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Shaping Energy-Saving Behavior in Education System: A Systematic Review

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ABSTRACT

Shaping energy-saving behavior in education system plays huge and obvious role in economic and social development. While there is a large amount of literature covering the issues of technical advancements in implementation of energy-saving technologies, organizational and technical aspects of world experience, there is still a lack of publications exploring the scale and features of energy-saving behavior in education system. This paper analyzes features of shaping energy-saving behavior at three levels: school, university, and communities. It systematically reviews 119 WoS and Scopus studies, which allowed us to determine influence factors and prospects of shaping energy-saving behavior for the younger generation and community reps. The paper sets four research questions aimed at data analysis. The results showed (a) the lack of research on issues related to shaping of energy-saving behavior at the school and university levels; (b) that mainly, literature focuses on a comprehensive study of individual and socio-demographic factors affecting energy-saving behavior of communities; (c) that at the university and school levels, situational and individual factors have the greatest impact on energy-saving behavior of students; gaps in socio-demographic factor research; and d) as prospects of shaping energy-saving behavior of students, development of educational programs, implementation of state policy on energy conservation, information on energy conservation issues can be highlighted – all from the beginning of the COVID-19 pandemic to the present. The paper is intended for researchers, education and energy experts interested in possibilities of educational technologies in shaping energy-saving behavior.

Keywords: Energy Resources, Energy-Saving Behavior, Energy Consumption Culture, Education, Quality Management, Energy Management
JEL Classifications: I21, I25, Q40

1. INTRODUCTION

At present, energy-saving behavior issues are becoming increasingly relevant, both for individuals and for companies trying to reduce energy costs and negative environmental footprint. Mankind is gradually beginning to realize consequences of rapid industrial growth and active exploitation of natural resources, whose reserves are being depleted at an alarming rate.

Nevertheless, the desired transition to the path of sustainable development is far from easy, despite the measures that society is trying to take with regard to the environment. The problem is that in many ways, restoration of the natural and energy balance

requires fundamental change in people's energy-saving behavior in education system, in development of their desire to protect the environment not every now and then but on a regular basis.

Since 2019, society has been facing an unexpected social issue in the form of the COVID-19 pandemic, which has radically affected the economy, politics of individual countries and nations, as well as feelings, thoughts, and behavior of individual people. Quarantine and isolation will be long remembered for their uniqueness, spontaneity, unpredictability, and impact on psychology. Good citizens were held hostage by socially restrictive economic conditions and were forced to promptly change their lifestyle, perception of the world around, and even attitude towards each other. In this regard, a new type of behavior is being formed, which is based on saving mental strength, material and energy resources. The process of managing economic behavior in a crisis involves development of socio-economic and educational programs aimed at optimizing energy-saving behavior.

Unfortunately, an individual's energy-saving behavior is affected by a plethora of factors, many of which are hard to define. Despite the fact that researchers have shown interest in this topic for a long time, an exhaustive answer to the question of what determinants and educational technologies affect energy-saving behavior in the post-COVID period is yet to be found.

In this paper, we set ourselves the goal of finding out whether such an important socio-economic characteristic as education can incline a person in the direction of energy-saving behavior, and if so, what is the explanatory share of an educational factor in this process.

If confirmed, our hypothesis about education's positive impact on energy-saving behavior may give a clearer idea of what kind of public policy is required for our future generations to continue living in a sustainable society.

2. THEORETICAL BASIS

2.1. Energy-saving Behavior in Education System

So, what factors determine opting for energy-saving behavior anyways?

Primary studies devoted to the role of individual behavioral aspect in sustainable development identify several determinants that may affect an individual's choice in favor of energy-saving actions. Indicatively, Moon et al. (2015) argue that a combination of social and personal moral norms positively affects the efficient use of electricity, water, and other resources, as well as environmental consumerism and the desire to recycle. A person's views and beliefs reflecting their awareness of problems and desire to make a difference also stimulate energy-saving behavior, although less significantly. In addition to these factors, Yadav and Pathak (2017) note several more, such as the so-called behavioral control, which essentially means the ease with which an individual can put their intentions into action (availability of financial resources, time, opportunity); the intrinsic utility of an environmental good and willingness to pay for its offer. The last two parameters primarily affect the desire to purchase eco-friendly products instead of conventional ones.

Considering the above, we can conclude that education has a great potential to help individuals reconsider their attitude towards environment and abandon environmentally "harmful" lifestyle and behavior by improving knowledge, instilling values, and transforming attitudes and beliefs.

Certainly, the presence of education in itself does not necessarily translate into more energy-saving behavior, but somehow it forms an idea of how important it is to maintain ecological environment in a stable state not only for our, but also for future generations.

He et al. (2007) examined how willingly Chinese farmers working in arid areas switch to a new, environmental technology involving irrigation with rainwater and additional irrigation, which restores soil fertility and reduces erosion. The assessment was based on a survey using binary regression, in which the dependent variable was a binary variable showing whether the farmer uses this technology on his plot or not. Various parameters were taken as control variables: household head's age, number of people in it, family income, distance to the nearest source of water for irrigation, risk tolerance, distance from the village to the nearest city, including household head's education years. The results showed that, as the authors suggested, education level growth increases the probability of adopting a new technology by about 23%.

Back in 2005-2008, the World Value Survey data for 47 countries showed that the higher the education level, the more people tend to be concerned about environmental issues. Moreover, 2010-2012 surveys on the same topic say that the majority of respondents with secondary education are ready to sacrifice accelerated economic growth in favor of greater environmental protection, while people with primary education or with none at all, would not show such a trend. The International Social Survey Programme data for 29 countries with the highest per capita incomes similarly showed that the proportion of people who disagree that we pay too much attention to the environment is growing from 25% to 46% with an increase in education from secondary to higher and vocational.

Many researchers have come to similar conclusions. Case in point, using the example of European countries, Meyer (2015) attempted to answer the question whether education really stimulates energy-saving behavior or not. The author notes that despite the fact of evidence of education level's positive impact on energy-saving behavior, unambiguous conclusions are impossible due to an ambiguous causal relationship: missed factors making an individual both receive more education and take care of environment may exist. The author addresses this issue by taking advantage of the change in the legislation on compulsory education in Europe in the twentieth century and eliminates endogeneity of school attendance. Two waves of Eurobarometer questionnaires and data for several countries allow abstracting from specific reforms of each individual region and aggregating information on different types of environmental behavior (opting for a "greener" way of transportation, reducing the use of plastic bags and other non-ecological materials, reducing water and energy consumption,

buying goods labeled as eco-friendly). Discontinuous regression has been chosen as an empirical strategy based on the criterion of whether the cohort fell under the effect of this law or not. The author came to the conclusion that in all specifications, education has a significant positive effect on energy-saving behavior.

Our study poses the following research questions, the answer to which is expected to be obtained by means of the method of systematic literature review:

- RQ1. How many studies have been contained in the Scopus and WoS since 2019 and what direction are they taking?
- RQ2. How are research keywords related?
- RQ3. What factors affect energy-saving behavior?
- RQ4. What are the important prospects in research of shaping energy-saving behavior?

Let us take a closer look at what educational factors affect energy-saving behavior.

2.2. Levels in Shaping Energy-saving Behavior

Shaping energy-saving behavior occurs at three levels: School, university, and community.

Ntanos et al. (2022), Drosos et al. (2021), and Dumciuviene et al. (2019) assess the perception of school administrators regarding energy-saving behavior of students and the environment. Their research notes the school administrators' responsibility for promoting energy-saving measures, for encouraging students and school staff to environmentally active behavior.

