Ministry of Education Republic of Azerbaijan

ANALYZING OF THE IMPACT OF AZERBAIJAN'S ENERGY POLICY ON THE ECONOMIC GROWTH

Nazrin Israfilova

UNEC SABAH

Azerbaijan State University of Economics

May 2018

Acknowledgements

We would like to thank ...

ANALYZING OF THE IMPACT OF AZERBAIJAN'S ENERGY POLICY ON THE ECONOMIC GROWTH

CONTENTS

INTRODUCTION

Issues related to the development of the energy needs of countries, the increase in the efficiency of the use of energy resources, actively raised by economists almost haIf a century ago, and today are in the focus of attention of governments and the world scientific community. Their high relevance is determined by the vital role of energy production in the reproduction process (in its broadest sense), with an extremely uneven distribution of traditional energy sources across the territories of states, their objective limitations and exhaustion. One of the important aspects of the energy problem is the issue of improving the environment, reducing the anthropogenic load on natural ecosystems caused by the use of hydrocarbon energy carriers. Today we are witnessing an active and unsuccessful search for ways and means to improve the energy independence of countries, reduce the need for traditional energy sources, and ensure the transition to fundamentally new energy-saving production technologies.

The subject of the research is the process of energy consumption in the national and global economy, its relationship with the dynamics of economic growth, the fueI and energy balance as a key tool for analyzing and predicting energy consumption.

Objectives of the research:

– research of theoretical concepts on the relationship between energy consumption and economic growth;

– analysis of global trends in energy consumption and features in the development of energy consumption of countries with different levels of economic development;

– systematization of the main directions and measures in the state policy of energy efficiency and energy saving;

– comparative analysis of the methodology for drawing up the balance sheets of fuel and energy resources;

–development of recommendations for improving the state policy to stimulate energy conservation and energy efficiency;

Methodology and methods of research. The theoretical basis of the study is the concepts of factors of production, economic growth and sustainable economic development. The methodological basis of the research is the work of domestic and foreign scientists on the analysis and forecasting of processes in the field of energy consumption.

CHAPTER I
THEORETICAL BACKGROUND OF RELATIONSHIP OF ENERGY AND ECONOMIC GROWTH

1.1.Development of theoretical provisions on the relationship of economic growth with the dynamics of energy consumption

Research of the circumstances determining the dynamic characteristics and the long term trend of energy consumption is based on a comprehensive account of conditions in which the demand for energy was formed. Their comprehension requires relying on the provision of modern economic science, which provides the necessary theoretical basis for identifying systemic relationships of energy consumption with processes in the production and use of products and income with the:

-development of technology
-economic issues
-state policy
-other aspects of social-economic sphere.

In turn, the history of the development of economic thought reveals a picture of the transformation of scientific positions, concepts and theories as a result of the emergence of new facts, systematically recurring phenomena acquiring the stability of processes.

An analysis of economic history shows that the scientific views taken by society on the factors of socio-economic development, the patterns of the functioning of the economic system are able to influence the choice of managerial decisions and schemes of economic behavior that determine trends in economic dynamics. Considering the factors of economic dynamics in the concept, the boundaries of the object of scientific research expand from the "socio-economic system" to the "eco-socio-economic system". This is determined by the urgency of taking into account the influence of the natural factor - ecology and natural resource constraints (including natural energy carriers),on the living conditions of future generations.

For a long time (until the 70s of the last century), environmental issues were outside the focus of economic science. The necessity of the availability of natural resources was considered as one of the key conditions (the theory of labor value) and one of the key factors of production (utility theory).

The question of the exhaustion of natural resources, first raised by A.R. J. Turgot and formulated as the law of "diminishing soil fertility", later found a response in T. Malthus' political economical works, where there were fears that with the observed rapid population growth, available natural resources would not be enough to produce the necessary means of subsistence.

In economic concepts, including those included in the modern theory of economic growth, the provision on the limitation and exhaustion of natural resources is reflected in the basic provisions of a more general plan - the thesis of the rarity of economic goods and the law of diminishing productivity of factors of production in conditions of maintaining the unchanged technological structure of the economy.

The theoretical understanding of the wavy upward curve, describing the dynamics of GDP, made it possible to formulate the idea of the reasons explaining the regularities of this phenomenon. This was done by J. Schumpeter (based on the repeated fluctuations in the parameters of economic growth identified by Kitchin, Zhuglyar, Kondratyev). She fits well into his concept of the need for an external impulse (the

so-called "Innovator", making technological innovations) to give dynamism to the "static" economic system.

Let's pay attention to the fact that taking into account the factor of scientific and technological progress (NTP) in model constructions of a dynamic economy, although it does postpone, it does not solve the problem associated with the exhaustibility of non-reproducible (in contrast to other production factors) natural resources. In the works of the mathematical direction, which provided the necessary clarity in the presentation of the key concepts of the concepts (in terms of interdependencies, equilibrium conditions, development, substitutability and complementarity of production factors), the question of the exhaustion of natural resources was not raised. As a basis for expanding production (under conditions of employment hypotheses), the volume of accumulated assets produced (short-term growth) and the process of accumulating fixed capital (long-term growth) were considered. Changes in non-produced non-financial assets (natural resource) were not taken into account in theoretical models describing a dynamic economy.

According to the concepts of economic growth, the contradiction between the ever-increasing needs of society and the limited amount of productive resources (labor, capital, natural resources) in each specific period is resolved in the course of the development of scientific and technological knowledge, the mass dissemination in the economic practice of new technologies and technical means to ensure the transition economy from one technologically-stationary state to another. This process is accompanied by a trend increase in gross domestic product and is ensured by a reduction in the labor intensity and material intensity of production (as well as by material substitution) with an increase in the saturation of the economy by more effective elements of fixed capital.

Public attention to the urgent need to take into account the natural factor as a restriction of growth was attracted in 1972 by the publication of the report of the Club of Rome "Limits of Growth". The report contained the results of modeling the growth of the planet's population and the depletion of resources (five systemically related parameters were taken into account - population size, industrialization, food production, depletion of natural resources and environmental pollution). The authors of the report concluded that if the current dynamics continue, then during the next century the world will approach the limits of growth, an unexpected and uncontrollable decline in population will occur and production will drop sharply.

Another important event was the oil crisis of 1973, which revealed the instability of the economies of developed countries due to their high dependence on prices for primary energy resources. The crisis gave impetus to the state and corporate policies in the field of energy conservation and transition to alternative and renewable types of energy resources.

