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Comparative Views on the Global Energy Problem in the Oil and Gas Pattern

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Abstract

The article puts forward views on the global energy problem. It focuses on population growth, industry, energy, consumption, exhaustible and inexhaustible resources. Energy has become an indispensable element of social and economic life due to its early use in lighting and heating, and since the early twentieth century in industry and other fields. It is considered that the causes of the global energy problem are related to the rapid growth of the world's population, the growth and development of industrial production. The implementation of these is considered to lead to the efficient use of energy resources, both globally and domestically. There is a need to make certain changes in people's lifestyles, conserve natural resources and increase the use of alternative energy sources. Against the background of a 7-fold increase in the world's population, the growing demand for energy resources of people and society as a whole is a topical issue. The main purpose of the study is to increase attention to the problem of energy in the world, to make certain changes in people's lifestyles and to make sound proposals on alternative energy resources. From a global point of view, the trends in the modern development of energy and the suggestion of more efficient ways of using energy are the scientific novelty of the research. Specifically, in many countries, oil comes out at a depth of 5,000 m and more, instead of the previous 500-1000 m, which has a negative impact not only on society, but also on the environment.

Keywords: *Population Growth, Industry, Energy, Consumption, Depleted and Inexhaustible Resources.*

Introduction

The COVID-19 pandemic, which began in early 2020, has caused the deepest economic downturn in the global economy in a decade. While experts from the International Financial Institutions (IFIs) forecasted global economic growth of 4.9% in 2020, because of the COVID-19 pandemic there was 5.2% decline in global GDP in 2020. Despite strong economic support measures by most governments to ensure economic activity, this setback had not to be prevented. Although there is a general economic downturn in the world in 2020, global economic growth is projected in 2021. This naturally increases the demand for energy. Research shows that the global energy problem is one of the primary factors determining the world economy. Global energy demand plays an important role in determining the prices of both food and non-food products. In this regard, in recent years, determining the urgency of energy demand in the world determines *the urgency*.

The theory of absolute advantages was first introduced by Smith in his work *An Inquiry into the Nature and Causes of the Wealth of Nations* (2011). According to this theory, a country possesses an absolute advantage in producing a good if it can produce it with fewer resource costs compared to other countries. Smith argued that nations should specialize in producing goods in which they have an absolute advantage and engage in trade, thereby increasing overall welfare.

Ricardo expanded this concept by introducing the theory of comparative advantages. He demonstrated that even if a country does not have an absolute advantage in producing any goods, trade can still be mutually beneficial if each country specializes in producing goods for which it has the lowest opportunity cost (Ricardo, 2022).

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In the early 20th century, Swedish economists Heckscher and his student Ohlin proposed a model known as the Heckscher-Ohlin theory (Ohlin, 1967). This theory explains the structure and direction of international trade through differences in countries' factor endowments — labor and capital. According to this model, countries export goods whose production intensively uses their relatively abundant factors of production and import goods that require factors in which they are relatively scarce.

Heckscher's work, *The Effect of Foreign Trade on the Distribution of Income* (1991), and Ohlin's subsequent book, *Interregional and International Trade* (1967), laid the foundations for this theory. The Heckscher-Ohlin model became a significant development of the classical theory of international trade proposed by Ricardo, providing a deeper understanding of how factor endowment differences influence trade flows between countries (Samuelson, 1941).

Thus, Smith's theory of absolute advantages, Ricardo's theory of comparative advantages, and the Heckscher-Ohlin theory represent key concepts in understanding international trade. Each builds upon and expands the previous ideas, explaining how and why countries exchange goods and services.

By pointing the attention to increase or decrease on the world's energy problem, it is necessary to make certain changes in people's lifestyles and to give preference to alternative energy resources.

Literature Review

The foundation of this study is built on the contributions of classical economists such as Petty, Smith, and Ricardo. Petty emphasized the role of material production and land in wealth creation, a concept crucial for understanding resource dependency. Smith and Ricardo extended these ideas with their theories of absolute and comparative advantages, which explain the efficiency of trade based on resource endowments. The works of Heckscher and Ohlin introduced the significance of factor endowments, particularly labor and capital, in shaping international trade dynamics. These theoretical insights establish a framework for analyzing global energy inequalities and their economic implications.