Iwasaki, (2022), Lee et al. (2022), Wan Hussain et al. (2021), and Zerinou et al. (2020) explore energy literacy and factors affecting energy-saving behavior of students. Their studies note that the school curriculum needs to focus on the link between environmental values and energy-saving behavior.

Researchers are increasingly paying attention to energy-saving behavior of university students (Correia et al. (2022); Franco et al. (2022); Iordache Platis and Romanowicz, (2020); Wee and Choong, (2019); Zhao et al. (2019)). Energy-saving behavior of university students, its mechanisms and determinants are a fairly new area of research. For modern students, generation Z reps, concern about the state of the environment, concern about ecology, participation in discussion of environmental issues, volunteer activity in ecology become characteristic.

Among the pressing challenges of economic development is the issue of obtaining maximum efficiency of energy resources used at different levels of management-in communities, including in the domestic sector of economy. Energy-saving behavior of communities is a constant focus for worldwide researchers. Among recent significant works, studies of energy-saving behavior of urban and rural communities by Wang et al. (2022), Owusu-Manu et al. (2022), Du et al. (2022), Zou and Mishra, (2020) outstand. Furthermore, Never et al. (2022), Kuai et al. (2022), Ergöz Karahan et al. (2021), Mi et al. (2020), and Brătucu et al. (2019) investigate energy-saving behavior of households. Energy-saving behavior of communities is given interregional and regional research in the works by Owusu-Manu et al. (2022), Wang and Watanabe, (2020), Valerio-Ureña and Rogers, (2019), and Kaya et al. (2019).

2.3. Factors Affecting Energy-saving Behavior

Ding et al. (2017) examined the factors affecting consumer behavior in relation to energy conservation in the Chinese province. The authors would divide this behavior into two directions: consumer choice when buying and daily use.

Three groups of variables were identified as factors affecting consumer behavior:

1. Individual features of people: Energy conservation knowledge; environmental situation knowledge; a sense of responsibility for the environmental situation; willingness to sacrifice own comfort to save energy; exposure to the influence of the group; habits.
2. Situational factors: energy conservation promotion, education and public awareness; energy prices; availability of energy-saving technologies.
3. Socio-demographic factors: gender; age; marital status; education; family type; income, etc.

The following hypothesis was put forward: As far as energy conservation goes, city and village residents behave differently. The authors came to the following conclusion: Urban residents are more economical in terms of energy consumption. This is due to the fact that they are more responsible about the environment; their knowledge about energy conservation is higher, consumer habits are better. Moreover, it is noted that energy saving propaganda has a negative effect on villagers. The authors explained this by the unwillingness of people to tolerate teachings of others.

Results of the study by Ding et al. (2017) appear significant and relevant for analyzing the shaping energy-saving behavior in education system.

2.4. Prospects of Research in Shaping Energy-saving Behavior

As things stand, one of important elements in shaping energy-saving behavior is beliefs of which people or things will be exposed to deteriorating environmental conditions and whether there are actions that could alleviate this threat. Energy Education company's website[1] lists motives pushing people to energy conservation. These include the following: demonstrating care for society; environmental protection and saving financial resources; performing the role model function-demonstrating social responsibility to the loved ones; engaging in meaningful, necessary work.

Formation of these motivational factors will be significantly facilitated by the following set of measures within education and upbringing system:

- Implementation of state policy,
- Shaping consumer behavior,
- Implementation of educational programs, and
- Providing the population with reliable information on energy conservation.

1 Energy Education. Website URL: http://www.energyeducation.ca/

3. MATERIALS AND METHODS

3.1. Systematic Review

Systematic review and meta-analysis lead the hierarchy of evidence on which evidential economics is based. These are integrative, unifying analytical methods that include the most complete and reliable information on specific issue under consideration.

Unlike conventional literature reviews, systematic reviews are conducted in accordance with a strict methodology that reduces the likelihood of systematic error. The main purpose of this type of reviews is a balanced and impartial study of the results of previously performed studies.

The main requirement is an analysis of all original qualitative research devoted to a particular issue. The total effect established on the basis of the results of all the studies reviewed is given a quantitative assessment using meta-analysis.

Systematic review stages:

1. Planning of the study, during which the following is determined:
   - Purpose of the proposed meta-analysis,
   - Research selection criteria,
   - Statistical analysis method, and
   - Data search methodology.
2. Searching for information, which includes all adequate studies on the problem under review. Various databases (Scopus, WoS, etc.) and articles and references in various publications are used for this.
3. Selection of studies on the basis of predetermined fundamental criteria, subsequent changes of which are not permitted.

3.2. Research Questions

Table 1 shows four research questions set to analyze shaping energy-saving behavior in education system.

3.3 Search Process

Research results have been given a systematic review according to the PRISMA 2020 criteria.

In 2020, requirements for a systematic review and presenting its results have been updated. A detailed description of the updated methodology of systematic review is presented in the PRISMA 2020 protocol (PRISMA – The Preferred Reporting Items for Systematic Reviews and Meta-Analyses). This manual defines an algorithm for creating a systematic review in accordance with a checklist of 27 control points with their detailed descriptions and examples of their accounting/compliance both when creating a review and its qualitative assessment. For the researchers' convenience, the creators of PRISMA 2020's updated version offered convenient online forms (https://www.prisma-statement.org/PRISMAStatement/Checklist), which can be filled in when creating a systematic review and meta-analysis to check completeness and accuracy of the latter and to ensure uniformity of the format for presenting the results.

Publications were searched across Web of Science and Scopus databases hereinafter referred to as databases.

The following keywords were used to search for data: Education, Energy-saving behavior. Table 2 shows the search strings.

3.4 Inclusion and Exclusion Criteria

Search protocol and recommendations for the selection and evaluation of relevant studies were developed as follows:

3.4.1. Search resources

Scopus database and Web of Science database.

3.4.2. Categories and keywords

("Education"), ("Energy-saving behavior").

3.4.3. Inclusion criteria

- Time frame: 2019 to 2023.
- Document type: Article.
- Source type: Journal.
- Publication Stage: Final.
- Subject area: Energy, Environmental Science, Social Sciences, Business, Management and Accounting, Economics, Econometrics and Finance.
- Language: English.

3.4.4. Exclusion criteria

Conference and proceedings, Review papers, books; duplicate.

3.5. Data Selection and Extraction Process

Figure 1 shows a step-by-step algorithm for finding studies that correspond to the review topic.

Table 1: Research Topics and Questions (RQ) (Own Development)

Themes	Research Questions (RQ)	Possible Answers Based on Literature
Characteristics of published articles on shaping of energy-saving behavior in education system	RQ1. How many studies have been contained in the Scopus and WoS since 2019 and what direction are they taking? RQ2. How are research keywords related?	Article IDs and links. Number of Scopus and WoS articles between 2019 and 2023
Analysis of shaping of energy-saving behavior in education system	RQ3. What factors affect energy-saving behavior? RQ4. What are the important prospects in research of shaping energy-saving behavior?	1. Individual characteristics of people 2. Situational factors 3. Socio-demographic factors (Ding et al. (2017)) - State policy, -Consumer behavior, - Educational programs, - Information (Own development)

Databases were searched for articles, then data was extracted. Further on, data was entered into the Excel database. As a result, 136 studies were found in databases, of which 40 in WoS and 96 in Scopus. Data extracted from each article included the author(s), publication title, abstract, keywords, database, publication year, and journal title.

