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Front cover: Photo of a solar cooker in Farrington Daniels's
Direct Use of the Sun's Energy
(Yale University Press, 1964).

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THE INTERNATIONAL COMMITTEE FOR THE HISTORY OF TECHNOLOGY (ICOHTEC)

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ICOHTEC'S PRIZES

Each year ICOHTEC awards two prizes: the Turriano-ICOHTEC Book Prize and the Maurice Daumas Prize at the organisation's symposium in the summer of each year. The first is for the best original book-length work in any of the official ICOHTEC languages (English, French, German, Russian, or Spanish) in the history of technology: this includes published or unpublished PhD dissertations or other monographs written by scholars who, when applying for the prize, are not older than thirty-seven years. The second prize recognises the best article submitted which deals with the history of technology in any period of the past or in any part of the world and which was published in a journal or edited volume in the past two years.

The Turriano-ICOHTEC Book Prize

The jury of the 2024 Turriano-ICOHTEC Book Prize decided to split this year's prize between two high-quality contributions by early-career researchers, Jacob Ward and Francesco d'Amaro, for their monographs based on their PhD theses.

Jacob Ward was awarded the prize for his *Visions of a Digital Nation. Market and Monopoly in British Communications* (MIT Press, 2024). The book explores the intersection of political history, business history, and history of technology and the transformative role of predictive technologies in telecom management.

The ex-aequo prize was awarded to Francesco Amaro for his book *Antipatriotas del agua. Conflictos y grupos de interés en el Franquismo* (Antipatriots of water. Conflicts and interest groups during Francoism; Editorial Comares, 2022). Amaro's work is a major contribution to the social and political history of right-wing dictatorships in Southern Europe and the complexities of infrastructure development within an authoritarian regime.

Maurice Daumas Prize

The ICOHTEC Maurice Daumas Article Prize for the year 2024 was awarded to Adewumi Damilola Adebayo from York University, Toronto, Canada.
Adewumi Damilola Adebayo won the 2024 prize for his paper "Electricity, Agency and Class in Lagos Colony, c.1860s–1914," published in *Past & Present* 262, no. 1 (February 2024): 168–206.

This year's honourable mention was granted to Marcos Camolezi from Université Paris 1 Panthéon-Sorbonne for the article "'Si nous avions à construire un oiseau…': finalisme et dessin chez Étienne Œhmichen, 1884–1955," in *Dessiner la technique: Pensée et discours visuels (XVIe–XXe siècles)*, edited by Jérôme Baudry and Valérie Nègre, 197–227. Paris: Presses des Mines, collection *Histoire, sciences, techniques et sociétés*, 2024.

CONTENTS

ICON: Journal of the International Committee for the History of Technology 29, no 2 (2024): 60–87
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FORMATION OF A CULTURE OF FRUGAL ENERGY CONSUMPTION IN THE CONTEXT OF SOCIAL SECURITY

Alla Polyanska, Yuliya Pazynich, Oksana Petinova, Olha Nesterova, Natalia Mykytiuk, and Galina Bodnar

The article focuses on the philosophical aspects of the study of energy efficiency culture in the context of social security. Issues related to the culture of energy-saving consumption of energy resources are raised in the context of energy ethics as a subset of applied ethics, which is a branch of the philosophy of science. The study explores elements of social security and their importance in modern conditions, considering their relationship and dependence on the level of consumption of energy resources among the population. The relevance of the problem is substantiated with an analysis of the economic and social factors of energy consumption, in particular prices, which affect the level of social security and that of energy consumption. The conducted analysis is complemented by empirical research, involving 997 respondents from Ukraine, who today are found in different parts of the world. A philosophical reflection on the formation of frugal energy consumption behaviour emphasises that personal ethics, knowledge, and societal structures must be aligned to foster responsible energy use. The results highlight the need for both internal (personal development and awareness) and external factors (technical infrastructure and information support) in shaping the culture of energy-saving behaviour.

The article highlights the main components of the behaviour culture that should be considered in relation to energy consumption—namely, values, norms, and responsibility. A survey of respondents involved in activities related to the energy sector was carried out and factors influencing the formation of a culture of behaviour regarding energy consumption were determined, including knowledge and experience, readiness for changes, and interest in using innovative energy-saving technologies.

Introduction

In modern society, which is aimed at being integrated within the framework of the global economic system, significant socioeconomic transformations are taking place. Specific processes reveal problems in modelling the optimal behaviour of business entities at micro and macro levels. In the conditions of the formation of the global economic system, the philosophical problematisation of knowledge of man assumes a more central role, including the search for new forms and methods of study and their presentation in socially relevant contexts. The one used here is related to research into the formation of an energy efficiency culture in the context of social security.

Economics today is not an isolated area of knowledge or special scientific research. Despite the accuracy and formalisation of the conceptual apparatus, it cannot definitively exclude philosophy and sociality. Man is a socioeconomic phenomenon in a variety of subjects and interdisciplinary connections, and a study of the aspects of *homo economicus* contributes to the mutual enrichment of scientific discourses. Modern *homo economicus* is an independent subject of economic life, a rational participant in market relations who strives to maximise profit. The social image of such a person is a carrier of human relationships and thus it becomes a universal basis for harmonising perception of the world with objective realities.[1]

Science has become an integral aspect of modern society, allowing people to better understand the world around them and develop new technologies to solve complex problems. The philosophy of science examines the connections between scientific ideas, models, data, as well as the basic assumptions and concepts underlying scientific activity, including economic activity, and it is based on various philosophical traditions, including ethics, philosophical anthropology, and axiology. The importance of sociohistorical aspects in scientific research, cultural prejudices, social conventions, and historical circumstances is well established. The philosophy of social sciences, a branch within the philosophy of science, deals with the nature of social phenomena, investigates the relationship between social sciences and other disciplines, particularly economics, and raises ethical issues, which, among other things, relate to the issue of the culture of consumer behaviour regarding energy resources and the formation of energy efficiency culture in the context of social security.

Throughout the 20th and the beginning of the 21st century, the trend of creating a transdisciplinary metatheory of the phenomenon of science that synthesises its epistemological, ontological, and civilisational-anthropological aspects into a single, if possible, logically consistent concept was clearly marked. This shift initiates and supports the process of reorienting technology toward the person

[1] Petinova, *Alternative Modifications of Homo Economicus.*

himself (both in the individual and social sense of the word), turning knowledge into a source of existential risk and exhausting the possibilities of further extensive technological development. These changes have already shifted from the field of theoretical research to the one of didactic understanding and translation, which can also be traced in the field of socioeconomic disciplines, where all these phenomena are the most acute both in terms of consequences and their perception by public consciousness.