Geller's *Energy Revolution: Policies for a Sustainable Future* (2002) provides a critical view of modern energy consumption patterns, highlighting their environmental costs. Similarly, Illich's *Energy and Equality* (1992) critiques industrialized nations' insatiable energy demands, coining the term "energy coma" to describe their overreliance. Both works emphasize the need for sustainable energy practices and the development of renewable energy sources to mitigate the environmental and social challenges posed by excessive fossil fuel consumption.

The research incorporates data from reputable sources such as the Energy Information Administration (EIA), World Bank, and Azerbaijan's State Statistics Committee. These datasets reveal trends in energy production, consumption, and pricing, illustrating the economic and environmental impacts of energy use. For instance, a 10% decline in global crude oil demand in 2020, attributed to the COVID-19 pandemic, underscores the vulnerability of energy markets to global disruptions.

The case of Azerbaijan provides a practical perspective on the intersection of energy production and national development. Heydar Aliyev's vision, as outlined in *Heydar Aliyev's Way in the New Period of Development of Azerbaijan* (2007), highlights the strategic importance of Azerbaijan's oil and gas reserves. The "Contract of the Century," which brought international collaboration to develop key oil fields, serves as a model for leveraging energy resources for economic growth while navigating geopolitical complexities.

The review emphasizes the environmental consequences of energy exploitation, particularly in oil-rich regions. Issues such as land degradation, radiation, and marine biodiversity loss are highlighted as significant concerns. These findings align with the observations of Odum (Odum, 2008), who stress the need for balanced resource utilization to sustain ecological health.

The literature advocates for a transition to renewable energy sources as a solution to the global energy crisis. The European Union's *Energy 2020* strategy and related frameworks emphasize competitive,

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sustainable, and secure energy practices. These align with global calls for energy conservation, lifestyle adjustments, and alternative energy adoption to address the twin challenges of energy scarcity and environmental degradation.

Methods and Materials

The study employed a combination of generalization, comparative analysis, and statistical analysis methods to investigate the global energy problem within the framework of oil and gas dynamics. These methods allowed the research to systematically evaluate and compare the contributing factors to energy dependency, resource distribution, and socio-economic impacts across different contexts and periods.

The study is grounded in a diverse range of theoretical literature, including the contributions of Kerimov, Orujov, and Israfilov from their book *Regulation of International Economic Relations. International Economic Organizations* (2012), as well as insights from classical economic theories. The works of Smith (2011), Samuelson (1941), Odum (2008) and Krugman (2005) provided a historical basis for analyzing trade and resource distribution. Additionally, the research incorporated the perspectives of Swedish economists Heckscher and Ohlin, who emphasized the role of factor endowments in international trade.

Practical insights were derived from statistical databases such as the Energy Information Administration (EIA), natworld.info, and the State Statistics Committee of Azerbaijan (stat.gov.az). These sources provided up-to-date quantitative data on global energy consumption, oil and gas reserves, and economic impacts, enabling a robust statistical comparison across different regions and timeframes.

The study involved a detailed comparative analysis of academic and practical viewpoints regarding the global energy problem. It examined the interdependence between energy consumption and societal demands, including industrialization, urbanization, and environmental implications. Particular attention was given to evaluating the energy policies and strategies of developed and developing countries, with Azerbaijan serving as a case study for oil and gas production and its role in the global energy market.

These methods and materials collectively allowed for a comprehensive examination of the multifaceted challenges associated with the global energy problem and provided a foundation for proposing actionable solutions.

Results and Discussion

A comparative analysis of scientific and theoretical literature on the global energy problem

In the face of a sevenfold increase in the world's population in the last two centuries, and an increase in the individual as well as social needs of people and society as a whole, the removal of agricultural impact of arable land on the planet from circulation, their erosion, the construction of roads, their allocation for construction naturally created certain difficulties in providing the population with food. As a result, in real life, along with natural foods, people have increased the production of artificial and genetically modified foods. It should be noted that such products were first produced in 1975 in the world.

The main essence of the efficient use of energy resources is to ensure dynamic and sustainable economic activity aimed at stabilizing the socio-economic development of all countries. Ensuring economic activity should not be based solely on the exploitation of energy resources, but on their efficient use. This is important for future generations. At present, various computing bodies around the world claim that the world has oil reserves of about 200-300 billion barrels, which may be enough for the next 100 years.