Ten duplicate articles were identified and immediately excluded from the Excel database leaving us with 126 articles. After selection on inclusion criterion (the title, abstract, or keywords have to contain the words Education and Energy-saving behavior), a final total of 119 articles were selected for systematic review. Figure 1 shows differentiation based on the PRISMA method.

4. RESULTS

RQ1. How many studies have been contained in the Scopus and WoS since 2019 and what direction are they taking?

We have analyzed the journals and their publication years (Tables A1 and A2 of the Appendix).

The analyzed articles have been published between 2019 and 2023. Selected analyzed period is associated with COVID-19 pandemic and identification of trends in research on shaping energy-saving behavior in education system in the post-COVID period. The largest number of 37 articles has been published in 2022, followed by 2020 with 29 articles and 2021 with 28 articles. Only 19 publications on our research topic have been published in 2019. As of March 2023, seven articles were found in two databases. This indicates the increasing attention of scientists to research issues of energy-saving behavior and identification of the role of education in this process.

Table 2: Search strings used in databases

Web of Science (WoS)	Scopus
(TS=("Education")) AND TS=(energy-saving behavior)	TITLE-ABS-KEY (“Energy-saving behavior”) AND (“Education”)

Figure 2 shows the number of articles on the research topic published in identified journals.

The largest number of articles on the research topic have been published in the following journals: Sustainability (14), Energies (9), Energy Policy (9), Journal of Cleaner Production (8), Energy Research and Social Science (8), International Journal of Sustainability in Higher Education (3), International Journal of Environmental Research and Public Health (3). Two articles have been found in the following journals: International Journal of Renewable Energy Development, Environmental Education Research, Energy Research and Social Science, Resources, Conservation and Recycling, Management of Environmental Quality: An International Journal, Journal of Turkish Science Education, Energy Economics. Other journals have published one publication each.

All analyzed articles investigate issues of energy-saving behavior.

Using Microsoft Excel, we grouped all studies into three levels: school, university, and community (Figure 3).

The largest number of articles, 92 (or 77%) of the identified 119 focus on exploring energy-saving behavior at the community level. Articles A4, A18, A20, A24, A26, A29, A37, A44, A48,

Figure 1: Selection process (PRISMA based on Haddaway et al. (2022))

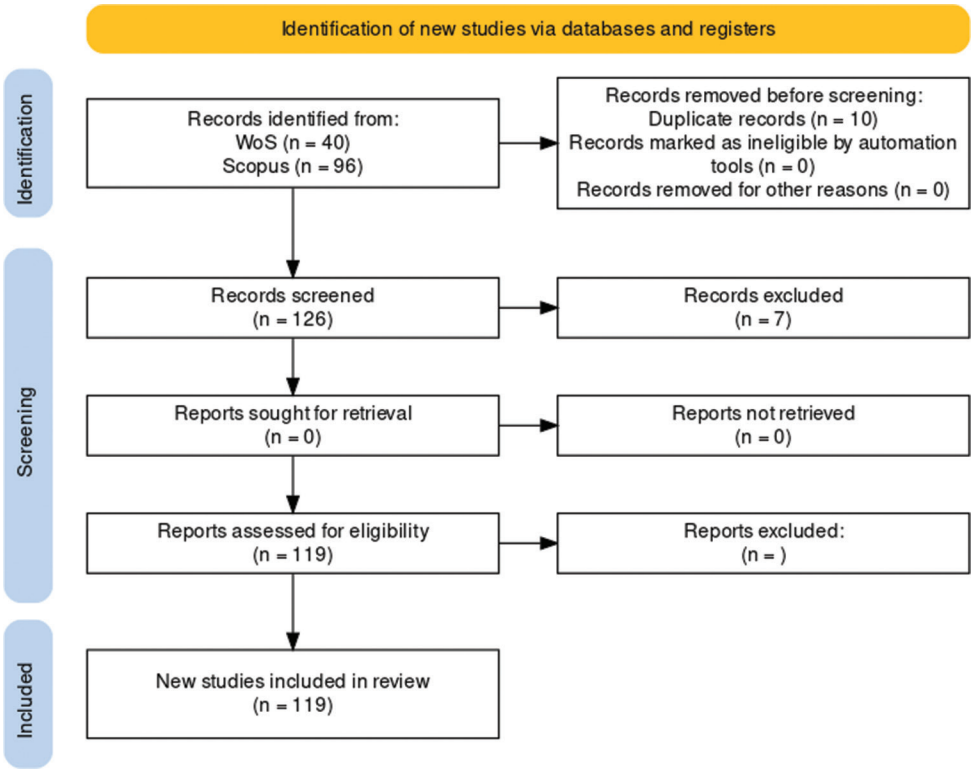


Figure 2: Journals and number of articles on the research topic

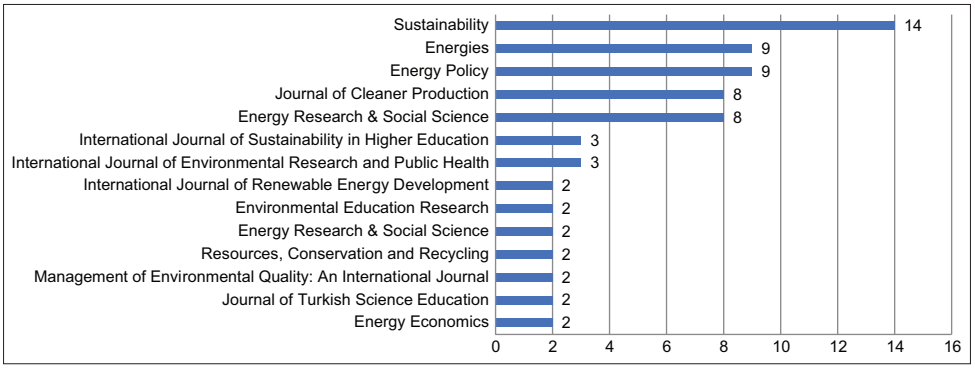
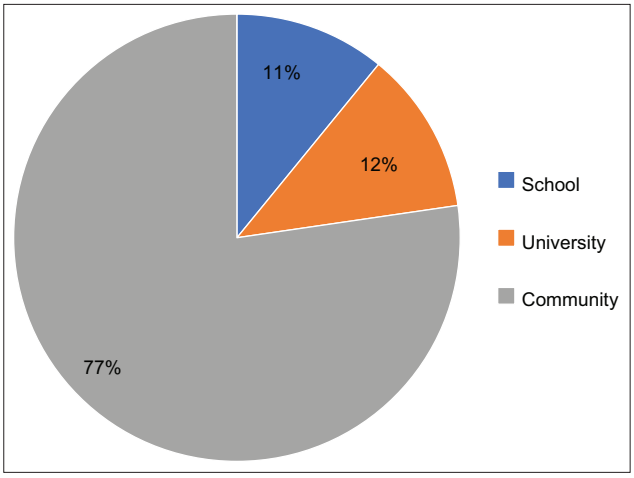


Figure 3: Share of research by school, university and community levels



A51, A63, A67, A71, A79, A82, A85, A91, A97, A113, and A117 study energy-saving behavior of urban and rural communities. Articles A5, A7, A9, A11, A31, A45, A49, A53, A54, A57, A60, A61, A68, A69, A71, A72, A73, A77, A86, A92, A93, A94, A103, A108, and A112 investigate energy-saving behavior of households. Articles A16, A24, A31, A39, A43, A62, A67, A68, A90, A103, A111, A113, and A117 conduct interregional and regional studies of energy-saving behavior of communities.