In the life of a modern man, science and technologies created on its basis play a special formative role. The future of civilisation is ultimately determined by trends in the development of modern science and technology. The basis of the development of the contemporary society, classified as a technogenic civilisation, is a continuous, expanded, and deepened process of transforming nature through technologies grounded in the development of science. Technogenic civilisation is one of the alternative ways of cultural evolution, which was implemented in Europe and North America, gradually displacing local forms of culture. Economy, as a set of relations of production, distribution and exchange, material and spiritual goods, in the conditions of a limited amount of material, energy and intellectual resources for their production, has long been in the focus of philosophers. The philosophy of economics as a branch of the philosophy of science thus focuses on understanding the relationship between people in the process of production, exchange and consumption, depending on historical, social, political, and cultural factors. So, the formation of a culture of energy efficiency and ethical issues of the culture of energy consumption is a particularly urgent problem today.

The behaviour of subjects of economic activity is carried out in a certain sociocultural and geopolitical space. Economic life is studied by various sciences that belong to the humanities. The philosophy of science also considers economic approaches and specific economic tools. Relying on philosophical categories and principles, it reveals essential aspects of economic phenomena and processes. The philosophical approach to economic practices involves highlighting the fundamental trends and regularities in the relationship between man and nature, as well as between humans in the work process; the focus is on the fundamental issues of human behaviour in the economic sphere, trends in the formation of material conditions for human life and society as a whole. The relationship between socioeconomic sciences and philosophy has praxeological, epistemological, and axiological aspects, which are the subject of research in the philosophy of economics as an activity and the philosophy of economics as a science. The economic behaviour of a person is not uniform in its nature and motivation. An individual's economic expectations and orientations are largely determined by his involvement in social, demographic, and professional communities. Also, an extremely important aspect of this problem is the issue of social security.

In the conditions of today's challenges and threats, every citizen of every country tries to adopt the position that allow creating safe living conditions, which is the fundamental need and condition for the survival of mankind. Another question is what these conditions are and what is the ideology of solving this issue. Ukraine found itself in a critical situation: the Russian-Ukrainian war is taking a lot of resources and human lives, so creating security is beyond the capabilities of an individual. The issue of social security as a collective phenomenon is one of the main tasks of today. Domestic legislation defines social security as a phase of state development in which the state can ensure a decent and high-quality living standard for the population regardless of internal and external threats. However, this definition needs a broader interpretation from the perspective of the possibility of creating proper living conditions not only through the efforts of the state, but also through the involvement of citizens in creating a suitable environment and raising public awareness. In solving this issue, the question of the formation and development of culture as a set of behavioural models and communication tools, capable of raising public awareness and forming their position and attitude towards issues that are critical for ensuring security, becomes important. Among such issues, the formation of a culture of energy efficiency is of high relevance, involving the reduction of energy consumption and dependence on external sources of energy resources resulting from the spread of public awareness regarding the economical consumption of energy resources.

Methods

To achieve the objectives set in the article, the following research methodology was used:

- *Philosophical approaches* were applied. In particular, the *empirical approach* emphasises the importance of empirical data in the development of knowledge, and empiricism refers to the importance of observation and surveying in scientific research. Based on the defined purpose of the article, a questionnaire was created, and a survey of energy consumers was conducted regarding their attitude and understanding of the problem studied in the article. The panel survey covered 997 respondents involved in the activities of universities and energy enterprises. According to the *philosophical-anthropological approach*, a person with his needs and interests is a determining factor in the determination of socioeconomic activity; a person is the driving force of social life and the subject of economic activity.
- The theoretical and methodological basis of the research was derived from the fundamental provisions of the philosophy of science, social philosophy, economic theory, and economic sociology.

- With the help of explication as a reflection, unique meanings that escape the usual logical procedures related to the definition and explanation of the concept (for example, social security, culture of energy efficiency) were clarified and specified.
- Relying on the analysis of scientific publications and familiarisation with the results of research on selected issues, the concept and elements of social security and the impact of the energy supply situation and the consequences of inefficient use of energy resources by consumers were summarised.
- The method of abstraction, the main idea behind the concept of the culture of consumers' behaviour of energy resources, was used to define the general concept of culture and identify its main characteristics and properties, which are the basis of the study of the prerequisites for the formation of cultures of behaviour to achieve the goals of social security.
- The findings were interpreted through data analysis, and conclusions were drawn, highlighting key achievements and recommendations.

Analysis of Research and Literature Review

The everydayness and permanence of every person's relevance to the issue of social security has attracted significant attention from the leading scientists and practising experts, who consider social security as a set of measures and programs aimed at ensuring the safety and wellbeing of citizens in society. These include measures of social protection, guarantees of social rights, health insurance, pension programs, as well as other measures aimed at supporting and assisting persons in need of special protection and attention. The goal of social security, which consists in creating stable conditions for a dignified life of every citizen, ensuring the basic needs and ensuring social justice in society, determines the interdisciplinary nature of this issue, since achieving it is connected with the use of knowledge and methodology of various fields to solve complex problems and tasks in the field of social protection, involving the joint work of specialists from various disciplines, such as sociology, psychology, economics, law, medicine, and others. The theory of social security is considered in the works of Nick Turner, who explored social problems, particularly aspects of security in society.[2] George Slavich and others studied the prerequisites for reducing social threats and promoting social stability.[3]

The findings of the works of Ukrainian researchers also offer their vision for solving social security problems. Iryna Kinash, Vira Kutsenko, Hanna

[2] Turner and Tennant, "Socially Constructing Risk, Safety, and Accidents."

[3] Slavich, "Social Safety Theory."

Yevtushenko,[4] Oleh Dzoba, Nataliya Stavnycha,[5] and Olena Harashchuk[6] study social security in the context of the implementation of the Sustainable Development Strategy of Ukraine. In their works, the role of fundamental education in ensuring economic development, driven by innovation, and in achieving social security is determined; the criteria and characteristics of a safe educational environment are given;[7] also, the authors emphasise that the main condition for maintaining social security is successful development of the economy.