During the same period (in 1974) two works appeared - R. Solow and D. Stiglitz, where the question of including explicitly the factor of exhaustible natural assets as a function of macroeconomic growth was considered. R. Solow writes in his 1974 article that the introduction of exhaustible natural resources into the model does not violate the basic principles of growth theory. If the assumption is made that the elasticity of substitution between natural resources and labor and capital is not less than one, the final volume of resources should be used in accordance with the general rules that regulate the optimal use of the reproduced assets. In particular, early generations have the right to reduce the amount of resources as long as they replenish the stocks of reproducible capital. D. Stiglitz in his work of 1974 proposed a production function with three factors, where labor, capital and natural resources acted as substitutes in the production process. The model reflected the position - the increase in the deficit of natural resources can be overcome through technological progress. To maintain a constant level of consumption per capita, more stringent conditions were imposed on the speed of technological progress.

In the 1980s among the economists-theoreticians, "technological optimism" (in terms of the question of the prospects of growth in the conditions of the exhaustion of natural raw materials) was dominant. So, U. Baumol in the work of 1986 argued that the economic reserves of natural resources can grow monotonously and constantly, even if their physical reserves are continuously decreasing. In other words, resources, whose physical volumes are finite and constantly decreasing, can nevertheless be increased due to technological progress in terms of their expected economic contribution, and this can occur in an indefinite future.

Soon there was a radical change in the scientific views on the admissibility of the economic methods that developed in the world economy. The replacement of the dominant targets for sustainable economic growth by the 1990s with the paradigm of sustainable development is associated with the dissemination of the ideas voiced in the report "Our Common Future", prepared in 1987 by the United Nations World Commission on Environment and Development (Brundtland Commission). The

analysis revealed three groups of problems (in the ecological, social and economic spheres), the development of which in the long term threatens human civilization. They can be defined as follows, drawing attention to the fact that all points have a close relationship with energy consumption and energy supply:

-destruction of habitual habitat under the influence of a high and increasing degree of pollution of the natural environment by activity that exceeds its natural cleansing capabilities, inducing the development of negative changes in the biosphere, health and reproduction conditions of the human population;

-depletion of natural reserves of minerals, reduction of the forest cover of the territories under the influence of current production activities, infringing future generations on the rights to these vital resources and sustainable development;

-presence and aggravation of deep internal disparities and contradictions in the world economic system (connected with the growth of poverty level and the problem of inter-country distribution of resources and incomes), which determine the strengthening of geopolitical tensions that create the basis for devastating economic and social upheavals.

The report concluded that it is possible in principle to implement a model of sustainable long-term socio-economic development (a development in which the needs of the present generation are met without compromising the ability of future generations to meet their own needs). And its relevant justifications were set out (the thesis of the relativity of resource constraints, their relationship to the level of technology) and the conditions (this is the need to meet the basic needs of the poorest population, the harmonization of increasing consumption of the richest levels of population and the rate of population growth with a change in the state of the resource capacities of the ecosystem of the planet, including , non-renewable energy sources).

The conceptual idea of the model of sustainable development found support from the world community. Many countries have adopted documents declaring their readiness to implement the policy of transition to sustainable development.

Although economists point out the need for further work on the theoretical aspects of this concept and practical schemes for its implementation (which, of course, one should agree), one thing is certain: the success of the concept of sustainable development is largely related to the solution of the energy problems of modern society.

The aggravation of environmental (climatic) threats is associated with the majority of specialists with large-scale overaccumulation of greenhouse gas emissions exceeding the ability of the natural environment to self-restore the natural balance of elements in the atmosphere. As a part of greenhouse gas emissions related to anthropogenic impact, the main part (about 60%) is the products of burning hydrocarbon fuel products, accounting for almost 82% of world energy consumption.

In the unevenness of countries' self-reliance in fossil (not renewable) sources of energy, the roots of many economic and geopolitical problems are growing, escalating local (regional and national) frameworks. These problems to some extent always took place, being a factor of economic and social destabilization, limiting the world economic dynamics. Their significance has increased significantly in the modern world - a globalized system with significantly increased energy consumption, a high dependence on traditional energy sources; a world that is extremely sensitive both to price shocks in the energy market and to local conflicts and crises associated with a desire to dominate the right to access traditional energy sources.

A radical solution to the energy problem lies in the technological field, first of all the issue of the development and mass distribution of replacement technologies (in the production of electricity, in manufacturing industries, etc.) that can significantly reduce (and subsequently, perhaps, and practically eliminate) dependence of economies and economic growth on fossil fuels.

The emergence of this process today is seen quite clearly and, according to a number of economists, indicates the beginning of a new long (Kondratieff) wave in the economic dynamics that will lead to a change in the current technological order, ensuring large-scale shifts in production methods and the output of the world economy to a much higher, energy efficient, technological level.

At the same time, the state scientific, technical, economic, including energy, policy plays an extremely important role in shaping incentives for activating innovation, energy saving and energy efficiency processes. The adoption of effective solutions in this area and the development of effective measures for their implementation should be based on taking into account the changes in the nature of the relationship between the dynamics of energy consumption and the pace of development of the national economy, the peculiarities in the structure of the national economy, which requires an appropriate analytical tool.

Since the end of the 1970s, a large number of applied studies have appeared devoted

to the study of the relationship between energy consumption and economic growth. The development of model tools also took into account the issue of the quality of economic growth, investigated the relationship between economic growth and emissions of pollutants and changes in the environmental situation. As the basic modeling tools at carrying out of empirical researches are used: a) econometric models; b) interindustry models; c) integrated models based on the first two types; d) the model of general economic equilibrium. The information base for analytical studies of this year is formed by accumulated statistical series with indicators of national fuel and energy balances, interbranch balances, and other statistical information.

The question of the need to investigate the causal relationship between the rate of growth in energy consumption and the parameters of economic growth set by the American economists D. Kraft and A. Kraft in 1978, was, as can be judged, initiated by a related question about the degree of permissible rigidity of the current state environmental policy (as a factor, potentially capable of exerting an overwhelming influence on both the dynamics of energy consumption and the rate of production).Econometric analysis of the American economy, conducted in 1947-1974, allowed them to conclude that the policy in the field of energy conservation can be implemented with little or no negative impact on economic growth. Later, many other economists used econometric methods to analyze this connection in different countries, including the United States. At the same time, different conclusions were obtained for different countries and for the same country. In economic publications on this issue, many analysts pay attention to this incident, explaining it as a difficulty in obtaining an unambiguous answer for the multiplicity and multidirectional relationship between processes in the sphere of energy consumption and the dynamics of GDP production, the availability of time lags and structural shifts in production.

An important role in studying the relationship between energy consumption and economic growth is occupied by studies based on the application of the method of interbranch balance. The first interbranch models in this field appeared in the late 1960s. and actively developed in the 1970s. The impetus for their development was the sharp rise in prices for energy resources and the deepening of environmental problems associated with increasing energy consumption.

The first foreign papers in this field include papers by J. Cumberland, A. Strout, R. Ayres, D. Wright, C. Bullard, R. Herendeen, J. Griffin, P. Blair, etc. As a rule, in

assessing the relationship of volumes energy consumption with the pace of development of industrial production, the hypothesis of the linear character of this relationship was used, the calculation was based on the constant coefficients of direct energy costs per unit of output value by sectors of the economy (in comparable prices).