14 articles (or 12%) of the identified 119 aim at studying energy-saving behavior among university students. These articles include A1, A10, A13, A14, A17, A28, A32, A47, A58, A65, A87, A101, A106, and A115.

Only 13 articles (or 11%) of the identified 119 focus on shaping energy-saving behavior of schoolchildren (Paper IDs: A2, A3, A6, A8, A12, A15, A22, A23, A25, A34, A39, A52, and A85).

RQ2. How are research keywords related?

The study analyzes keywords in the articles under review, shown in Figure 4. For this purpose, we used VOSviewer, a software for building and visualizing bibliometric networks.

Results of the program analysis of articles found let us identify the following six large clusters: red, green, blue, purple, yellow, and blue. Red (energy efficiency, climate education, community, education for sustainable development, energy consumption, energy literacy, energy rebound effect, energy transition, higher education, management) we like to conventionally call Energy Literacy; green (behavior, electricity consumption, households, Industry 4.0, literacy) is Energy Efficiency; blue (awareness and engagement, curriculum, energy-efficient product, green purchasing, schools, student participation, sustainable energy consumption) is formed by keywords that allow articles to be classified as Energy Saving; a group of terms colored yellow (awareness, education, energy saving culture, social marketing) is designated as Energy Conversation; articles from the purple cluster (endogenous problems, environmental awareness, income, sustainable society) we conditionally titled Energy Saving Behavior; and light blue (bioeconomy, consumer behavior, school environment) combines research on renewable energy issues.

Visualization like this clearly demonstrates that, generally, results of studies of shaping energy-saving behavior at the school and university levels were least actively published.

RQ3. What factors affect energy-saving behavior?

Figure 5 systematizes factors affecting energy-saving behavior at three levels: school, university, and community.

64 articles suggest that at the community level, individual factors have the greatest impact on energy-saving behavior (Paper IDs: A19, A20, A21, A30, A31, A33, A35, A37, A41-A46, A48-A51, A54-A56, A59-A64, A66, A67, A69-A84, A89-A91, A93-A95, A97-A100, A102, A104-A107, A109, A112-A114, A116, and A118). These are followed by 20 articles suggesting socio-demographic factors (Paper IDs: A4, A5, A7, A9, A11, A16, A18, A24, A26, A29, A36, A38, A40, A53, A68, A86, A92, A103, A117, and A119). 8 articles propose situational factors as having the least influence on energy-saving behavior at the community level (Paper IDs: A27, A57, A88, A96, A105, A108, A110, and A111).

10 articles put forth situational factors as the ones having the greatest influence on energy-saving behavior of students at the university level (Paper IDs: A1, A10, A13, A14, A32, A47, A65, A101, A106, and A115). Individual factors have the least influence in 4 articles (Paper IDs: A17, A28, A58, and A87).

Figure 4: Research keywords and their relationship

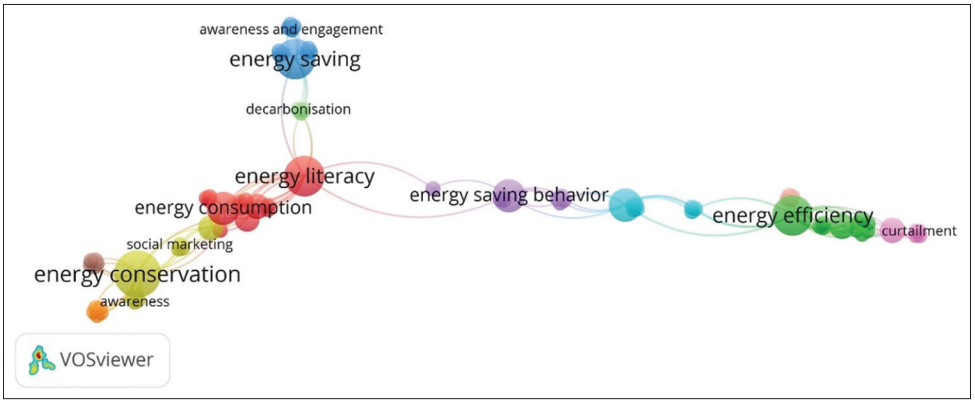


Figure 5: Factors affecting energy-saving behavior

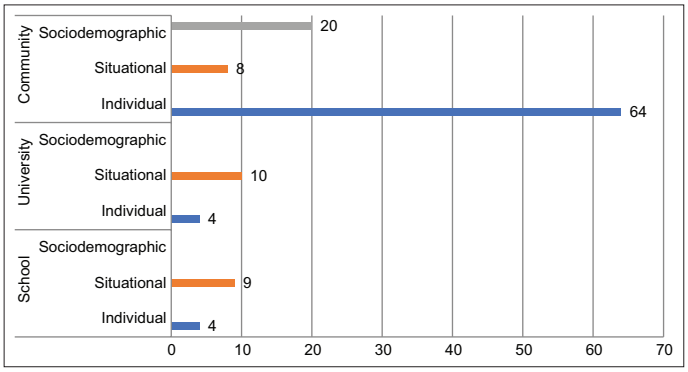
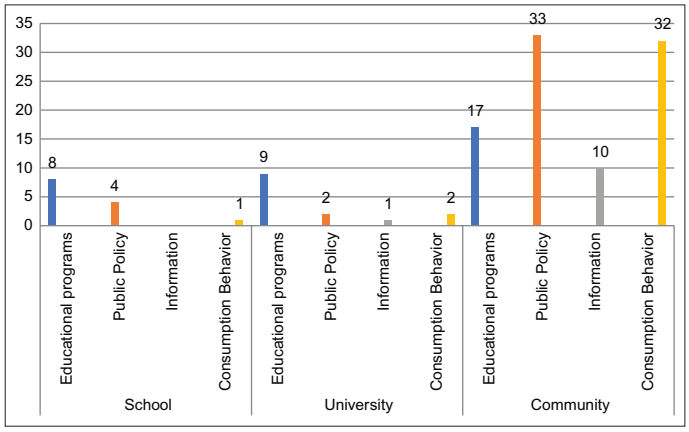


Figure 6: Energy-saving behavior shaping research prospects



At the school level, situational factors have the greatest impact on the energy-saving behavior of schoolchildren in 9 articles (Paper IDs: A3, A6, A12, A15, A23, A25, A34, A39, and A85). 4 articles suggest that individual factors have the least influence (Paper IDs: A2, A8, A22, and A52).

It is noteworthy that socio-demographic factors are not the subject of research from the analyzed articles at the school and university levels.

RQ4. What are the important prospects in research of shaping energy-saving behavior?

Figure 6 shows the main prospects in research of shaping of energy-saving behavior.

Indicatively, at the community level, important prospects in shaping energy-saving behavior are as follows:

- Public Policy-33 studies (Paper IDs: A18, A26, A27, A37, A38, A43, A48-A50, A55, A56, A62, A63, A67, A68, A70, A71, A73-A76, A79, A80, A92-A95, A97, A105, A110, A116-A118).
- Consumer Behavior-32 studies (Paper IDs: A9, A11, A16, A35, A36, A40-A42, A45, A46, A53, A59, A60, A64, A66, A69, A72, A77, A78, A81, A83, A84, A86, A89, A90, A100, A102, A103, A107, A109, A112, A119).
- Educational Programs-17 studies (Paper IDs: A19, A20, A21, A24, A29, A30, A51, A57, A88, A91, A96, A98, A99, A104, A108, A113, A114).
- Information-10 studies (Paper IDs: A4, A5, A7, A31, A33, A44, A54, A61, A82, A111).