Nataliya Valinkevych and Andriy Dankevych[8] conducted a study on the theoretical and methodological principles of energy saving management, taking into account modern concepts of digital transformation and regulating energy efficiency. The study identified and formulated a number of regularities and contradictions of this phenomenon: energy saving is a by-product of scientific and technological progress; energy producers are not interested in reducing energy costs; energy consumption is constantly increasing, active energy saving only restrains the growth rate; state energy policy is inconsistent and contradictory; economic criteria place higher barriers on the energy-efficient projects of enterprises than on the projects of expansion of energy use.[9]

According to Victoria Bevs,[10] for an organisational and economic mechanism of energy saving in enterprises, there is a need for a complex system, consisting of a support system and a functional and target system, which contain a certain set of organisational and economic levers that affect economic indicators of the company's activity to ensure the efficiency of its activity and obtain competitive advantages.

In the studies of Alla Polyanska, Yuliya Pazynich, Khrystyna Mykhailyshyn, and Svitlana Savchuk, the prerequisites and necessity of energy transition for the Ukrainian energy industry were substantiated and a policy of smart specialisation[11]

4 Kinash et al., "Innovative and Educational Paradigm of the Formation of Social Security."

5 Dzoba et al., "Social Security in the Conditions of Implementation of the Sustainable Development Strategy of Ukraine."

6 Harashchuk et al., "Educational-Scientific Factor in the Formation of Creative Economy and Social Security."

7 Harashchuk et al., "Educational-Scientific Factor in the Formation of Creative Economy and Social Security."

8 Valinkevych and Dankevych, "Theoretical and Methodological Principles of Energy Saving Management."

9 Lier and Pysmenna, *Economic Mechanism of Energy Efficiency Policy Implementation.*

10 Bevs, "Development of the Energy Saving Mechanism at Food Industry Enterprises."

11 Polyanska et al., "Energy Transition."

at the regional level was proposed for the implementation of energy changes.[12] Also, the influence of digital maturity on the effects of sustainable development was revealed in the energy sector under the conditions of Industry 4.0.[13]

The urgency of solving the social security issue highlights the need to form a culture of energy efficiency in the context of social security, which is a key problem in the modern world.[14] This concept requires attention due to the growing threats associated with climate change, limited resources, and socioeconomic challenges related to energy.[15] The works of scientists on mineral extraction also consider the issue of social security because of the energy transition and the need for technological changes, and therefore the development of appropriate social policy, including measures of social security and protection. The culture of energy efficiency includes a conscious attitude to energy consumption, reducing costs, and maximising the effectiveness of resource use.[16] In the context of social security, the formation of this culture entails several aspects.[17]

Reducing energy consumption helps reduce costs for households, enterprises, and society in general. This can affect economic sustainability, employment, and overall living standards.[18] By reducing energy dependence and using alternative energy sources, creating a culture of energy efficiency can help ensure the sustainability of energy supply.[19] This allows reducing emissions and alleviates impact on the environment—energy efficiency helps reduce air and water pollution, promoting a cleaner and healthier environment.[20]

The sociocultural aspect should be considered separately. The formation of an energy efficiency culture also involves a change in the approach to consumption, awareness of one's own responsibility in the use of resources, and participation in joint initiatives for energy saving.[21] Energy efficiency can help improve infrastructure, reduce the risk of accidents and other energy-related problems, which in turn affects overall social security.

The formation of an energy efficiency culture requires a comprehensive approach, which includes education, information activities, introduction of technologies,

[12] Polyanska et al., "Aspects of Energy Efficiency Management."

[13] Polyanska et al., "Impact of Digital Maturity on Sustainable Development Effects"

[14] Seheda et al., "Mathematical Model for the Management of the Wave Processes."

[15] Sobolev et al., "Reasons for Breaking of Chemical Bonds."

[16] Mykhailyshyn et al., "How to Achieve the Energy Transition."

[17] Griadushchiy et al., "Mining of Thin Coal Seams in Ukraine."

[18] Pylypenko et al., "Social Capital as a Factor of Innovative Development."

[19] Dychkovskyi et al., "Simulation Modelling in Mining and Near Mining Activity."

[20] Lier and Pysmenna, *Economic Mechanism of Energy Efficiency Policy Implementation.*

[21] Vladyko et al., "Simulation of Leaching Processes of Polymetallic Ores."

and the creation of incentives to support energy-efficient solutions.[22] The active involvement of government structures, the general public, and the business sector is necessary to achieve this goal and support social security through sustainable and efficient energy use. The harmonisation of relations with interested parties also affects the dissemination of values and reaching consensus on solving issues of the economical use of energy resources.[23]

The Sustainable Development Report provides data on the unequal responsibility and differences in the consumption of natural resources between import- and export-oriented countries, as well as between high- and low-income countries. The material footprint per capita in high-income countries is 10 times higher than in low-income countries. To conclude, the importance of raising awareness is noted to ensure effective and sustainable management of limited and unevenly exploited natural resources by 2030.[24]

Considering the above, the purpose of the article is to substantiate the fragile energy consumption culture to achieve social security and to generalise on the recommended set of tools for its formation and development.

The Culture of Energy-Saving Behaviour in Economic Culture: A Philosophical Reflection

Economic culture determines the behaviour of an economic person. Depending on the specifics and features of the constituent elements, it determines and guides such behaviour in a certain direction. Economic culture is the basis of social practice, a multidimensional phenomenon that can be viewed as a set of rational and irrational components. It contains both—economic values and norms, economic stereotypes and mythologies formed and spread in the given society, ideas, concepts and beliefs, economic traditions, as well as the attitudes and orientations of people in relation to the existing economic system as a whole, certain "rules of the game," and principles of the relationship between the individual and economic institutions. These components are determined by socioeconomic, national-cultural, sociohistorical and other factors, which are characterised by stability and are not susceptible to rapid changes, even during periods of deep transformations in social life.[25]

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[22] Dokunina, "Theoretical Aspects of the Formation of the Economic Mechanism."

[23] Petrenko et al., "View on Harmonization of Interaction of Business Entities."

[24] United Nations, *The Sustainable Development Goals Report. Special Edition*, 2023, https://unstats.un.org/sdgs/report/2023/The-Sustainable-Development-Goals-Report-2023.pdf.

[25] Petinova, *Ekonomichna liudyna u sotsialno-filosofskomu dyskursi.*

The economic behaviour of subjects and the content of economic theories simultaneously reflect not only objective factors (in this case, the category of interests is used), but also subjective values. In a broad sense, values are interpreted by modern scientific methodology as any features of the subject's consciousness and objects that have normative significance for the subject. Thus, values act as prerequisites for knowledge. With regard to socioeconomic and humanitarian scientific knowledge, values are divided into two groups: general worldview values (encoded by the cultural and historical context of the development of science) and cognitive and methodological values (which ensure the generation of new objective knowledge, ways of posing, selecting, and testing of hypotheses, and their integration into the system of theoretical knowledge).