From this point of view, it has already been unequivocally accepted by any state that serious consideration of the social factor is a necessary factor in achieving sustainable socio-economic development. These, in turn, contribute to the efficient use of the world's energy resources as one of the main conditions for socio-economic development.

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The utilization of energy across various economic sectors significantly intensifies society's dependence on energy resources. Consequently, contemporary economic literature often aligns the global energy challenge with the food security issue, emphasizing their interconnectedness within a unified structural framework. This perspective is consistently reflected in the scientific contributions of both domestic and international scholars. For instance, this viewpoint is prominently discussed in the in the work *The World Economy: Problems of the Modern Age* (Aliyev et al, 2007). The convergence of these issues underscores that food and energy concerns represent critical global economic and social challenges, rooted in specific underlying causes.

First of all, the production, distribution, exchange and consumption of food and energy products are considered to be an integral part of the normal development of the modern world economic system. Second, the primary source of food and various production and service products of the population is mainly related to land. For example, oil and oil products, coal, various peats and others are like that. Although the products of nuclear power plants has been used for obtaining the energy products in recent years, the land has been a major factor in it, too.

The British classical economist Petty mentioned that wealth is created in the sphere of material production, and therefore it is known that they attach special importance to land (Petty, 2011).

Finally, it should be noted that scientists point out the problem of food and energy in the same way as the fact that along with food, energy products are unevenly distributed on Earth. On the other hand, in the 1930s, Swedish economists Heckscher and Ohlin proved in their research that the factor that determines international trade between countries is the unequal distribution of available resources, including energy (Hecksher, 1991; Ohlin, 1967). On the one hand, this was a kind of development of the theories of Smith, Ricardo (Theory of Absolute and Comparative Advantages) and the completion of the essence of this theory (Smith, 2011; Ricardo, 2022).

International experience shows that energy has become the most used requirement for every moment of our daily lives and every activity. Meeting the growing demand of society with energy requirements that are not dangerous at a certain level and in terms of environmental values, as well as its use is the most important problem of modern society.

Today, the United States and other developed countries, one of the world's leading nations, use the depleted natural resources such as oil, natural gas and coal to meet their energy needs. In modern times, many people put forward the idea that the use of energy is less harmful to society and the environment. That is, the main threat is not to get energy, but at the same time not to harm the global world. In the United States and other industrialized countries, almost all energy comes from fossil fuels such as oil and gas. Howard Geller, general director of the American Southwest Energy Productivity Project (SWEEP), commented on energy use of the country in his book "The Energy Revolution: Policies for a Sustainable Future" (2003): "How energy is produced during use and at the same time the potential damage to the environment is not taken into account" (Geller, 2002). People think more about getting energy as a basis. The level of energy use of countries is directly related to their level of development and what energy resources they use. They do not think much about its impact on society and the environment.

We come across to many shortcomings in Geller's opinion. Any energy production process carried out without taking into account environmental values will have a negative impact on both the population and the country's economy. As a result of the above mentioned ideas, so-called "curse of wealth" in oil-rich countries has entered the economic literature since 2013. It should be noted that in terms of energy, oil-rich countries can not develop industrially. They export more raw materials.

Illich wrote in his "Energy and Equality" book that some superpowers, such as the United States, France and Japan "will never be satisfied with energy consumption" (Illich, 1992). He also believes that the main reason for the energy problem is the industry of developed countries. He says some superpowers, such as the United States, Japan and France, have joined the "Energy Coma" and they will never be satisfied with energy consumption. International experience has clearly shown that in a country where energy consumption is increasing, the level of welfare of the population is declining (Illich, 1992). Naturally, this

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is reflected in the produced products. We have mentioned above that the production of any agricultural and industrial product depends on the use of energy.The country that consumes the most energy means that the production of goods and services increases in that country. Increased energy consumption creates a kind of dependency or "energy inequality". In fact, even in modern times, all wars between the countries of the world create the need for or management of energy at the root of economic and political cataclysms. On the one hand, this leads to the massacre of people, "slavery" and the deepening of inequality between countries. These views are already being voiced at global conferences. Thus, excessive energy consumption is a great danger not only to human life, but to the entire living world. While some countries support the use of nuclear energy, other countries have already stopped using it. On the other hand, the oil produced on the land not only makes the land unusable, but also creates radiation in this area. Offshore oil harms the bio-living world. If we take into account that oil as an energy resource is already used in many countries are extracted from 300 thousand meters, 500 thousand meters and greater depths, and there are explosions in many oil fields for extracting these products from that depth, which is detrimental to the mankind of it.