At the university level, prospects for shaping energy-saving behavior are as follows: Educational Programs-9 studies (Paper IDs: A1, A10, A13, A14, A17, A32, A65, A101, A106), Public Policy (Paper IDs: A28, A115) and Consumer Behavior (Paper IDs: A58, A87)-two studies each. Only one study (A47) highlights Student Awareness as prospect for shaping energy-saving behavior.

At the school level, 8 studies highlight Development of Educational Programs as a prospect in shaping energy-saving behavior of schoolchildren (Paper IDs: A6, A12, A15, A23, A25, A34, A39, A85). Also highlighted as prospects are: Implementation of Public Policy-4 studies (Paper IDs: A2, A3, A22, A52) and Shaping Consumer Behavior (Paper ID: A8).

5. DISCUSSION

This paper systematically reviewed 119 WoS and Scopus scientific papers allowing us to determine the levels, factors of influence and prospects in research of shaping energy-saving behavior in education system. Generally, the studied papers present successful cases of shaping energy-saving behavior at three levels: school, university, and community. The largest number of studies (77%) aim to study energy-saving behavior at the community level. The

smallest number of analyzed papers focus on studying shaping energy-saving behavior among university students (12%) and schoolchildren (11%). In this regard, the results obtained correlate with Iwasaki (2022), Ng and Cheung (2022), and Bahrami and Mohammadi (2021) who note a lack of scientific research of energy-saving behavior among schoolchildren and students. The researchers also note the low level of students' energy production knowledge, although they are aware of energy-saving behavior, and they show a relatively good attitude towards energy conservation issues. VOSviewer keyword analysis has shown that, in general, the results of studies on shaping energy-saving behavior at the school and university levels have been published least actively.

The paper considers main factors affecting energy-saving behavior, namely, individual, situational, and socio-demographic factors. At the community level, individual factors have the greatest impact on energy-saving behavior, followed by socio-demographic and situational factors. At the university and school level, it is situational and individual factors that have the greatest impact on the energy-saving behavior of students. We can conclude that energy-saving behavior of individuals depends on finding the right combination of intervention types based on the analysis of causal variables, as well as on how energy-saving incentives fit into the system of personal interests, e.g., which people or things will be affected as a result of environmental degradation. Wang et al (2022), Never et al (2022), Du et al (2021), and Ding et al (2017) confirm this and note lifestyle requirements imposed more by individual choice or preferences than by society as a considerable barrier to implementation of energy-efficient practices. It is interesting to note that energy saving issues are particularly acute for economic entities of energy-producing regions. Continuing the current course on development of costly and environmentally complex deposits, simultaneous engagement in energy conservation appears impossible.

The main prospects in research of shaping energy-saving behavior are as follows:

- At the community level: implementation of the state policy on energy conservation, shaping of consumer behavior, introduction of energy conservation educational programs, wide public awareness on energy conservation issues;
- At the university and school levels, as prospects for shaping energy-saving behavior of students we can identify development of educational programs, implementation of state policy on energy conservation, creation of energy conservation issues awareness.

It is obvious that today energy conservation education is not significantly included in the basic educational program at schools and universities (Keller et al. (2022); Ilham et al. (2022); Correia et al. (2022)). This education direction is either ignored or considered as an addition to the programs and must prove its inclusion in the learning process. It is worth noting that it is necessary to distinguish between energy-saving intentions and environmental impact. If we are to achieve a change in the current situation regarding energy use, we need to instill within schools and universities not only a proper attitude towards energy conservation, but also teach specific practices in this regard.

6. CONCLUSION

Like all other industries, COVID-19 pandemic has affected the energy sector worldwide. While the short-term effects had minimal side effects in the absence of any reported power outages, the sector experienced severe demand side effects due to the rapid decline in economic activity. In addition, coronavirus pandemic may have a significant long-term impact on the development of global energy due to reassessment of traditional concepts, such as the role of government and education in the energy sector, energy security, climate change, and shaping of energy-saving behavior.

The results of the study allow us to state that research show a contradiction between the importance of energy conservation declared at the official level and the low scale of population's involvement in this process, especially at the university and school levels. Socio-demographic factors affecting the intensity of energy-saving behavior include age and financial situation. Young people are among the categories who practice energy-saving behavior relatively rarely, which actualizes the need for activities aimed at forming ideas among young people about the importance and necessity of the energy saving process.

Productivity of personality-oriented education is affected by educational and spatial environment in which professional and educational process is carried out. Shaping of energy-saving behavior among young people can be ensured through the development and application of interactive educational complexes that allow for direct control of the course of practical training, realistic simulation of situations and working out tasks focused on energy conservation.

The task of forming energy-saving behavior among young people requires compliance with the principle of educational environment ecoconformity, whose key component, we believe, should be quality and energy management. In addition to optimizing the system itself, quality management development in education system and energy management is associated with involvement of all educational process participants in the energy management process. The first step towards understanding the goals and principles of energy efficiency policy is transparency of energy consumption, education quality, openness of information for students and teachers of an educational institution, and participation of students in monitoring electricity consumption.

In conclusion, we would like to note that the analysis of scientific papers over the past 5 years shows that education system is the most important tool for overcoming barriers to energy-saving behavior and forming required motivation. It is the teacher, a mentor who is the translator of ethical norms, values and knowledge underlying the student's behavior. Organization of systematic, comprehensive work on shaping energy-saving behavior among young people contributes to the improvement of ecological culture and implementation of state policy for energy conservation and energy efficiency.

The value of the research consists in identifying scientific literature trends in shaping of energy-saving behavior for students,

professional communities, and decision makers interested in energy conservation and efficiency. Results of the study confirm the need for further research of shaping of energy-saving behavior at the university and school levels. This further research could take the following directions:

a. A detailed and complete study of factors affecting energy-saving behavior of university and school students,
b. Implementation of educational programs in the field of energy conservation, and/or
c. Development of a quality management system in education and energy management system.

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Zou, B., Mishra, A.K. (2020), Appliance usage and choice of energy-efficient appliances: Evidence from rural Chinese households. Energy Policy, 146, 111800.