The central problem of axiology is the problem of "good." What is good in the economic sense? In the eighteenth- and nineteenth-century English philosophy, a utilitarian view was widespread, according to which the good is reduced to practical utility. However, along with practical goods, consumer goods should also be distinguished, which can be understood as any things (material or ideal) that a person uses. The philosophical approach is aimed at revealing people's attitudes toward consumer goods and values. That is, we are talking about the ability of people to evaluate various goods and give preference to some of them. It should be noted that social activity depends on the nature of value orientations—or vice versa, their passivity and consumerism.

Today, the dominant form of egoism is defined as organised egoism. Values and traditions that are not combined with profit and efficiency lose their meaning. The flourishing of technological civilisation contributes to the development of a special symbolic type of consumption. The rise of a global technological civilisation is also connected to the transformation of technologies into an absolute value, but at the same time, the key role of man is recognised in the development and functioning of the economy. Everyday socioeconomic cognitive activity consists of determining the objective conditions for the formation of economic relations, serving the material needs of people's lives, which can include the use of energy resources.

Human economic behaviour is behaviour related to the selection of rational, pragmatic, or socially oriented economic alternatives to solve economic problems at all stages of the economic cycle—production, distribution, exchange, and consumption. The economic motivation of human behaviour articulates, with the help of semantic resources, the principle of maximisation, which includes the concepts of benefit, costs, calculation, optimisation of resource use, profit, and utility.[26] The economic motivation of the behaviour of *homo economicus* in the system of market relations is connected with the existential and axiological problems of

[26] Petinova, *Alternative Modifications of Homo Economicus*, 106–9.

choosing the future and caring for the quality of life, determining the possibilities of development, social values and ideals, the transformation to the better side of socioeconomic life, including economic, ideological, sociocultural, psychological, spiritual, political, and ethical segments. A person today acts as an agent of social practices, a subject of activity, who has the freedom to choose means for the implementation of life projects. Social practices arise from initial habitual attitudes acquired in an objective social environment. The works of Oksana Petinova present a thorough study on *homo economicus* and his behaviour through the prism of the metaphysics of economics.[27]

In our opinion, the culture of energy-saving behaviour is an aspect of economic culture that is included in the scope of modern research in the field of applied ethics. Igor Pecheransky notes that the social and cultural-civilisational dynamics, determined by technological progress and new global economic challenges, actualise moral conflicts in the early twenty-first–century world. This lays additional foundations for deepening research in the field of applied ethics, which does not have a narrowly functional connotation but "sociocultural significance," restores the integrity of the human world, the value of a person, his dignity and self-worth, preserves the quality of humanity and the balance between the systems of segmented society. An understudied direction of applied ethics in the philosophy of science is energy ethics. In the framework of Western studies, there is no standardised methodology and systematic approach to the ethical analysis of energy decisions. It is about the production and use of energy, which gives rise to a wide range of moral issues.[28] Giovanni Frigo, in his article "Energy Ethics, Homogenization and Hegemony: Reflections on the Traditional Energy Paradigm," was one of the first to raise the issue of the need for an organised research field and for the fundamental definitions of "energy ethics."[29]

At the current stage, experts in energy ethics often emphasise energy consumption as an important factor that determines the means of human existence and affects the wellbeing and quality of human life, which is already a moral issue. According to Carl Mitcham and Jessica Rolston, studies of this direction of ethical and applied knowledge distinguish between two approaches to understanding its specifics: the first evaluates energy production "as a virtue" and associates the increase in the rate of consumption with the growth of wellbeing. It follows from this that people are absolutely obliged to maximise energy production. Instead, the second approach questions the coherence of positions on this issue, arguing that justice and energy can grow simultaneously only up to a certain point.[30] Some

[27] Petinova, "Homo Economicus Through the Lens of Metaphysics of Economics."

[28] Pecheranskyi, "Enerhetychna etyka – prykladna etyka chy ne zavzhdy etyka?," 4–5.

[29] Frigo, "Energy Ethics, Homogenization, and Hegemony."

[30] Mitcham and Rolston, "Energy Constraints," 316, 318.

scientists argue that the form and amount of energy consumption in modern society can restrain, rather than cause, human prosperity.[31]

The concept of frugal energy consumption resonates with broader ethical, environmental, and economic principles that various philosophers have touched upon. Ernst Schumacher is one of the most influential philosophers and economists when it comes to frugality and sustainability. His concept of "Buddhist economics" emphasises a frugal approach to consumption and resource use. He argued that instead of maximising consumption, societies should focus on achieving well-being through simplicity, sustainability, and moderate use of resources. His famous phrase "small is beautiful" advocates for decentralised and human-scaled economies that prioritise sustainable practices over endless growth.[32]

Mahatma Gandhi was an advocate for simple living and frugality, which he saw as a moral imperative. He believed that the Earth provides enough to satisfy everyone's needs, but not everyone's greed. His philosophy of "trusteeship" implied that individuals should manage resources wisely and in moderation, acting as stewards for future generations.[33] His approach is deeply rooted in ethical consumption and rejecting material excess in favour of a life aligned with ecological balance.

Hans Jonas was a twentieth-century philosopher whose work on the ethics of technology and ecology is directly related to the concept of responsible consumption.[34] He argued that modern technological societies must adopt a "principle of responsibility," meaning that we have a duty to act in a way that ensures the sustainability of the planet and the wellbeing of future generations. His philosophical imperative aligns with the idea of frugal energy consumption because it focuses on limiting environmental damage and adopting practices that avoid exploitation of natural resources.

Ivan Illich was a critic of modern industrial society, arguing that over-consumption of energy and resources creates inequity and social injustice. In his work *Energy and Equity*, he examines how high levels of energy use lead to inequalities, both socially and ecologically, and advocates for a lower-energy, more equitable society.[35] His work is directly related to the frugal use of energy, advocating for small-scale solutions and local self-reliance.

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31 Geerts, "Towards a Qualitative Assessment of Energy Practices," 521.

32 Schumacher, *Small is Beautiful*.

33 Dwivedi, "The Gandhian Trusteeship System," 429–39.

34 Jonas, "The Imperative of Responsibility," 419–29.

35 Ivan Illich, *Energy and Equity. Toward a History of Needs*, New York: Pantheon, 1979, https://blogs.ubc.ca/landscapesofenergy/files/2010/11/ivan-illich-energy_and_equity.pdf.