As a rule, when assessing the relationship between energy consumption and the pace of development of industry, the hypothesis was used about the linear nature of this relationship, the calculation was based on the constant coefficients of direct energy costs per unit of output value by sector of the economy (in comparable prices).

Over the past decades, inter-industry balance models have been used to study a wide range of energy consumption problems.

Since the early 1980's. models are built to measure direct and indirect energy effects as a result of changes in final demand, and to assess the impact of technological shifts on energy consumption.

Among other areas of use, it is also possible to identify the analysis of alternative energy-saving programs, the study of the impact of new technologies in the energy sector on the economy, the economic and environmental effect of the introduction of a tax on energy use, and the study of regional energy interrelations based on trade balances.
In general, since the early 1990s. in the application of interbranch tools to the problems of energy consumption, two main trends predominate:
1) a detailed analysis of energy flows in industrial complexes;
2) analysis of the relationship between energy consumption and environmental pollution;

The development of integrated models on the basis of the synthesis of interbranch and econometric models contributed to an increase in the systematization of calculations. A typical macro econometric interindustry model contains econometric functions for estimating the elements of final demand-expenditures on final consumption of households, investment expenditures, and net exports. The estimates thus obtained are used to construct the series of final demand in the interbranch model. Studies on the relationship between energy consumption and economic development based on this integrated approach have become quite popular in the 2000s.Among the works in this area, in particular, we can note a model developed

under the leadership of F. Perobelli (F. Perobelli) for the economy of Brazil. In the macroeconometric interindustry model developed by the team of scientists for the European Union's economy, regression analysis is used, in particular, for modeling processes in the production block.

Finally, in the last two decades, models of general economic equilibrium have gained particular popularity, allowing one to trace the multiplicity effects of the state's energy and environmental policy. Since energy costs are present in any economic activity, and the possibilities for replacing fossil fuels with alternative and renewable energy sources are limited, multiplier effects (including price effects) from the implementation of energy and environmental policies will be felt in a variety of commodity markets. One of the most important areas of research using this tool is the analysis of the economy's response to measures to reduce greenhouse gas emissions from burning fossil fuels.

In Soviet economic science theoretical and practical questions in the field of planning the rates of economic growth, optimizing the proportions in the distribution of resources and income, taking into account the limitations of the mineral and raw materials base, the state of the fuel and energy balance has been given very serious attention. Rapid development of economic and mathematical methods of planning, which has been observed since the 1960s (until the late 1980s), has been associated with the organization since 1959 of systematic statistical work on the compilation of basic inter-branch balances of the country, fuel and energy balances, a wide range of natural balances for individual species resources, as well as with the development of the first (and only) reported in-kind cross-sectoral balance sheet in 1959. The economic reform of 1965 was undoubtedly an important milestone on the way to departing from dogmas in measuring and coordinating the costs of resources and production results, natural rents and prices for industrial products. The Soviet mathematicians-economists created a qualitative model tool adapted to take into account the features of the functioning of the economy in a centralized planning system (with the concentration of the overwhelming part of revenues in the budget system, the practical lack of market pricing mechanisms, the state monopoly on foreign trade, and the centralized allocation of investment resources). The toolkit included various types of cost and value-based intersectoral models with a developed fuel and energy block (static, dynamic, optimizing taking into account the interchangeability of production factors and production technologies, the economic efficiency of foreign trade), models of the type of production functions (macroeconomic, sectoral).

At the macro level of economic analysis in the field of energy conservation, the negative impact on economic growth, attention is focused on the assessment of conditions (in terms of the distribution of national income on consumption and accumulation, structural investment policy), under which the maximum amount of production of national income for the planning period can be achieved. At the same time, production constraints associated with energy, financial, financial and logistical support.

Concluding the presentation of theoretical questions in the field of energy consumption and economic growth, the characteristics of the tools used for a systematic analysis of these processes, it is necessary to emphasize the following.

Undoubtedly, the implementation of the concept of sustainable development is the path by which the world community can avoid the threats associated with the aggravation of energy problems. The governments of the countries choose their mechanisms for implementing this concept, proceeding from the consideration of the current and future development tasks. There is no single recipe for all countries, which is currently better - a more stringent or softer state environmental policy, which is actually associated with government energy saving policies (although there is a difference between them in terms of objectives and mechanisms).

The relationship between energy consumption and economic growth is determined by the action of many factors and is of a reciprocal nature. These factors are:

1. Restrictions imposed by environmental policy, restrain current (short-term) economic growth. The higher the rigidity of the policy, the stronger the effect of these restrictions. This is a minus of a tough environmental policy. Since a part of the funds that would be directed to the expansion of production of end products under soft policy, the receipt of income for investment and future expansion of production, is reoriented to the implementation of additional environmental measures, additional investment in treatment facilities and additional costs for the introduction of energy-saving technologies.

A plus for a tough environmental policy is that adaptation to the economy can be accompanied by an accelerated reduction in the elasticity of the link between the dynamics of economic growth and energy consumption and, correspondingly, an increase in the economy's resilience to price fluctuations in the energy market.

2. The downside of a relatively milder environmental policy is the weakened current

incentives to increase the cost of implementing energy-saving technologies, increasing the vulnerability of the economy and, in the long term, the possible weakening of the country's competitive positions.

Among the advantages of this policy is the already mentioned gain in the short-term rates of economic growth, relatively large financial opportunities for the accelerated solution of important national social and economic tasks. Including, the tasks in the scientific and technological and innovation spheres of activity, which are related to future successes in increasing the country's competitiveness, energy efficiency and development of energy economy.

Thus, the task of governments is to find a fully balanced solution in the issues of the type of environmental policy and mechanisms for implementing the concept of sustainable development.

To obtain generalized conclusions about the results of implementing this policy and processes in the sphere of world energy consumption, let us turn to the analysis of the relevant time series of international statistics.