Although the rise in energy prices has generally affected commodity prices, this has been somewhat volatile in 2020. Thus, according to World Bank (WB) statistics, in 2020, energy prices decreased by 18.3%, non-energy prices increased by 16.1%, and food prices increased by 14.9%.

A comparative analysis of the views and opinions in the existing literature on the global energy problem shows that the issue of energy has been the subject of discussion not only of economists, but also of politicians as a whole. In fact, we have explained abovethe reasons for this to some extent. That is, the population needs energy at all stages of society. In this regard, politicians face the need to voice these views for their countries in order to meet the needs of society. Therefore, the political leaders of our country also voiced the energy issue and the problem in one form or another in their speeches.

Assessment of Global Energy Demand in the Example of Oil and Gas and A Look At the Azerbaijani Economy

In modern times, the importance of energy in human life is constantly growing. This is due, on the one hand, to the rapid industrialization of individual countries and, consequently, to the growing demand for energy, on the other hand, to the inflow of energy into various spheres of human life. Specifically, modern human uses such a variety of electrical equipment (refrigerator, TV, vacuum cleaner, etc.) in the kitchen, all of which are powered by energy. Whether in our homes, in our kitchens, or in various sectors of the economy, the use of energy strengthens the energy dependence of a society. Therefore, it is no coincidence that looking at many of the modern economic literature, it is clear that the global energy problem is grouped in the same structure as the food problem.

In modern times, a number of theoretical views have been formed on finding more efficient energy sources, overcoming existing global energy problems and solving such problems. It is known that energy sources are divided into two groups:

Inexhaustible energy resources;

Exhaustible energy resources.

Inexhaustible energy resources include solar energy, climate and sea currents. All minerals are usually exhaustible and non-renewable energy resources. However, there are renewable resources, including land, biological resources and hydropower.

In general, it is interesting to look at responsible types of energy consumption in the world. Statistics show that the lowest energy consumption in the world was 3% for nuclear energy, 7% for hydraulic energy, 25% for natural gas, 26% for coal and 39% for oil.

The most consumed energy resources in the world are oil and natural gas. Each year, billions of tons or dollars of these natural resources are used. Therefore, such a situation will lead to its end. Therefore, it is necessary to think not only about individual economies, but also about the world economy as a whole. As

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the world economy gradually moves towards the formation of a single economic system, the concerns and problems of mankind take on a new meaning and take on a universal or global character. The more people oppose the formation of the world as a single economy, the more the world economy develops and the more the population grows accordingly. Population growth increases energy consumption. In this regard, let's look at the dynamics of world population growth (look at Table 1).

Tale 1. World Population

Years	World population (with person)	Annual growth(%)	Population density (population /km²)	Urbanization %
2018	7,632,819,325	1.09 %	51	54.9 %
2017	7,550,262,101	1.12 %	51	54.4 %
2016	7,466,964,280	1.14 %	50	54.0 %
2015	7,383,008,820	1.19 %	50	53.6 %
2010	6,958,169,159	1.24 %	47	51.3 %
2005	6,542,159,383	1.26 %	44	48.9 %
2000	6,145,006,989	1.33 %	41	46.5 %
1995	5,751,474,416	1.53 %	39	44.7 %
1990	5,330,943,460	1.81 %	36	42.9 %
1985	4,873,781,796	1.80 %	33	41.1 %
1980	4,458,411,534	1.79 %	30	39.2 %
1975	4,079,087,198	1.97 %	27	37.6 %