Peter Singer, in his work *Practical Ethics*, developed his principles of minimising harm and maximising wellbeing in the context of energy consumption, and suggests that individuals should adopt frugal, eco-friendly practices to reduce the negative environmental impact on humans and non-human animals alike.[36] He advocates for global responsibility in managing resources, encouraging frugality as part of a broader ethical obligation to prevent harm.

Pope Francis, in his encyclical on the environment, calls for a radical rethinking of humanity's relationship with nature. He urges societies to embrace frugal consumption to prevent environmental degradation and promote social justice. The encyclical emphasises the need to reduce waste and energy consumption to protect the poor and vulnerable from the impacts of climate change. His religious and ethical perspective resonates with frugality as a moral duty in caring for "our common home."[37]

These and other thinkers offer a broad spectrum of ethical, ecological, and philosophical justifications for frugal energy consumption and sustainability and create a background for the formation of a fragile energy consumption culture.

Social Security and Energy Efficiency: Formation of Energy-Saving Consumer Behaviour

Social security is an important component of achieving effective working conditions, particularly in an organisation. It provides for proper working and living conditions. The approach to energy resources oriented towards their economical use, their increase in efficiency, is reflected in social security, due to such factors as reducing dependence on energy supply, hence proper work, and its conditions. To achieve an effective level of energy consumption by various energy consumers, both behavioural and technical aspects are distinguished. The behavioural factors include the conscious use of energy, energy culture, and education. The technical aspects cover the use of energy-efficient technologies, equipment, and facilities. While sufficient attention has been paid to the technical aspects of achieving energy efficiency, issues related to the formation of energy consumption behaviour and culture require additional solutions. In our opinion, this is due to the complexity of this issue. It is important not only to learn about how to turn off the lights, use low-cost energy means, insulate the premises, use alternative energy sources, etc., but also to understand how people generally perceive this problem, how familiar they are with the methods and techniques of the energy-efficient use of energy

[36] Singer, *Practical Ethics.*

[37] Pope Francis, *Encyclical Letter Laudato Si' of the Holy Father Francis on Care for Our Common Home*, https://www.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html.

resources, what prevents them from following energy efficiency policies, and what solutions they would expect from the management for their energy-saving behaviour to form an appropriate level of social security for them.

It should be noted that consumer energy efficiency is an important topic in today's world, as it helps reduce energy consumption and has a positive impact on the environment and economy. In this article, we also explore the concept of energy efficiency and its importance for consumers. Energy efficiency is the ability of a system, equipment, or device to perform a certain function with less energy consumption. This can be achieved by using efficient technologies, improving processes, or reducing energy losses. Consumers—such as homes, offices, industrial plants, and vehicles—can become more energy efficient by implementing various measures: for example, installing energy-efficient lighting, insulating buildings, using energy-saving household appliances, installing an energy management system, and using energy-efficient technologies in production processes. The benefits of energy efficiency for consumers are obvious. Firstly, reducing energy consumption leads to lower energy costs and, therefore, lower electricity or fuel bills. This can be especially advantageous for businesses that spend significant amounts of money on energy. Secondly, energy efficiency helps reduce the negative impact on the environment. Reducing energy consumption means reducing greenhouse gas emissions. Therefore, it is important to develop such a model of behaviour. The formation of a culture of human behaviour is a process by which a person acquires knowledge, values, norms, and skills that determine behaviour in various social situations. This process begins at birth and continues throughout a person's life.

The connection between social security, energy efficiency, and a culture of frugal energy consumption is multifaceted and involves economic, environmental, and societal aspects. Thus, social security in the organisation is a concept that covers various aspects of guaranteeing the wellbeing and safety of society and its members. It refers to measures that ensure the protection of people from various social risks and threats, especially in the areas of economy, employment, healthcare, social protection, and criminal security. Investigating the relationship between social security and economical use of energy resources reveals how it affects each considered component of social security directly.

The economic component is tailored to the income security of the population that is directly related to what part of the income the population pays for consumed energy resources. According to the analysis by the European Trade Union Confederation (ETUC), as of 2022, the average annual electricity bill exceeded a month's salary for low-wage workers in most EU Member States. About 9.5 million working people were already struggling to pay their electricity bills before the cost-of-living crisis began. As of July 2022, the cost of gas and electricity in Europe has increased by 38% compared to the previous year and continues to rise. This has resulted in minimum-wage workers in 16 EU Member States having

to put aside the equivalent of a month's salary or more to keep the lights and heat on at home. In 2021, it was the case in 8 Member States. The number of days a minimum-wage earner must work to pay the electricity bill has increased dramatically in some countries: Estonia (+26 days per year), the Netherlands (+20), the Czech Republic (+17), and Latvia (+16). In four countries—Slovakia, Greece, the Czech Republic, and Italy—the average annual electricity bill also exceeds the monthly salary of a worker earning an average salary. It should be noted that these data refer to the cost of energy in July 2022.[38] The crisis faced by the workers is currently even worse and exacerbated by further increases in the cost of energy.[39] Thus, the increase in prices for energy resources leads to an increase in the share of wages to cover them and a decrease in the income of the population.

Therefore, we believe that social protection is a necessary basis for considering the issue of energy provision, since the consequences of the functioning of the economy in the strict quarantine regime caused by the spread of COVID-19 were the impetus for the deepening of energy poverty. Employees of the service sector were the most affected by the introduction of a strict quarantine in EU countries, despite the fact that this sector mainly employs people with relatively low wages, as well as the socially vulnerable segments of the population. Small entrepreneurs and their employees who lost their source of income while not being socially protected suffered no less. For example, in France, 74% of employees in small businesses and small entrepreneurs reported a deterioration in their personal financial situation due to the introduction of the strict quarantine regime.

The protection of human rights is also linked to the economical use of energy resources. Rising energy prices limit the population's access to essential energy supply services. The right to food and a warm home is a human right and must be protected. Disadvantaged people cannot be expected to pay unsustainable bills. There should be a ban on disconnection. In order to prevent the deepening of energy poverty among the population, the following additional measures were implemented in the EU states: a ban on disconnection from energy services (Austria, Belgium, France, Germany, Greece, Ireland, Italy, Hungary, the Netherlands, Poland, and Spain); subsidies for energy resources, adjustments and freezing of tariffs (Austria, Belgium, Croatia, Cyprus, France, Greece, Italy, Portugal, Romania, Slovenia, and Spain);[40] deferring payment of bills or setting personalised payment plans for energy resources (Bulgaria, the Czech Republic,

[38] Eurostat, "Electricity Components for Prices for Household Consumers: Annual Data," 2024, http://surl.li/osafx.