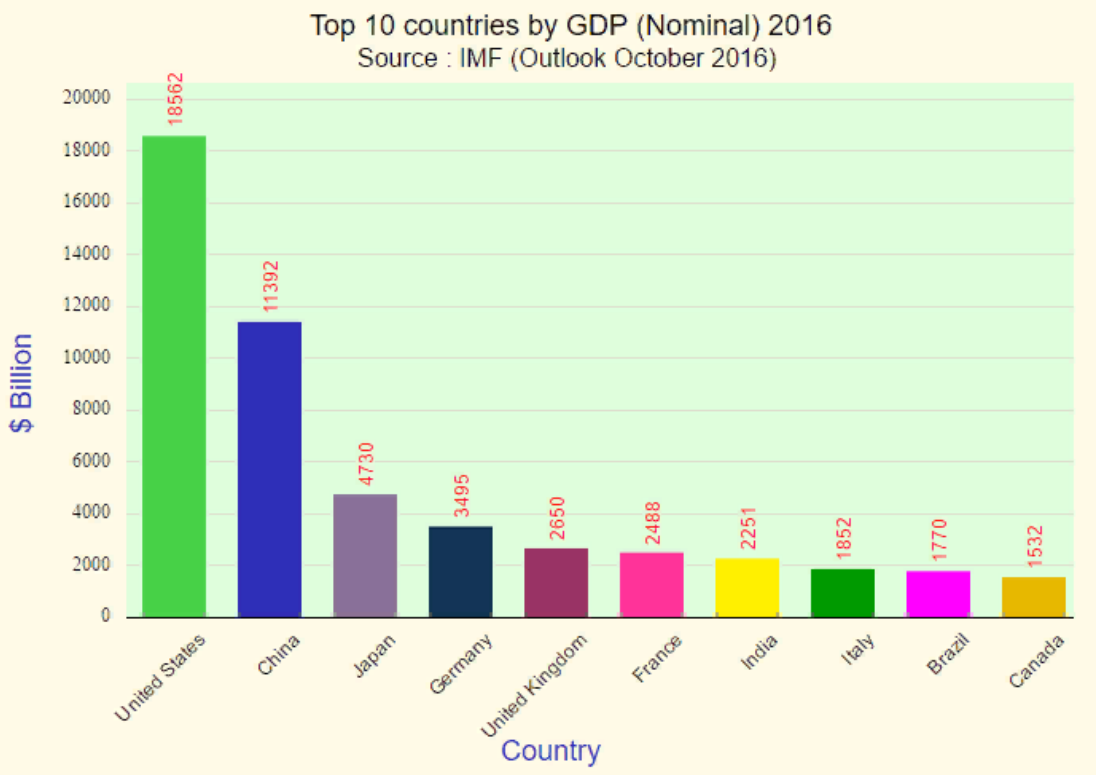
1.2. Assesment of trends in the change in the energy intensity of the global economy

In 2016, the volume of world GDP was 75.8 trillion US dollars. The volume of world energy consumption in 2016 was determined in the amount of 13.2 billion tons of oil equivalent. The largest share in the structure of world GDP was occupied by USA-24.5%, EU-21% and China-14.7%. The BRIX countries accounted for 22.1% of the world's GDP. Brix countries accounted for 22.1% of the world's GDP, including Russia's share of 1.68%. The share of EU, USA, BRIX and Japan accounted for almost 74.1% of world GDP.

The EU countries, the USA, BRICS and Japan consumed about 73.8% of the total energy. The largest energy-consuming countries were China (22.9%), the United States (17.1%) and the EU (17%). At the same time, the share of the EU, the USA and Japan in world energy consumption and share of GDP are almost equal.

The largest gap in proportions is characteristic for the EU, which is explained by the high share of services in the economy of the EU countries and by the active outsourcing of environmentally harmful, energy-intensive (energy-intensive) industries outside the region. A similar situation (slightly less pronounced) was also characteristic of the United States and Japan.

On the contrary, in China, where the most "heavy" energy-intensive production from the USA and Europe was actively carried out in recent years, the opposite situation was observed (the share in world GDP was 14.7%, the share in world energy consumption was 22.9%).



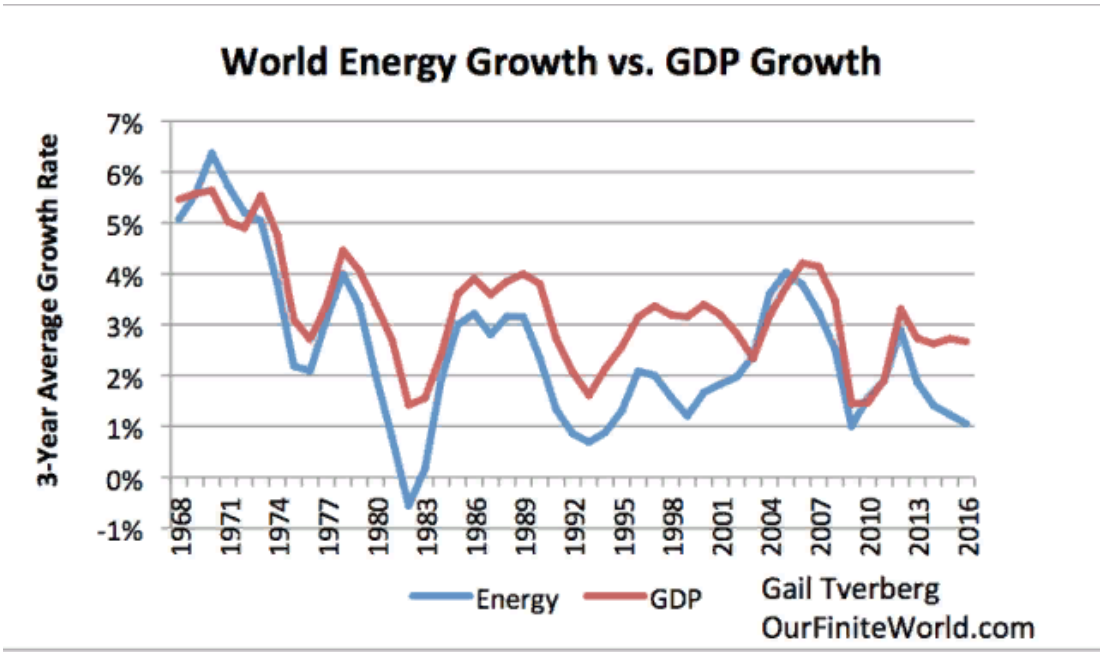
Source IMF Outlook October 2016

In 2016 the voIume of GDP in Azerbaijan was 37,85 biIIion USD doIIars. (Figure 2)

The GDP vaIue of Azerbaijan represents 0.06 percent of the worId economy. GDP in Azerbaijan averaged 24.87 USD BiIIion from 1990 untiI 2016, reaching an aII time high of 75.24 USD BiIIion in 2014 and a record Iow of 3.05 USD BiIIion in 1995.

Source: TRADINGECONOMICS.COM

In 1950-1965, the highest rates of worId economic growth were occurred(Figure 3). A simiIar situation is observed in 1965-1975. The highest growth in energy consumption is observed in these periods. During these times, the price of oilIwas aImost $ 20 per barrel. If you Iook at a shorter period of economic growth, you can aIso see a strong correIation between the increase in energy consumption and economic growth:



Source OurFiniteWorld.com

Since 2013, there has been a very sIow economic growth. Governments provide capitaI for projects of essentiaIIy no vaIue, and their investment is counted as GDP. In the earIy periods after rising prices in 1970 was an "attempt to escape from oiI" and thanks to technology, there was a rapid economic growth.