APPENDIX

Table A1: Journals of analyzed papers

Identificator	APA
A1	Zhao, S., Song, Q., Wang, C. (2019), Characterizing the energy-saving behaviors, attitudes and awareness of university students in Macau. Sustainability, 11(22), 6341.
A2	Ntanos, S., Kyriakopoulos, G.L., Anagnostopoulos, T., Xanthopoulos, T., Kytagias, C., Drosos, D. (2022), Investigating the environmental and the energy saving behavior among school principals through classification algorithms. International Journal of Renewable Energy Development, 11(2), 449-461.
A3	Lee, Y.F., Nguyen, H.B.N., Sung, H.T. (2022), Energy literacy of high school students in Vietnam and determinants of their energy-saving behavior. Environmental Education Research, 28(6), 907-924.
A4	Wang, J., Li, Y., He, Z., Gao, J., Wang, J. (2022), Scale framing, benefit framing and their interaction effects on energy-saving behaviors: Evidence from urban residents of China. Energy Policy, 166, 113005.
A5	Kuai, P., Zhang, X., Zhang, S., Li, J. (2022), Environmental awareness and household energy saving of Chinese residents: Unity of knowing and doing or easier said than done? Journal of Asian Economics, 82, 101534.
A6	Wan Hussain, W.N.H., Halim, L., Chan, M.Y., Abd Rahman, N. (2021), Predicting energy-saving behaviour based on environmental values: An analysis of school children's perspectives. Sustainability, 13(14), 7644.
A7	Mi, L., Qiao, L., Gan, X., Xu, T., Lv, T., Qiao, Y., Ding, C. (2020), Assessing the effect of non-financial information intervention on promoting group-level energy savings. Science of The Total Environment, 720, 137533.
A8	Dumciuviene, D., Cibinskiene, A., Andrijauskiene, M. (2019), Determinants of energy saving: Evidence from a vocational school in Greece. Energies, 12(19), 3647.
A9	Ergöz Karahan, E., Göçer, Ö., Göçer, K., Boyacıoğlu, D. (2021), An investigation of occupant energy-saving behavior in vernacular houses of Behramkale (Assos). Sustainability, 13(23), 13476.
A10	Iordache Platis, M., Romanowicz, J. (2020), Integrating energy saving awareness into student engagement-based teaching and learning process. Sustainability, 12(22), 9626.
A11	Liu, X., Wang, Q., Wei, H.H., Chi, H.L., Ma, Y., Jian, I.Y. (2020), Psychological and demographic factors affecting household energy-saving intentions: A TPB-based study in Northwest China. Sustainability, 12(3), 836.
A12	Zerinou, I., Karasmanaki, E., Ioannou, K., Andrea, V., Tsantopoulos, G. (2020), Energy saving: Views and attitudes among primary school students and their parents. Sustainability, 12(15), 6206.
A13	Franco, D., Macke, J., Cotton, D., Paço, A., Segers, J.P., Franco, L. (2022), Student energy-saving in higher education tackling the challenge of decarbonisation. International Journal of Sustainability in Higher Education, 23(7), 1648-1666.
A14	Wee, S.C., Choong, W.W. (2019), Gamification: Predicting the effectiveness of variety game design elements to intrinsically motivate users' energy conservation behaviour. Journal of Environmental Management, 233, 97-106.
A15	Drosos, D., Kyriakopoulos, G.L., Ntanos, S., Parissi, A. (2021), School managers perceptions towards energy efficiency and renewable energy sources. International Journal of Renewable Energy Development, 10(3), 573-584.
A16	Wang, L., Watanabe, T. (2020), Does haze drive pro-environmental and energy conservation behaviors? Evidence from the Beijing-Tianjin-Hebei area in China. Sustainability, 12(23), 9972.
A17	Ortega Lasuen, U., Ortuzar Iragorri, M.A., Diez, J.R. (2020), Towards energy transition at the Faculty of Education of Bilbao (UPV/EHU): diagnosing community and building. International Journal of Sustainability in Higher Education, 21(7), 1277-1296.
A18	Ali, G., Yan, N., Hussain, J., Xu, L., Huang, Y., Xu, S., Cui, S. (2019), Quantitative assessment of energy conservation and renewable energy awareness among variant urban communities of Xiamen, China. Renewable and Sustainable Energy Reviews, 109, 230-238.
A19	Khoo, C.K., Li, X., Huang, J. (2022). Green behaviors and green buildings: A post-occupancy evaluation of public housing estates in Hong Kong. Sustainability, 14(16), 9862.
A20	Du, Q., Han, X., Li, Y., Li, Z., Xia, B., Guo, X. (2021). The energy rebound effect of residential buildings: Evidence from urban and rural areas in China. Energy Policy, 153, 112235.
A21	Caldwell, K.A., Vaughn, L.A., Harrod, E., Harrod, J. (2019), Social Marketing–Enhanced Home Energy Education Encourages Adoption of Energy-Saving Practices. The Journal of Extension, 57(5), 11.
A22	Wang, J., Long, R., Chen, H., Li, Q. (2022), How do parents and children promote each other? The impact of intergenerational learning on willingness to save energy. Energy Research and Social Science, 87, 102465.
A23	Iwasaki, S. (2022), Effects of environmental education on young Children's water-saving behaviors in Japan. Sustainability, 14(6), 3382.
A24	Owusu-Manu, D.G., Quaigrain, R.A., Edwards, D.J., Hammond, M., Hammond, M., Roberts, C. (2022), Energy conservation literacy among households in Sub-Sahara Africa. International Journal of Energy Sector Management, 16(6), 1130-1149.
A25	Ilham, Z., Zulkifli, N.E.I., Ismail, N.F., Danik, A.S., Abdul Halim-Lim, S., Wan-Mohtar, W.A.A.Q.I., Jamaludin, A.A. (2022), Energy conservation: awareness analysis among secondary school students. Environmental Education Research, 28(6), 925-947.
A26	Zou, B., Mishra, A.K. (2020), Appliance usage and choice of energy-efficient appliances: Evidence from rural Chinese households. Energy Policy, 146, 111800.
A27	Fawehinmi, O., Yusliza, M.Y., Ogbeibu, S., Tanveer, M.I., Chiappetta Jabbour, C.J. (2022), Academic employees' green behaviour as praxis for bolstering environmental sustainable development: A linear moderated mediation evaluation. Business Strategy and the Environment, 31(7), 3470-3490.