[39] Federation of Trade Unions of Ukraine, Official Web Portal, 2024, https://www.fpsu.org.ua/napryamki-diyalnosti/mizhnarodna-robota/24494-novyny-kolektyvno-dohovirnoho-rehulyuvannya-yefpho-2.html.

[40] Ministry of Finance, "Electricity Tariffs," 2024, https://index.minfin.com.ua/ua/tariff/electric/2021-10-01/.

France, Germany, Ireland, Lithuania, Poland, Portugal, Slovakia, and Spain). No additional measures have been identified to prevent the deepening of energy poverty in the context of the spread of COVID-19 in such EU states as Denmark, Estonia, Finland, Latvia, Luxembourg, Malta, and Sweden.[41] The consequence of ensuring the previously discussed elements of social security is in compliance with the requirements of medical safety and workplace safety because proper energy supply and skills of its effective use create ergonomic working conditions, prevent diseases, etc.

Therefore, the social welfare and social security of employees depend on the level of energy consumption, and in the conditions of the energy supply crisis, the level of energy use also has an impact on social security in society, considering the possibility of using cheaper and environmentally safer alternative energy.

Consumer energy efficiency refers to efforts aimed at reducing energy consumption while maintaining or improving the quality of services or products. This covers a wide range of industries, including construction, industry, transport, and domestic energy use. In addition, energy efficiency is of great importance in terms of saving resources, reducing greenhouse gas emissions, and ensuring sustainable development. Reducing energy consumption helps reduce fuel and electricity costs, and also reduces dependence on energy imports. Based on the new energy policy, the EU attaches great importance to energy saving. EU countries are required to achieve cumulative end-use energy savings for the entire obligation period (running from 2021 to 2030), equivalent to new annual savings of at least 0.8% of final energy consumption in 2021–2023,[42] at least 1.3% in 2024–2025,[43] 1.5% in 2026–2027, and 1.9% in 2028–2030.[44] The emphasis on energy saving is explained by its significance in preserving hydrocarbon resources, saving the financial funds of consumers, and reducing carbon dioxide emissions.

The significant consequences of energy use in terms of energy dependence, reliability of supply, and environmental impact lead to the need for more detailed knowledge of the elements of energy demand and the factors related to it. In

[41] Stefan Bouzarovski and Harriet Thomson, *Towards an Inclusive Energy Transition in the European Union: Confronting Energy Poverty Amidst a Global Crisis*, Luxembourg: Publications Office of the European Union, 2020, https://op.europa.eu/en/publication-detail/-/publication/4a440cf0-b5f5-11ea-bb7a-01aa75ed71a1/language-en.

[42] Statista, "Primary Energy Consumption Worldwide from 2000 to 2023," https://www.statista.com/statistics/265598/consumption-of-primary-energy-worldwide/.

[43] Trading Economics, "Renewable Energy Consumption (% Of Total Final Energy Consumption)," 2024, https://tradingeconomics.com/slovenia/renewable-energy-consumption-wb-data.htm.

[44] European Commission, "Energy Efficiency Directive," https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-directive_en.

such conditions, the formation of energy-saving behaviour of energy consumers becomes important.

Empirical Research and Analysis of Results

Note that the characteristics of the abovementioned aspects of behaviour are constantly changing. Constant monitoring of people's understanding of measures that contribute to energy efficiency is important. For this purpose, we conducted a survey. The results of the meta-analysis of the conducted research are presented in table 1.

Table 1. Metadata survey results on energy saving consumer behaviour.

Indicator	Criterion	Result, %
Age	Less than 25 years	59.2
	25–44 years	23.6
	44–60 years	13.2
	60–75 years	4
Gender	Male	30.5
	Female	69.5
Education	Secondary	48.5
	Special technical	11.3
	Higher	36.2
	Scientific degree	4.2
Field of activity	Student	51.5
	Entrepreneur	10.7
	Retired	12.7
	Specialist	14.4
	Manager	3.4
	Scientist	3.3
Is the problem of economical use of energy resources relevant for you?	Yes	63.3
	No	1.1
	Never think about it	25.6

As can be seen in table, 63.3% of respondents consider the problem of economical use of energy resources to be urgent. Among the interviewees, there are specialists, managers, as well as scientists from universities who are involved in the development of the energy sector. Among the respondents, 59.2% are young. Thus, the survey

covered respondents of different age groups and professional spheres, which made it possible to consider the opinions of different categories of respondents.

As a result of the survey, we obtained estimates of factors that, in our opinion, influence the formation of energy consumption behaviour (table 2).

Table 2. A selection of factors affecting the level of respondents' readiness for economical use of energy resources (Y).

Parameter	X1	X4	X6	X8	X9	X10
Description	The level of concern and the importance of the issue regarding the efficient use of energy resources	The level of awareness and knowledge about the efficient use of energy resources	The personal level of conscious, efficient use of energy resources	The technical capabilities for the efficient use of energy resources in your area	The need for additional knowledge and informational support regarding the efficient use of energy resources	The role of personal development in the efficient use of energy resources
R2	0.365	0.432	0.46	0.463	0.463	0.430

Note: The selection of indicators was carried out using a correlation-regression analysis based on the indicator R^2.

From the selected 17 factors, 7 were found to significantly impact the resulting indicator (Y), based on the R criterion (values close to 0.5 and higher).

Based on the R^2 values provided in the table, we can summarise the effects of different factors on respondents' readiness for frugal use of energy resources and provide a philosophical interpretation on them:

1. Factor 1 (R^2=0.365) demonstrates a moderate influence on readiness. It shows that individuals' concern for energy use and recognition of its importance directly affect their motivation to adopt energy-saving behaviours. People who are more concerned tend to be more willing to engage in energy-saving practices.
2. Factor 4 (R^2=0.432) indicates that awareness and knowledge have a higher impact than concern, which suggests that simply knowing more about energy efficiency has a stronger effect on readiness. When people are informed about the consequences of wasteful energy use and the benefits of conservation, they are more likely to act. Factors such as concern, knowledge, and awareness resonate with philosophical ideas

that understanding of the broader societal and ecological implications of energy consumption leads to more ethical behaviour. The R^2 values support the notion that awareness cultivates a more profound sense of responsibility, aligning with philosophical views that informed individuals are more likely to make ethical choices.