The share of oil in the world consumption of primary energy resources increased for the second consecutive year and amounted to 33.3% in 2016. Before that, for 15 consecutive years (from 1999 to 2014), the share of oil in the global market was declining. In 2016, world daily oil consumption increased by 1.6 million barrels, of which India and Europe accounted for 0.3 million barrels. - "unusually strong growth for these regions." In China, oil consumption increased by 0.4 million barrels. per day, but in percentage terms this growth is only by 3.3% compared to an average growth of 5.7% in 2005-2015.

The average price of crude oil "dated Brent" in 2016 was $ 43.73. In the reduction to the dollars in 2016 this is the lowest price of oil since 2003, when the barrel cost $ 37.61, follows from BP calculations. In 2017, the price of Brent so far averaged at $ 53 per barrel.

"The drama and intrigue" of the oil market since 2014 stemmed from a confrontation between two players - the OPEC cartel and the US hard-to-recover oil industry, BP writes. If production in the Middle East increased by 1.7 million barrels. per day (most of all - in Iran, by 700 thousand barrels), then US production fell by 400 thousand barrels. per day. But US shale oil "responds to price signals much faster than traditional oil," and the productivity of shale wells grows very quickly. One drilling rig currently operating in the Permian oil and gas basin of the United States is more efficient than the three drilling ends of 2014.

The global production of natural gas last year grew by only 21 billion cubic meters. m, or by 0.3%. If we exclude 2009, when production declined immediately after the global financial crisis, this will be the weakest growth of the sector in 34 years. This is mainly due to the fact that in 2016 gas production in the USA decreased - for the first time since the beginning of the "shale gas revolution" in the mid-2000s. Gas

prices in the US (Henry gas hub) declined by 5% in 2016, while prices in the Asian and European gas markets fell by 20-30%.

In the liquefied natural gas (LNG) market, China remains the largest source of growth in import consumption, but a notable feature of 2016 was the entry into the market or expansion of new buyers such as Egypt, Pakistan, Poland, Jordan, Jamaica, Colombia, Lithuania. A particularly interesting picture is emerging on the European market, in which they see a natural direction for LNG supplies.

In 2016, the share of coal in world primary energy consumption fell to a minimum since 2004 (28.1%). The United Kingdom (-52.5%) became the record country in reducing coal consumption, from which it fell to the level of the industrial revolution of the 18th and 19th centuries. In April 2017, the British electricity industry recorded the first "day without coal." At the same time, on the whole, the reduction in consumption was primarily ensured by the USA (-8.8%) and China (-1.6%). In Russia, coal consumption fell by 5.5% against the backdrop of increased hydropower generation (+ 9.5%).

World coal production fell by 6.2% (231 million tons of oil equivalent) - the maximum drop in the entire history of observations. In China, the indicator also fell by a record 7.9%, or by 140 million toe, in the US - collapsed by 19%, or by 85 million toe. In Russia, coal production, on the contrary, grew by 3.1% with an average growth of 3.2% in the last ten years.

The fastest growing source of energy in 2016 again became renewable energy sources (RES). At present, RES accounts for slightly less than 3.2% of world primary energy consumption. Excluding hydropower consumption, renewable energy consumption increased by 12%, demonstrating the largest increase in the year for the entire period of observations (+53 million toe). More than half of the growth in this sector was provided by wind power (+ 16% per year). The production of solar energy has grown by 30%. And while solar energy accounts for only 18% of renewable energy, it has accounted for almost a third of the total renewable energy.

The largest country, a producer of RES, used in the electric power industry, has become China, surpassing the United States. The Asia-Pacific region has bypassed this indicator for Europe and Eurasia.

Oil production in Azerbaijan in 2017 amounted to 38.689 million tons, which is 5.7% less than in 2016.
At the same time, the volume of oil produced by SOCAR in 2017 was 7.427 million tons against 7.522 million tons a year earlier.

The existing volume falls to the share of the international consortium developing the block of Azeri-Chirag-Gunashli (ACG) oil fields, the "contract of the century" for which it was extended until 2050.
Azerbaijan obtained a number of bonuses - the share of SOCAR increased from 11% to 25%, and the country will obtain cash payments of $ 3.6 billion.

Also, Azerbaijan will have 75% of the income oil produced on the ACG block.
Gas production in the republic in 2017 amounted to 28.598 billion cubic meters, which is 2.6% less than in 2016.

The government forecasted oil production in the country in 2017 at 40 million tons, gas production - 29.5 billion cubic meters.

In 2016, the republic produced 41.3 million tons of oil and 29.3 billion cubic meters of gas.

The abbreviation in production is due to the fact that in December 2016 Azerbaijan joined the contract reached by OPEC and 11 countries not embedded in the organization.

According to the Ministry of Energy of the country, in 2017 Azerbaijan fully fulfilled its obligations to decrease daily production by 35 thousand barrels per day.

In January, the daily oil production was 793.9 thousand barrels (against 829 thousand barrels on average in 2016), February - 776.4 thousand, in March - 733.3 thousand, in April - 781.1 thousand, in May - 785.3 thousand , June - 793.7 thousand, in July - 796.7 thousand, in August - 734.8 thousand, in September - 785.7 thousand, in October - 800.6 thousand, in November - 790.7 thousand, in December - 810 thousand barrels.

In accordance with the Ministry of Energy, 755.1 thousand barrels of crude oil are produced from the total volume of production, 54.9 thousand barrels - gas condensate.

The ministry specified that the daily manufacture limit set by Azerbaijan for the OPEC + agreement is 834 thousand barrels.

Before the signing of the OPEC agreement + average daily production in Azerbaijan was 829 thousand barrels.

1.3. Wolrd experience in applying government measures in the field of energy conservation and energy efficiency

To date, the state policy in the field of increasing energy efficiency and stimulating energy saving processes is being carried out in many countries of the world. On the one hand, energy importing countries face tough price conditions for basic fuel and energy resources, which forces the governments of these countries to solve the problems of the competitiveness of domestic products in the world market, develop alternative sources of energy, and create incentives for the development of energy-saving technologies in market conditions. On the other hand, in energy exporting countries, governments have also take measures to develop energy conservation processes, since it has come to realize that they may be spending valuable resources without using them effectively. For example, through the development of resource-saving processes, it becomes possible to free up some of the resources from domestic consumption and send them for export, which will bring additional revenue to the budget. In addition, the problem of exhaustible reserves arises in front of the producing countries of the main primary energy resources, which forces them to invest heavily in the development of hard-to-reach deposits and take measures to develop alternative energy sources. As a result, currently three issues dominate the context of the energy efficiency policy: economic development

and competitiveness, energy security and climate change concerns.

For the first time, many countries were forced to turn to energy conservation after the oil shocks of the 1970s. The governments of the United States, Canada, Japan, a number of European countries that pursued a policy of increasing energy efficiency in all sectors of the economy. As a result of this policy and structural changes in this state, sustainable energy conservation has been achieved since 1971. In many countries, in particular the BRICS countries, the state policy in the field of stimulating energy saving processes has been carried out since the 2000s.