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Table A1: ***(Continued)***

Identificator	APA
A28	Correia, E., Sousa, S., Viseu, C., Leite, J. (2022), Using the theory of planned behavior to understand the students' pro-environmental behavior: A case-study in a Portuguese HEI. International Journal of Sustainability in Higher Education, 23(5), 1070-1089.
A29	Twerefou, D.K., Abeney, J.O. (2020), Efficiency of household electricity consumption in Ghana. Energy Policy, 144, 111661.
A30	Minelgaitė, A., Liobikienė, G. (2021), Changes in pro-environmental behaviour and its determinants during long-term period in a transition country as Lithuania. Environment, Development and Sustainability, 23, 16083-16099.
A31	Brătucu, G., Constantin, C.P., Chițu, I.B., Grădinaru, E., Dovleac, L. (2019), Approaching the bioeconomy in terms of increasing the energy efficiency of households in Romania. The Amfiteatru Economic Journal, 21, 90-104.
A32	Gródek-Szostak, Z., Malinowski, M., Suder, M., Kwiecień, K., Bodziacki, S., Vaverková, M.D., Niemiec, M. (2021), Energy conservation behaviors and awareness of Polish, Czech and Ukrainian students: A case study. Energies, 14(18), 5599.
A33	Lundberg, D.C., Tang, J.A., Attari, S.Z. (2019), Easy but not effective: Why "turning off the lights" remains a salient energy conserving behaviour in the United States. Energy Research and Social Science, 58, 101257.
A34	Keller, L., Riede, M., Link, S., Hüfner, K., Stötter, J. (2022), Can education save money, energy, and the climate?-Assessing the potential impacts of climate change education on energy literacy and energy consumption in the light of the EU energy efficiency directive and the Austrian energy efficiency act. Energies, 15(3), 1118.
A35	Kreczmańska-Gigol, K., Gigol, T. (2022), The impact of consumers' green skepticism on the purchase of energy-efficient and environmentally friendly products. Energies, 15(6), 2077.
A36	Zagonari, F. (2021), Foreign direct investment vs. cross-border trade in environmental services with ethical spillovers: A theoretical model based on panel data. Journal of Environmental Economics and Policy, 10(2), 130-154.
A37	Jiang, A., Zhong, Q., Wang, Y., Ao, Y., Chen, C. (2021). Influencing factors of commercial energy consumption intention of rural residents: Evidence from rural Chengdu. Energies, 14(4), 1010.
A38	Lin, C., Gao, Y., Huang, J., Shi, D., Feng, W., Liu, Q., Du, X. (2020), A novel numerical model for investigating macro factors influencing building energy consumption intensity. Sustainable Production and Consumption, 24, 308-323.
A39	Ng, P.M.L., Cheung, C.T.Y. (2022), Why Do Young People Do Things for the Environment? The Effect of Perceived Values on Pro-Environmental Behaviour. United Kingdom: Young Consumers.
A40	Zhao, S., Duan, W., Zhao, D., Song, Q. (2022), Identifying the influence factors of residents' low-carbon behavior under the background of "Carbon Neutrality": An empirical study of Qingdao city, China. Energy Reports, 8, 6876-6886.
A41	Wang, Q. C., Lou, Y. N., Liu, X., Jin, X., Li, X., Xu, Q. (2023), Determinants and mechanisms driving energy-saving behaviours of long-stay hotel guests: Comparison of leisure, business and extended-stay residential cases. Energy Reports, 9, 1354-1365.
A42	Hamouri, B. (2023), Predicting energy-saving behavior in Saudi Arabia using theory of planned behavior. Uncertain Supply Chain Management, 11(1), 21-30.
A43	Long, R., Wang, J., Chen, H., Li, Q., Wu, M., Tan-Soo, J.S. (2023), Applying multilevel structural equation modeling to energy-saving behavior: The interaction of individual-and city-level factors. Energy Policy, 174, 113423.
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A46	Li, H., Wang, Z.H., Zhang, B. (2023), How social interaction induce energy-saving behaviors in buildings: Interpersonal and passive interactions vs public and active interactions. Energy Economics, 106515.
A47	Duong, C.D. (2023), Using a unified model of TPB, NAM and SOBC to understand students' energy-saving behaviors: moderation role of group-level factors and media publicity. International Journal of Energy Sector Management, (ahead-of-print).
A48	Du, S., Liu, G., Li, H., Zhang, W., Santagata, R. (2022), System dynamic analysis of urban household food-energy-water nexus in Melbourne (Australia). Journal of Cleaner Production, 379, 134675.
A49	Ceylan, R., Özbakır, A. (2022), Increasing Energy Conservation Behavior of Individuals towards Sustainable and Energy-Efficient Communities. Smart Cities, 5(4), 1611-1634.
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A53	Verachtert, S. (2022), The effects of attitudes on household energy behavior. A study of climate change concern, responsibility, and awareness in European societies. Social Science Quarterly, 103(5), 1221-1233.
A54	Fatoki, O. (2022), Determinants of Household Energy Saving Behaviour: An Application of the Goal Framing Theory. Planning, 17(5), 1621-1628.
A55	Shen, M., Li, X., Song, X., Lu, Y. (2022), Linking personality traits to behavior-based intervention: Empirical evidence from Hangzhou, China. Environmental Impact Assessment Review, 95, 106796.
A56	Pop, R.A., Dabija, D.C., Pelău, C., Dinu, V. (2022), Usage intentions, attitudes, and behaviors towards energy-efficient applications during the COVID-19 pandemic. Journal of Business Economics and Management, 23(3), 668-689.
A57	Never, B., Kuhn, S., Fuhrmann-Riebel, H., Albert, J.R., Gsell, S., Jaramillo, M., Sendaza, B. (2022), Energy saving behaviours of middle class households in Ghana, Peru and the Philippines. Energy for Sustainable Development, 68, 170-181.
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Table A1: ***(Continued)***

Identificator	APA
A59	Akhound, A., Rizvi, A.M., Ahmed, W., Khan, M.N. (2022), Understanding intentions to reduce energy consumption at the workplace by the employees: case of a developing country. Management of Environmental Quality: An International Journal, 33(2), 166-184.
A60	Lam, T.W.L., Tsui, Y.C.J., Fok, L., Cheung, L.T.O., Tsang, E.P.K., Lee, J.C.K. (2022), The influences of emotional factors on householders' decarbonizing cooling behaviour in a subtropical Metropolitan City: An application of the extended theory of planned behaviour. Science of The Total Environment, 807, 150826.
A61	Ruokamo, E., Meriläinen, T., Karhinen, S., Räihä, J., Suur-Uski, P., Timonen, L., Svento, R. (2022), The effect of information nudges on energy saving: Observations from a randomized field experiment in Finland. Energy Policy, 161, 112731.
A62	Perret, J.K., Udalov, V., Fabisch, N. (2022), Motivations behind individuals' energy efficiency investments and daily energy-saving behavior: The case of China. International Economics and Economic Policy, 19, 129-155.
A63	Duong, C.D. (2022), Cultural values and energy-saving attitude-intention-behavior linkages among urban residents: a serial multiple mediation analysis based on stimulus-organism-response model. Management of Environmental Quality: An International Journal, (ahead-of-print).
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A65	Wang, Y., Zhang, W. (2022), A study about the impact of energy saving climate on college students' energy saving behavior: based on analysis using the hierarchical linear model. Journal of Environmental Planning and Management, 1-19.
A66	Auzoult, L. (2022), Assessing the trans-situational consistency of pro-environmental energy-saving behavior (Evaluación de la consistencia inter-situacional de la conducta proambiental de ahorro energético). PsyEcology, 13(2), 103-138.
A67	Weckroth, M., Ala-Mantila, S. (2022), Socioeconomic geography of climate change views in Europe. Global Environmental Change, 72, 102453.
A68	Rainisio, N., Boffi, M., Pola, L., Inghilleri, P., Sergi, I., Liberatori, M. (2022), The role of gender and self-efficacy in domestic energy saving behaviors: A case study in Lombardy, Italy. Energy Policy, 160, 112696.
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A70	Shen, M., Li, X., Lu, Y., Cui, Q., Wei, Y.M. (2021), Personality-based normative feedback intervention for energy conservation. Energy Economics, 104, 105654.
A71	Zhang, J., Ma, L., Li, J. (2021), Why Low-Carbon Publicity Effect Limits? The Role of Heterogeneous Intention in Reducing Household Energy Consumption. Energies, 14(22), 7634.
A72	Fijnheer, J.D., van Oostendorp, H., Giezeman, G.J., Veltkamp, R.C. (2021), Competition in a household energy conservation game. Sustainability, 13(21), 11991.
A73	Liu, X., Wang, Q.C., Jian, I.Y., Chi, H.L., Yang, D., Chan, E.H.W. (2021), Are you an energy saver at home? The personality insights of household energy conservation behaviors based on theory of planned behavior. Resources, Conservation and Recycling, 174, 105823.
A74	Tverskoi, D., Xu, X., Nelson, H., Menassa, C., Gavrilets, S., Chen, C.F. (2021), Energy saving at work: Understanding the roles of normative values and perceived benefits and costs in single-person and shared offices in the United States. Energy Research and Social Science, 79, 102173.
A75	Xie, C., Ding, H., Zhang, H., Yuan, J., Su, S., and Tang, M. (2021), Exploring the psychological mechanism underlying the relationship between organizational interventions and employees' energy-saving behaviors. Energy Policy, 156, 112411.
A76	Zhu, J., Alam, M.M., Ding, Z., Ekambaram, P., Li, J., Wang, J. (2021), The influence of group-level factors on individual energy-saving behaviors in a shared space: The case of shared residences. Journal of Cleaner Production, 311, 127560.
A77	Xu, Q., Hwang, B.G., Lu, Y. (2021), Exploring the influencing paths of behavior-driven household energy-saving intervention-Household Energy Saving Option (HESO). Sustainable Cities and Society, 71, 102951.
A78	Jung, M., Cho, D., Shin, E. (2021), Repairing a cracked mirror: The heterogeneous effect of personalized digital nudges driven by misperception. Production and Operations Management, 30(8), 2586-2607.
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A81	Chen, C.H.V., Chen, Y.C. (2021), Assessment of Enhancing Employee Engagement in Energy-Saving Behavior at Workplace: An Empirical Study. Sustainability, 13(5), 2457.
A82	Xu, L., Francisco, A., Taylor, J.E., Mohammadi, N. (2021), Urban energy data visualization and management: Evaluating community-scale eco-feedback approaches. Journal of Management in Engineering, 37(2), 04020111.
A83	Sharma, S., Christopoulos, G. (2021), Caring for you vs. caring for the planet: Empathic concern and emotions associated with energy-saving preferences in Singapore. Energy Research and Social Science, 72, 101879.
A84	Shukla, P. (2021), The role of green marketing in energy conservation in the domestic sector. International Journal of Energy Economics and Policy, 11(1), 263-263.
A85	Bahrami, S., Mohammadi, Y. (2021), Assessing energy literacy of Iranian ninth-grade students. Journal of Turkish Science Education, 18(4), 707-731.
A86	Never, B., Albert, J.R.G. (2021), Unmasking the middle class in the Philippines: Aspirations, lifestyles and prospects for sustainable consumption. Asian Studies Review, 45(4), 594-614.
A87	Du, J., Pan, W. (2021), Examining energy saving behaviors in student dormitories using an expanded theory of planned behavior. Habitat international, 107, 102308.
A88	Cotton, D.R.E., Zhai, J., Miller, W., Dalla Valle, L., Winter, J. (2021), Reducing energy demand in China and the United Kingdom: The importance of energy literacy. Journal of Cleaner Production, 278, 123876.