3. Personal level of conscious energy use (R^2=0.46) is one of the strongest factors, reflecting that individuals who are already mindful and deliberate in their energy use are much more prepared to adopt energy-saving behaviours. This suggests that personal habits and internal motivation are critical in driving such behaviours.
4. Technical capabilities in the area (R^2=0.463) have the highest R^2 value that highlights the key role of external, infrastructural factors. Even if individuals are motivated, if the technical infrastructure (e.g., availability of renewable energy or efficient appliances) is lacking, they may be limited in their ability to act. The technical capabilities and the need for informational support reveal a dual philosophical aspect. On the one hand, individuals must act ethically (as influenced by personal values), but they are also part of a societal structure that requires collective action and institutional support. Philosophical reflection would argue that individual morality is insufficient without proper social frameworks to enable responsible energy consumption.
5. The need for additional knowledge and informational support (R^2=0.463) is similar to technical capabilities, emphasising the importance of continuous education and guidance. Respondents who perceive a need for more support and information are significantly influenced in their readiness to act, suggesting that systematic support can bolster energy-saving efforts. The result implies that individuals may recognise their lack of full understanding or competence in energy-saving measures, which corresponds to the Socratic idea of "the more you know, the more you realise how much you don't know." Here, the gap in knowledge prompts a need for further learning, and the role of education as a philosophical pursuit becomes crucial in bridging this gap. For energy-saving behaviours to become widespread, society must not only impart the initial knowledge but also ensure continuous access to information and learning.
6. The role of personal development (R^2=0.43) reflects the idea that personal growth, including ethical and philosophical reflection on resource use, is an important motivator that indicates a significant link between personal growth and readiness to engage in energy-saving behaviours. People who view energy-saving as part of their personal development or ethical responsibility tend to be more prepared to engage in these behaviours. This

> suggests that individuals who prioritise their development—particularly in terms of ethics, responsibility, and self-improvement—are more likely to adopt sustainable consumption habits. This connects directly with existentialist philosophy, which focuses on personal responsibility and the development of one's authentic self. Philosophers such as Jean-Paul Sartre argued that individuals are free to shape their values and actions, but with that freedom comes the responsibility to make choices that reflect one's understanding of the broader impact on society. Personal development in the context of energy-saving behaviour can be seen as a journey toward becoming more ethically conscious, where self-improvement aligns with a growing awareness of the environmental and societal consequences of one's actions. By making deliberate choices to conserve energy, individuals contribute not only to their personal ethical growth but also to the welfare of society as a whole, increasing the level of knowledge as a basic requirement of modern development[45] and behaviour formation.[46]

Thus, the philosophical reflection on energy-saving behaviour formation emphasises that personal ethics, knowledge, and societal structures must be aligned to foster responsible energy use. The R^2 values highlight the need for both internal (personal development and awareness) and external (technical infrastructure and information support) factors in shaping a culture of energy-saving behaviour. By combining the philosophical reflection with empirical data, we understand that fostering energy-saving habits requires a holistic approach that integrates values, knowledge, and systemic support.

With these results we return to the issue of culture of behaviour. This phenomenon is understood as a set of formed socially significant qualities of an individual, the daily actions in society, which are based on norms of morality, ethics, aesthetics, and culture.[47] The culture of individual behaviour is largely determined by generally accepted norms of culture in different cultural and historical eras in different countries and among different social groups. It is not limited to formal observance of rules of conduct; it is an important component of personal morality, and expresses such qualities as humanity, a sense of self-worth, and citizenship, which are manifested in all aspects of people's daily lives. In addition, the culture of behaviour involves several abilities and skills that help to properly organise mental and physical work, observe personal hygiene, and daily routine.

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[45] Polyanska, "Knowledge Management as Basis of Modern Development of the Companies."

[46] Polyanska, "Cognitive Methods of Manager Behavior Formation."

[47] O. F. Huk, "Analysis of the Concept of 'Culture of Behavior' in Humanities," 2024, https://sociology.knu.ua/sites/default/files/library/elopen/actprob17_173.pdf.

The main components of culture affecting the regulation of behaviour are values, norms, and sanctions.[48] The concept of values is based on the presence of certain objects, phenomena of signs, and properties that reflect their significance for a person or society. A value system is an important regulator of the harmonious functioning of people in society. The value system provides a model, a way of life, and functions in the form of behavioural stereotypes. Norms are the practical embodiment of values. Social norms can be viewed as society's requirements for a person, which define the scope, nature, and boundaries of what is possible and acceptable in terms of behaviour. Since the norm carries the requirements of mandatory implementation, in situations of choice it leads to a collision of personal and social-normative motives, because of which their adjustment and the individual's choice take place. Values are protected by norms. The same role, but relative to norms, is performed by sanctions. Sanctions monitor actions that express an attitude towards the norm: if the norm is violated, a negative sanction (punishment) is assigned, while compliance with the norm implies a positive sanction (reward). Therefore, the culture of behaviour is regarded as a sphere of formation, development, and socialisation of a person. Such a culture includes a certain system of values, which are embodied in behavioural norms and rules. Thus, cultural norms reflect society's requirements for people's behaviour, define the limits of actions and deeds that contribute to successful development.

The total influence of the specified elements of the population's culture of behaviour in relation to energy-saving consumption could be depicted in the form of a pyramid, which symbolises the close connection of elements and strategies for the formation of a culture of behaviour, the absence of one of the elements can significantly affect the final goal of making a rational decision by the consumer (fig. 1).

Figure 1 shows that all elements of a company's internal environment, segments, and programs are closely interconnected and collectively affect the main goal—the formation of a culture of energy efficiency among consumers. Consumers should be understood as households, the business segment, municipal facilities, industrial enterprises, as well as company employees.

Thus, the formation of a culture of behaviour is a complex task, the solution of which depends not on one person or subject, but on the systematic and consistent work of spreading the ideology of economical use of energy resources. As a result, the culture of consumer behaviour regarding the economical use of energy resources should create values that must be based on standards and regulated by appropriate measures that will stimulate the development of energy-saving behaviour. For that, certain work is already being done. For example, from the standpoint of social

[48] Huk, "Analysis of the Concept of 'Culture of Behavior' in Humanities."