Source: http://www.worldometers.info/world-population/#

As can be seen from the table, the population is growing every year. According to 2018 statistics, the population is 7.6 billion and it continue with increasing dynamics. By global population growth the energy use is increasing, too. The growth of the world's population also necessitates the emergence of new techniques and technologies. The emergence of new equipment and technology, as important as it is to meet the needs of people, on the other hand, it is a major source of energy consumption. It should be taken into account that one of the reasons for the global energy problem, in my opinion, is the newly created equipment and technologies. The source of conflicts between countries in the world is to control, acquire and manage these resources. Unplanned energy exploitation in many countries is already nearing the end of a number of natural resources. It is no coincidence that many economists, scientists and people looking for a global energy problem predict that the world's oil reserves will decline sharply in the next 100 years. As a result, a number of countries are already looking for alternative energy sources. Currently, a number of countries around the world also use solar and straw energy. However, the amount of experience or use of these energy resources is small. This means that in the future, humanity is in serious danger for facing the global energy crisis. The world's energy security and environmental problems are also growing. Studying the causes of the global energy crisis, first of all, it is necessary to take into account the risk of rapid exploitation and depletion of these energy sources. Unfortunately, it should be noted that the use of natural resources, including energy, is growing every year around the world.

As for the global energy supply, 70% of these sources are located in the East. Depending on the tendencies of international relations, changing market conditions, political and diplomatic movements, Because of the

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reality of sharing more than half of its consumption with Europe, the United States, China and Japan, from time to time, serious economic and social problems arise.

According to statistics from the Energy Information Administration, global demand for crude oil in 2020 decreased by about 10% compared to the previous year. This is due to the fact that in order to prevent the spread of the pandemic in the global world, that in the most countries the restrictive measures are related to travel, tourism, as a result, a sharp decline in transport use have led to declining oil consumption. This can be seen in the statistics of the World Energy Information Administration.

All this shows that the issue of energy, on the other hand, is a matter of economic security of countries. In other words, not every politician wants to see his country's economic security under threat in terms of energy. Therefore, it is looking for various ways to ensure energy security. It is no coincidence that in 1994, an agreement called the "Contract of the Century" was signed between 11 oil companies representing 6 countries in the capital of our country. This agreement envisages the joint development of 3 oil fields of our country (Azeri, Chirag and Gunashli). It should be noted that SOCAR had 10% stake, Amoco-BP-34%, Unocol-10%, LUKOIL-10% and the remaining 6 companies had a 36% stake in the agreement. The contract is considered to be for 30 years and 8 billion dollars of USA is intended to be spent for the exploration, production and export of 600 million tons of oil and 100 billion m3 of natural gas.

When the contract of the century was signed, national leader Heydar Aliyev noted: "Azerbaijan's energy potential has served Russia for centuries, and the economy of the former USSR for the last 70 years. This potential can be an effective stimulus for the development of the world economy, as well as its leap. In this regard, the West and Azerbaijan need each other. If global cooperation allows one of the parties to enter the world market, it allows the other side to get rid of the impending energy crisis (Gunter, 2024).

In 1995 H.Aliyev noted about Azerbaijan's energy resources: Azerbaijan has been extracting oil and gas since ancient times. Industrial oil production in our country began in the middle of the last century in 1848. At the beginning of the century, our oil industry had reached a high stage of development. At that time, most of the world's oil production fell to Azerbaijan's share . Over the past period, Azerbaijan has extracted 1.4 billion tons of oil. However, Azerbaijan still has rich oil and gas fields. At the present time, when we join the world community as an independent state, we are taking measures to use our energy resources" (Aslanlı, 2024).

The participation of the Azerbaijani economy in the system of international economic relations and the division of labor is deepening, which contributes to the integration of our country into the system of international economic relations and the increase in exports of more finished products. All this creates a solid foundation for the stable and sustainable development of the republic's economy.

In 2019, 35.6% of the country's GDP was formed due to the oil and gas sector, which is 0.03% more than the previous year. It should be noted that oil production has decreased compared to the previous year. In this regard, let's look at the dynamics of oil production as a result of investments in the country's economy, especially in the oil industry.