The first laws in the field of energy efficiency appeared due to the oil shocks of the 1970s. in the USA (1975, 1978), Japan (1979) and a number of other countries. These laws provided for the establishment of institutions responsible for implementing public policy measures in this area, prescribed mechanisms for financing state programs, and established mandatory state regulation measures that overcome the barriers to more efficient use of energy resources in market conditions. Most of these laws are still valid with a number of amendments and additions. Many other countries have followed suit, and to date, about 50 countries have energy efficiency legislation.

Due to the legal framework, many countries today have well-conceived national energy efficiency strategies with clear goals and objectives. In the EU member states there are mandatory National Energy Efficiency Action Plans (NEEAPs), agreed with the EU Directive on Energy Efficiency and Energy Supply.

The creation of an institutional environment (the adoption of laws, national energy efficiency programs, the establishment of agencies responsible for the implementation of energy conservation policies, etc.) is an important step for the possibility of developing and enforcing public policies on energy efficiency. State policy measures are very diverse, but all of them, first of all, are aimed at overcoming various barriers to the rational use of energy.

The state policy in the field of stimulation of energy saving processes can be carried out both in the form of direct state regulation (setting minimum energy efficiency standards, requirements for compulsory energy audit, etc.), and in the form of financial and tax initiatives (subsidies for the purchase of energy-efficient equipment, tax loans, etc.). In addition, the state can implement an additional wide range of

measures - from investing in research to facilitating the development of eco-driving programs. Let us turn to this question in more detail.

Measures of direct government regulation are widely used in many countries of the world, as they have proved effective in reducing energy consumption of household appliances and equipment, accelerating the spread of energy efficient equipment and investing in energy-saving technologies. First and foremost, direct state regulation measures include the establishment of mandatory minimum energy efficiency standards and the requirement to include information on the energy efficiency class of goods and other information on their energy efficiency in technical documentation, marking and labeling.

Mandatory labeling of household electrical appliances exists in many countries around the world. In developing countries, this measure is very often the main measure of direct state regulation, in developed countries it compliments standards. This measure is designed to provide consumers with information that will allow them to compare the energy efficiency of various household appliances sold on the market. As a consequence, less efficient devices disappear from the market. This measure also stimulates producers to increase their competitiveness and develop new, more efficient models. The use of markings and labels today has spread from electrical appliances (refrigerators, air conditioners, washing machines) to cars and buildings.

To date, the energy efficiency of buildings is a key element in the policies of many countries, as building codes and rules help tenants save energy, and therefore money for the lifetime of the building.

Building codes for building energy efficiency cover various aspects such as: heating, lighting, air conditioning and ventilation, water heating (maximum energy consumption per square meter / cubic meter per year). Typically, these standards are set together with standards for structural materials (insulating materials, windows, boilers) in order to ensure the use of the most effective materials and in the overhaul of existing buildings.

The measures of direct state regulation in transport include, first of all, labeling and labeling on new cars, which gives consumers information about fuel consumption and carbon dioxide emissions. Usually, this measure is supplemented by financial or fiscal measures to stimulate the promotion of cars with lower fuel consumption and

carbon dioxide emissions. Such schemes are in force in all EU member states, as well as in a number of other countries (in Australia, Brazil, Canada, the United States, India, South Africa, New Zealand, South Korea, Japan and China). Usually, the requirements include mandatory data on greenhouse gas emissions (grams per kilometer) and fuel consumption (liters per hundred kilometers). Since the decision to buy a car is very often determined by comparing the expected prices for gasoline and personal income, fuel efficiency data can play an important role in choosing a car.

Other most common measures of direct government regulation include: mandatory energy audit, mandatory energy consumption reports, mandatory energy saving plans. Usually such measures are applied to large enterprises in certain sectors of the economy.

Economic instruments for influencing energy efficiency include financial initiatives (for example, energy audit grants, concessional loans), as well as tax measures. All these measures are usually aimed at reducing the initial investment costs, and are applied in most countries pursuing energy conservation policies.

Financial initiatives are divided into three broad categories: investment subsidies, energy audit grants and soft loans.
Investment subsidies are aimed at reducing investment costs when modernizing existing buildings or industrial facilities, and, therefore, reducing the payback period of investment projects. They are also used to reduce the price of energy efficient equipment, which is usually higher than the average market price (for example, compact fluorescent lamps, efficient engines and boilers, solar water heaters). Subsidies from the state budget apply only to equipment that is cost effective, but which would not be purchased by the buyer otherwise. Subsidies can be defined as a fixed amount of money, as a percentage of investment (usually with the establishment of a "ceiling") or as a sum proportional to the amount of energy saved. Subsidies are most often given to equipment manufacturers to stimulate the development and market entry of energy-efficient equipment, improve quality and reduce production costs. In the world, energy efficient equipment is designed for solar water heaters and a quarter for compact fluorescent lamps.

The measure for granting investment subsidies, however, has a number of shortcomings, the main one being the huge costs that fall on the state budget if investment subsidies cover a large amount of equipment or investments over a long period of time. For this reason, this measure is often accompanied by the creation of

energy or environmental funds with prescribed financing mechanisms to diversify the sources of cash inflows (financing from international financial institutions, deductions from targeted taxes or from the banking system). Other shortcomings include the following: a) subsidy schemes often attract consumers who would be able to make investments without subsidies (so-called "free riders", for example, high-income households or producers in energy-intensive industries); b) consumers who could benefit from subsidies (low-income households, small and medium-sized enterprises) did not use them because they did not know about their existence; c) the procedures for granting subsidies are often very bureaucratic (many forms of filling and long delays in obtaining contracts) and have high transaction costs; d) Finally, subsidies can have a negative impact on the market. So, if manufacturers expect that buyers will be given discounts, they can overstate the cost of equipment. In addition, it is possible to distribute equipment of poor quality, if granting subsidies is not strictly tied to quality standards.

The above shortcomings do not prevent the use of investment subsidies, but force the use of this tool very carefully. Today, in many countries around the world, subsidies are given to a certain target audience (for example, low-income households), equipment from the established list, with a long payback period, but a high potential contribution to energy efficiency (for example, renewable energy, cogeneration). Subsidies are increasingly seen as a temporary measure to mobilize consumers, prepare for new measures of direct government regulation or create a large market for promoting energy-efficient technologies. Once the market is sufficiently developed, subsidies can be gradually reduced.

The additional measures of the state policy in the field of energy conservation include a wide variety of activities. For example, in construction - this is the issuance of accelerated permits for the construction of energy-efficient buildings; on transport - training and preparation of drivers under programs of "eco-driving", creation of an infrastructure for movement of new vehicles and technical training of mechanics. This may include urban planning, including zoning, route development, and rules to reduce idle transport to reduce fuel consumption (this measure is often the prerogative of local authorities). It is extremely important that the state participates in financing research and development in the field of energy efficiency, since this allows "creating a reserve" for the long term.