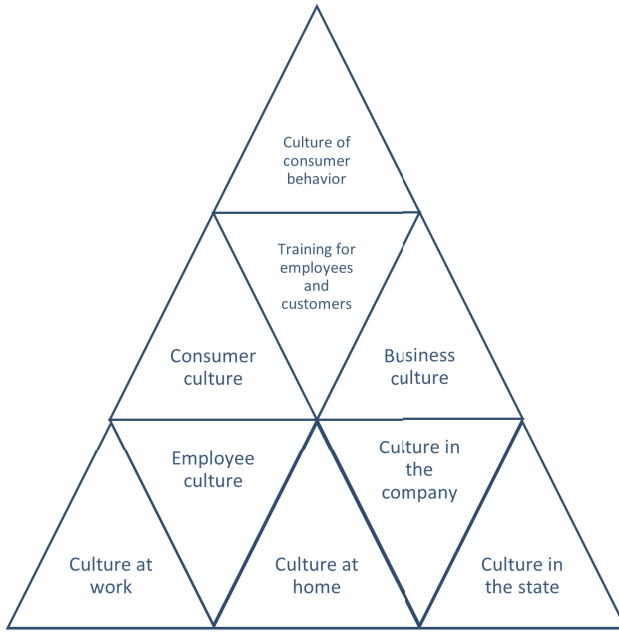

Figure 1. Levels of consumer behaviour culture formation. (Source: Authors' data.)

protection, in accordance with the provisions of the Treaty on the Establishment of the Energy Community and directives of the European Union, the framework for providing state social assistance to vulnerable consumers of energy resources has been outlined in Ukraine. The state's involvement in shaping energy consumption through laws, programmes, and funding mechanisms reflects the philosophical principle of the common good. The state's responsibility is not only to provide energy but to guide society toward responsible, sustainable consumption. This aligns with the social contract, where individuals agree to certain constraints and support systems in exchange for the broader protection and benefits provided by the state. By fostering a culture of energy-saving, the government helps ensure a collective approach to addressing environmental challenges and promoting the common good of society.

The important role of the state in forming a culture of energy-saving consumption of energy resources supports the development of alternative and renewable energy sources and predicts the possibility of access to energy consumption from renewable sources for all end users, for example condominiums. The state's efforts to promote renewable energy access for all, especially low-income and vulnerable consumers, speak of the principle of intergenerational justice. This philosophical concept emphasises the obligation to protect the environment and ensure resource

availability for future generations. By promoting sustainable practices and supporting the transition to renewable energy, the policies in Ukraine work toward a long-term ethical vision where current consumption patterns do not compromise the needs of future generations. Therefore, the issue of developing state and local target programs with various funding mechanisms is gaining importance. Such mechanisms of state support will allow to reduce the costs of energy services for household consumers, abandon heating with resources with a high carbon content of waste, as well as help people overcome difficult life circumstances and return to an active economic and social life.[49]

An important aspect of the formation of a culture of behaviour and an important condition for the fulfilment of assigned tasks is the company's ability to create opportunities for its employees to understand the process of goal-setting. For the company to function effectively, each employee must clearly understand the vision, mission, and goals of the enterprise. It is important that the executor understands the tasks entrusted to him and how important the contribution to the development and functioning of the company is. Philosophically, encouraging active participation in reducing energy consumption can be seen as a move away from individualism toward a collective mindset. In a world facing climate change and resource scarcity, individual actions are insufficient to tackle global challenges. The Ukrainian framework recognises the need for collective action, where individuals modify their consumption habits not only for their personal benefit but for the benefit of society and the environment. This is a reflection of communitarian ethics, which prioritises the needs of the community over individual autonomy when it comes to shared resources.

An illustrative example here is the activities of the energy company SaskPower, which is engaged in safe, reliable, and stable supply of electricity for the residents of Saskatchewan in Canada. The company's vision is formulated as follows: "World leader of energy companies due to innovation, productivity and service." Their mission is "Reliable, affordable, constant electricity." The company's values are based on such principles as "safety, loyalty, and respect." SaskPower makes significant efforts for their employees to understand the mission and goals of the company's activities, which are to clearly define the purpose of the activity and specify it in target indicators. Also, the components of the whole implementation process, with the help of feedback, make it possible to effectively perform the tasks assigned to employees and achieve the company's goals. At the same time, such work is carried out based on communication with potential consumers and clients.[50]

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[49] S. P. Zavhorodnia, *Availability of Energy for the Population: Problems and Prospects: Analyst. Report* (NISD, 2020), analytrep_04_2021.pdf (niss.gov.ua).

[50] Polyanska and Blyshchak, "Goal-Setting: The Essence of the Process."

Conclusions

The article justifies the philosophical reflection on the formation of a culture of energy-saving resource consumption for social security through consistent resolution of specific tasks. It substantiates the connection between social security and the consumption of energy resources. In pursuit of this understanding, the works of scholars on the growing relevance of this issue are analysed, with a particular emphasis on Ukrainian researchers, as this problem is especially pressing for their society today. The philosophical reflection on the culture of energy-saving behaviour allows for a deeper understanding of energy consumption based on human attitudes toward the planet's resource-saving needs and the awareness of the problem's importance for societal development. This is achieved through a combination of knowledge and a conscious attitude, facilitated by cultural influence. Based on the research on energy consumption in European countries, the article establishes a connection between the culture of energy use and social security, highlighting the basic criteria for fostering energy-saving behaviour among consumers.

The authors emphasise that philosophical analysis of energy-saving issues deepens our understanding of the significance of conscious attitudes toward natural resources. The results of the empirical research identify key factors influencing readiness for energy-saving behaviour, such as regional technical capabilities (R^2=0.463), personal awareness of energy usage (R^2=0.432), the need for additional knowledge (R^2=0.463), and the personal level of conscious, efficient use of energy resources (R^2=0.46).

A significant emphasis is placed on the necessity of government support for fostering a culture of energy conservation. This includes legislative initiatives, social assistance programs, and the development of alternative energy sources. The government acts as a guarantor of social security by promoting energy-saving technologies and policies. The survey results reveal that the majority of respondents (59.2%) are under 25 years old, which reflects high awareness of energy-saving issues among the younger generation. This finding also confirms the need for continued public education and dissemination of information.

It is concluded that the formation of a culture of energy-saving behaviour is grounded in key components such as values, norms, and sanctions that regulate human behaviour within society. Systematic implementation of these norms fosters sustainable, energy-efficient behaviour. The article concludes that cultivating a culture of energy-saving consumption will reduce energy costs, improve environmental conditions, and enhance social security. Moreover, taking into account the perspectives of contemporary scholars broadens the potential for strengthening social security, a crucial element for societal wellbeing, and further highlights the relevance of this issue.

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