Table 2. The Oil Production (İncluding Gas Condensate) For the Relevant Years İn Our Country, Thousand Tons

Years	Mln. Ton
1995	9, 2
2000	14, 0
2001	14, 9
2002	15, 3
2003	15, 4
2004	15, 5
2005	22, 2

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2006	32, 2
2007	41, 7
2008	50, 0
2009	50,3
2010	50,6
2011	45,3
2012	42,9
2013	43,2
2014	41,9
2015	41,5
2016	40,9
2017	38,7
2018	38,8
2019	37,5

Source: https://www.stat.gov.az/source/balance_fuel/

By this aim it is necessary to continue measures in the following areas to ensure the sustainable development of the oil and gas industry of our country:

Search and exploration of new oil and gas fields;

Involvement of newly discovered fields in full-scale economic turnover;

Carrying out work on new wells involved in economic turnover and rehabilitation of inactive wells;

Constantly monitor the application of new equipment and technologies to the oil industry;

Make use of the advanced achievements of science and technology and encourage its domestic production.

Discussion

The research highlights the complexity of the global energy problem, integrating theoretical perspectives, empirical data, and case studies to provide a comprehensive understanding of the issue. This discussion evaluates the causes, implications, and potential solutions to the global energy crisis, referencing key contributions from the literature.

The global energy crisis is fundamentally rooted in population growth and industrial expansion. As illustrated by the data from Worldometers, the global population has grown exponentially over the past century, leading to increased energy consumption across all sectors of society (Kərimov, 2012). This finding aligns with the theoretical frameworks of classical economists like William Petty and Adam Smith, who emphasized the importance of resource availability and efficient production in economic development (Petty, 2011; Smith, 2011).

Technological advancements have further exacerbated the demand for energy. As new equipment and industrial technologies emerge, their energy requirements often outpace the supply of renewable resources, resulting in a greater reliance on finite resources like oil and coal(Kruqman, 2005). This dependency is particularly pronounced in developed nations, as noted by Illich in *Energy and Equality*, where industrialization fosters an insatiable demand for energy resources (1992).

The environmental consequences of over-reliance on fossil fuels are significant. The extraction and consumption of oil and gas lead to land degradation, water contamination, and greenhouse gas emissions, contributing to climate change. Geller's *Energy Revolution* underscores the necessity of considering environmental values in energy production, a perspective echoed by numerous global energy policies

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(Geller, 2002).

Socially, energy inequality has emerged as a critical issue. Countries with abundant energy resources often experience the "curse of wealth," where economic reliance on resource exports hinders industrial diversification and sustainable development. This phenomenon is particularly evident in oil-rich nations like Azerbaijan, where despite substantial reserves, economic growth remains vulnerable to fluctuations in global energy prices (Aslanlı, 2024).

Effective energy policies are vital for addressing the global energy problem. The European Union's *Energy 2020* strategy exemplifies a commitment to competitive, sustainable, and secure energy practices. Similarly, Azerbaijan's "Contract of the Century" showcases the potential of international collaboration in optimizing resource use and ensuring energy security (Gunter, 2024).

At the national level, Heydar Aliyev's vision for Azerbaijan highlights the strategic importance of leveraging energy resources for socio-economic development. His emphasis on international partnerships and technological innovation remains relevant in contemporary energy management strategies (Aslanlı, 2024). The transition to renewable energy sources is imperative for mitigating the global energy crisis. Solar, wind, and hydropower offer viable alternatives to depleting fossil fuels. However, their adoption remains limited, particularly in developing nations, due to high initial costs and technological barriers (Aliyev, 2007).

Furthermore, lifestyle changes and energy conservation measures are critical. Reducing energy consumption in transportation and industrial sectors, coupled with investments in energy-efficient technologies, can significantly alleviate the strain on global energy supplies.

Conclusion

By the research it was founf out that the causes of global energy problem are related to the rapid growth of the world's population and the growth and development of industrial production. The causes of the global energy problem can be divided into four parts.

Human growth in the world and the corresponding increase in their needs;

Development of world industry and energy consumption;

Development of equipment and technology;

Political and economic factors.

Used as the lighting and heating in the early twentieth century, energy has become an indispensable element of social and economic life due to its greater use in industry and other fields. Responding energy needs at a sufficient level and without threatening environmental values is a major challenge for any society today. As a solution to the global energy problem, the following has been proposed:

Reduction of energy use;

Making certain changes in people's lifestyles;

Reduction of transport and transportation costs;

Energy conservation and protection;

Use of alternative energy sources.

It is considered that the implementation of these will lead to the efficient use of energy resources, both globally and domestically.

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