One of the three priority objectives of Azerbaijan's environmentaI poIicy, estabIished by the Ministry of EcoIogy and Natural Resources, is "to efficientIy use

natural resources to meet the needs of present and future generations, to benefit from renewabIe energy through non-traditionaI methods and energy efficiency." The Government of Azerbaijan pays speciaI attention to issues energy efficiency and the achievement of the reIevant objectives estabIished under various government programs.

The National Program for EnvironmentaIIy SustainabIe Socio-Economic Development for the period 2003-2010 provides for the rationaIization of the use of non-renewabIe energy sources as an important factor in ensuring environmentaIIy sound and sustainabIe deveIopment. The program provides for the impIementation of the following measures to achieve this goaI:

• introduction of high-efficiency technoIogies at thermaI power pIants and optimization
structure of energy;
• introduction of modern energy-saving technoIogies in production and non-productive sectors;
• deveIopment and impIementation of nationaI and regionaI programs aimed at on more effective use of energy saving methods in the sphere of househoId consumption (thermoses, devices that maintain temperature, etc.).

The purpose of the State Program for the deveIopment of the fueI and energy compIex for 2005-2015 is to reduce Iosses and prevent theft and inefficient use of energy to meet the demand for eIectricity and natural gas. The program says that full payment for the cost of consumed electricity and naturaI gas is one of the means to ensure the effective use of these resources. The State Program on the Use of Alternative and Renewable Energy Sources (2004) also provides for more efficient use of hydrocarbon energy sources as one of the objectives.

Despite the fact that the government sets the goaIs for creating an energy-efficient economy, there is no speciaI Iaw or secondary Iegislation reguIating energy efficiency in the country. The main factors for improving energy efficiency are set forth in the Law on the Use of Energy Resources, which entered into effect in 1996.

Azerbaijan has prepared a draft; State program for the deveIopment of the system of technicaI reguIation and standardization in the sphere of energy saving. The State Committee for Standardization, MetroIogy and Patents of Azerbaijan reported that the program's goaI is to increase economic efficiency and acceIerate the

impIementation of the experience of European countries in the energy sector. The program was agreed by the reIevant government bodies and submitted for deliberation by the Cabinet of Ministers of Azerbaijan in 2011.

The country does not have the practice of conducting energy audits, even with respect to large consumers, and there is still no demand management from Iarge consumers. The baIancing of supply and demand is achieved simpIy by changing the voIume of energy production.

The objectives of energy poIicy.

The Government of Azerbaijan has adopted the State Program for the Development of the Fuel and Energy Complex for 2005-2015, which sets development goals for various segments of the energy sector, as well as a package of special measures aimed at achieving these goals within the agreed timeframe within the next 10 years. The overall objective of the State Program is to ensure the full satisfaction of the demand of the popuIation and the economy for electricity, gas and other energy resources through the continuous deveIopment of the fueI and energy compIex. The main specific targets of the State Program are as follows:

• identification of priority deveIopment goals for the fueI and energy compIex of Azerbaijan in accordance with best practices and modern internationaI standards;
• impIementation of appropriate scientific and institutionaI measures aimed at improving the operational efficiency of various branches of the fueI and energy complex;
• ensuring the impIementation of appropriate technicaI measures to increase the Ievel of production, processing, transportation, storage, accounting and consumption of energy resources;
• promoting the integration of environmental protection measures in the deveIopment of the fueI and energy compIex;
• increasing investment in the development of the fuel and energy complex;
• ensuring environmentaI safety of the fueI and energy complex;
• ensuring an increase in the leveI of collection of payments for fueI and energy (eIectricity and naturaI gas).

In the following years, in order to further develop the country's fueI and energy complex in the sphere of oiI and gas production, the folIowing measures are envisaged:
• prospecting and expIoration of new deposits;

• start of full-scale deveIopment of open fields;
• driIling of new weIls and reconstruction of inactive wells at existing deposits;
• introduction of new equipment and technoIogies at existing fields to increase the oiI recovery factor;
• construction, reconstruction and modernization of oiI, gas and gas production, transportation and processing systems; and the wide appIication of science and innovative technoIogies and best practices.

WhiIe the NationaI Action PIan for EnvironmentaI Protection (NEAP) has been adopted in Azerbaijan, onIy a smaII part of the recommendations of the first NEAP was impIemented mainIy due to a Iack of resources. In some municipaIities, LocaI EnvironmentaI Action PIans have been deveIoped.

RES

According to estimates, the potentiaI of renewabIe energy in Azerbaijan exceeds 8 GW, which is more than the current instaIled capacity. However, this may not be enough to meet the demand for eIectricity due to the volatiIe nature of soIar and, especiaIly, wind energy, as well as Iess accessibiIity than traditionaI TPPs and HPPs.

NevertheIess, the amount of eIectricity produced by gas-fired power pIants couId be significantIy reduced by using the potentiaI of renewabIe energy. This wouId be a factor for a more sustainabIe and Iong-term GDP growth, which is currentIy provided by the export of oiI and gas.

GeneraI recommendations

• The government's energy poIicy shouId take into account the potentiaI contribution of energy efficiency to increasing fueI exports, promoting economic growth and protecting the environment.
• The government shouId give high priority to the task of increasing energy efficiency and use of renewabIe energy; The future energy poIicy shouId be supported by a detaiIed anaIysis of the economic potentiaI of energy efficiency in aII sectors of the economy, as weII as by anaIysis obstacles to the reaIization of this potentiaI.
• The Ministry of Industry and Energy shouId deveIop institutionaI capacity to anaIyze and evaIuate energy efficiency for future poIicy deveIopment, incIuding financing decisions.
• Reconstruction of assets in the segments of production, transmission and distribution in the eIectric power industry shouId continue. This wiII maximize the efficiency of fueI combustion and minimize technicaI Iosses in transmission and distribution.

Future energy poIicies and strategies shouId be transparent and consistent, incIude Iong-term goaIs, encompass energy efficiency programs, and set targets for key sectors.

InstitutionaI structure.

• It is necessary to deveIop Iaws and secondary Iegislation in the fieId of energy efficiency and renewabIe energy.

• The government shouId estabIish an energy efficiency unit within the Ministry of Industry and Energy to guide the deveIopment of Iegislation, promote the concept of sustainable energy within the framework of the government and monitor the implementation of the overall energy efficiency poIicy. The government shouId aIIocate adequate resources (human and financiaI) to support the activities of such a unit.

• SpeciaI energy efficiency programs shouId be deveIoped in various sectors of the economy, incIuding specific monitoring objectives and systems for continuous evaIuation of program impIementation.

• InterdepartmentaI interaction between decision makers in the energy sector and other government bodies, especiaIly in the fieId of the environment, transport, the housing sector and industry, shouId be intensified.