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Table A1: ***(Continued)***

Identificator	APA
A89	Böckle, M., Novak, J., Bick, M. (2020), Exploring gamified persuasive system design for energy saving. Journal of Enterprise Information Management, 33(6), 1337-1356.
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A92	Shrestha, B., Bajracharya, S.B., Keitsch, M.M., Tiwari, S.R. (2020), Gender differences in household energy decision-making and impacts in energy saving to achieve sustainability: A case of Kathmandu. Sustainable Development, 28(5), 1049-1062.
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A94	Wang, Q.C., Wang, Y.X., Jian, I.Y., Wei, H.H., Liu, X., Ma, Y.T. (2020), Exploring the "Energy-saving personality traits" in the office and household situation: An empirical study. Energies, 13(14), 3535.
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A103	Vita, G., Ivanova, D., Dumitru, A., García-Mira, R., Carrus, G., Stadler, K., Hertwich, E.G. (2020), Happier with less? Members of European environmental grassroots initiatives reconcile lower carbon footprints with higher life satisfaction and income increases. Energy Research and Social Science, 60, 101329.
A104	Endrejat, P.C., Meinecke, A.L., Kauffeld, S. (2020), Get the crowd going: eliciting and maintaining change readiness through solution-focused communication. Journal of Change Management, 20(1), 35-58.
A105	Zhang, J., Li, M. (2020), The profit model design and development strategy of Industry 4.0 under the concept of green and low-carbon. International Journal of Technology Management, 84(3-4), 177-196.
A106	Alghamdi, A.K.H., El-Hassan, W.S. (2019), Saudi undergraduate students' needs of pedagogical education for energy literacy. Journal of Turkish Science Education, 16(4), 521-537.
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A108	Mulcahy, R., Russell-Bennett, R., and Iacobucci, D. (2020), Designing gamified apps for sustainable consumption: A field study. Journal of Business Research, 106, 377-387.
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A113	Zhao, X., Cheng, H., Zhao, H., Jiang, L., Xue, B. (2019), Survey on the households' energy-saving behaviors and influencing factors in the rural loess hilly region of China. Journal of Cleaner Production, 230, 547-556.
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A117	Kaya, O., Florkowski, W.J., Us, A., Klepacka, A.M. (2019), Renewable energy perception by rural residents of a peripheral EU region. Sustainability, 11(7), 2075.
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A119	Boomsma, C., Jones, R.V., Pahl, S., Fuertes, A. (2019), Do psychological factors relate to energy saving behaviours in inefficient and damp homes? A study among English social housing residents. Energy Research and Social Science, 47, 146-155.

Table A2: Years and journals of analyzed papers

Database/journals	Years					Total
	2019	2020	2021	2022	2023	
Scopus	11	20	20	21	7	79
Advances in Climate Change Research				1		1
Applied Energy			1			1
Asian Studies Review			1			1
Behavioral Sciences				1		1
Business Ethics: A European Review		1				1
Energies		2	1		1	4
Energy Economics			1		1	2
Energy Efficiency		1				1
Energy for Sustainable Development				1		1
Energy Policy	1		1	2	1	5
Energy Reports					1	1
Energy Research and Social Science	2	3	3			8
Environment, development and sustainability				1		1
Environmental Impact Assessment Review				1		1
Frontiers in Built Environment		1				1
Geo Journal of Tourism and Geosites				1		1
Global Environmental Change				1		1
Habitat international			1			1
International Economics and Economic Policy				1		1
International Journal of Energy Economics and Policy			1			1
International Journal of Energy Sector Management					1	1
International journal of environmental research and public health		2	1			3
International Journal of E-Services and Mobile Applications (IJESMA)		1				1
International Journal of Technology Management		1				1
Journal of Business Economics and Management				1		1
Journal of Business Research		1				1
Journal of Change Management		1				1
Journal of Cleaner Production	3	2	2	1		8
Journal of Enterprise Information Management		1				1
Journal of Environmental Engineering (Japan)		1				1
Journal of Environmental Planning and Management				1		1
Journal of Housing and the Built Environment	1					1
Journal of Management in Engineering			1			1
Journal of Turkish Science Education		1	1			2
Management of Environmental Quality: An International Journal				2		2
Planning				1		1
Production and Operations Management			1			1
PsyEcology				1		1
Resources, Conservation and Recycling	1		1			2
Science of The Total Environment				1		1
Simulation and Gaming	1					1
Smart Cities				1		1
Social Science Quarterly				1		1
Sustainability	2		2		1	5
Sustainable Cities and Society			1			1
Sustainable Development		1				1
Sustainable Energy Technologies and Assessments				1		1
Uncertain Supply Chain Management					1	1
WoS	7	9	8	16		40
Amfiteatru Economic	1					1
Business Strategy and the Environment				1		1
Energies	1		2	2		5
Energy Policy		2	1	1		4
Energy Reports				1		1
Energy Research and Social Science	1			1		2
Environment, development and sustainability			1			1
Environmental Education Research				2		2
International Journal of Energy Sector Management				1		1
International Journal of Renewable Energy Development			1	1		2
International Journal of Sustainability in Higher Education		1		2		3
Journal of Asian Economics				1		1

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Table A2: ***(Continued)***

Database/journals	Years					Total
	2019	2020	2021	2022	2023	
Journal of Environmental Economics and Policy			1			1
Journal of environmental management	1					1
Renewable and Sustainable Energy Reviews	1					1
Science of The Total Environment		1				1
Sustainability	1	4	2	2		9
Sustainable Production and Consumption		1				1
The Journal of Extension	1					1
Young Consumers				1		1
Grand total	18	29	28	37	7	119