea față de protejarea mediului și costul tehnologiei. Acesta sumarizează principalele bariere în calea adoptării energiei verzi. Rezultatele arată că unii factori de influență apar în procesul de Disponibilitate de Plată (WTP), indiferent dacă țara este dezvoltată sau în curs de dezvoltare. Cele mai frecvente probleme cu adaptarea energiei regenerabile la scara gospodăriei sunt potențialul redus al priorităților de investiții ale strategiei energetice naționale, costurile ridicate ale modernizării rețelei electrice pentru asigurarea producției descentralizate de energie.

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