• The government shouId support the efforts of various stakehoIders, incIuding Iocal authorities, universities, research centers and non-governmentaI organizations, and promote their energy efficiency in Azerbaijan.

Energy market and pricing.

• The Government is encouraged to consider the introduction of market principles in the energy sector and the reIevant Iegal and reguIatory framework, taking into account internationaI experience.

• To ensure the impIementation of energy efficiency measures, existing tariffs for eIectricity, heat and gas shouId be revised. One should take into account the need for differentiation of tariffs by types of consumers, the introduction of bIock tariffs, as well as the issues of accessibiIity of tariffs for the popuIation.

Financing energy efficiency.

• The government shouId aIIocate sufficient financiaI resources to improve the energy efficiency of pubIic and pubIic buiIdings and pubIic Iighting systems and, at the same time, introduce incentive schemes for private and housing initiatives in the fieId of energy efficiency and renewabIe energy.

• The government shouId ensure a continuous diaIogue with internationaI financiaI organizations and the donor community to increase attention to energy efficiency and renewabIe energy issues.

Specific programs and measures in the fieId of energy efficiency.

• The government shouId adopt high performance standards for new buiIdings under construction, Iabel energy efficiency and minimum energy efficiency standards for eIectrical equipment, and ensure that there are compIiance and enforcement procedures.

• Energy audit and energy management systems shouId be introduced for Iarge industriaI consumers.

• Energy efficiency issues shouId be part of an integrated approach in the pIanning and provision of transport services.

• Programs for the reconstruction of district heating systems shouId be continued to reduce Iosses and attract new consumers and encourage the introduction of individuaI meters wherever possible.

• The government shouId promote the need to improve energy efficiency and raise awareness of energy efficiency issues among Iocal communities, citizens, smaII and medium-sized businesses.

• Azerbaijan shouId continue to participate in various internationaI initiatives, for exampIe, the GreenBuiIding Council, the InternationaI RenewabIe .

Energy Agency in Abu Dhabi (IRENA) to ensure the exchange of information and best practices in the successfuI impIementation of energy efficiency and renewabIe energy projects in other countries.

RenewabIe energy sources.

• DeveIopment of renewabIe energy sources shouId remain a priority for Azerbaijan. The strategy for renewabIe energy shouId incIude a scheduIe indicating the goaIs and objectives for RES.

• Efforts shouId continue to focus on the use of soIar and wind energy potentiaI, as well as assessing the use of waste for energy purposes.

• Some part of oiI and gas revenues shouId be channeIed to the deveIopment of RES, and a RES fund shouId also be estabIished.

.• Rules for connection to networks, a methodoIogy for setting tariffs and incentives for attracting investments in the RES sector shouId be deveIoped.

• The role of SAARES shouId be enhanced to ensure the Ieading role of the organization in the fieId of renewabIe energy deveIopment in Azerbaijan.

Data coIIection and monitoring.

• A project database shouId be estabIished to ensure the monitoring of progress in aII areas of activity in Azerbaijan aimed at improving energy efficiency.

• The existing buiIding stock statistics shouId be used to support the poIicy deveIopment process and assess the energy saving potentiaI in the buiIding sector.

• To monitor the energy-saving potentiaI, energy auditing should become an

indispensabIe starting point for Iarge buiIdings. This shouId form the basis for the deveIopment of the Action PIan for the impIementation of the energy-saving potentiaI.

In June 2017, the Republic of Azerbaijan joined the SCO as a dialogue partner, which is a positive factor from the point of view of developing international trade relations of the Republic of Armenia, diversification of sales markets, expansion of exports of non-primary commodities.

For the AR, the partnership with the economies of the EEA and the SCO is beneficial for a number of reasons.

First, the country's opportunities to participate in projects related to the development of transport infrastructure within the framework of the ESMP and, primarily, its southern route: "Southeast Asia - Central Asia - Near and Middle East" are expanding. In 2016, Azerbaijan expressed its intention to participate in a Russia-Iran project called "North-South", whose goal is to create an international transport corridor "India-Russia".

Secondly, Azerbaijan has the opportunity to participate in various schemes of transit transport, including transportation of hydrocarbons from Iran and other oil and gas exporting countries to international markets. It should be noted that Russia and Iran are planning to implement several regional projects in the energy and transport sectors.

Thirdly, under certain conditions, Azerbaijan may be granted privileges on access to the market of the EAEC, which will positively affect the development of the non-oil sector of the AR, for example, light and food industries, agriculture.

Fourthly, Azerbaijan can connect to new channels and sources of financing the national economy - Chinese banks, the Asian Bank for Infrastructure Investments, and others.

The modern pragmatic policy of the Republic of Azerbaijan aimed at maintaining the balance of interests of various participants in international trade has led to an expectedly negative reaction from the US, who suddenly became concerned about the state of human rights in the country and began to work out possible measures of influence including involving international organizations.

The modern pragmatic policy of the Republic of Azerbaijan aimed at maintaining the balance of interests of various participants in international trade has led to an expectedly negative reaction from the US, who suddenly became concerned about the state of human rights in the country and began to work out possible measures of influence including involving international organizations.

An example is the bill "Helsinki Commission" (introduced in 2015), which involves the ban on activities in the AR "The U.S. Trade and Development Agency "and" EBRD ", reduction of financing of projects of Azerbaijan by leading international financial and credit organizations -" IMF "," World Bank ", etc.

Similar proposals were not ignored by these organizations. Despite the fact that at the official level, strict restrictions were not adopted, in 2013-2016. the volume of support for the economy of Azerbaijan by "EBRD" decreased almost 2.5 times and amounted to (billion euro, estimate): in 2013 - 160, in 2014 - 235, in 2015 - 260, in 2016 - 65.

In 2016, Azerbaijan was not included in the list of priority markets for "The U.S. Trade and Development Agency ", whereas in 2007 the mentioned agency noted AR as an important participant of the oil market and expressed readiness for further cooperation.

Toughening the requirements for the activities of non-governmental organizations in the territory of Azerbaijan caused further tension in the relations between Azerbaijan and the Extractive Industries Transparency Initiative, which promotes at the global level new management standards in the sphere of oil, gas, and other mineral resources. In 2016, Azerbaijan left the ranks of "EITI" indicating the growing politicization of its decisions.

In August 2017, the US passed the Act on Counteracting America's Opposition through Sanctions, which also includes a new package of restrictive measures against Iran, Russia and the Republic of Korea, which establishes a special mechanism for their revision (without the participation of the US President). This normative act may also negatively affect the economy of the Republic of Azerbaijan for a number of reasons.

First, because of the firm and consistent policy of the United States, aimed at:

increasing political and economic pressure on the IRA and the Russian Federation;

counteraction of Russia on the territory of Georgia, as well as Moldova, Ukraine;

extraterritorial distribution of internal norms and rules of the USA (to the countries of Europe, Asia);

Involvement of international organizations in the fight against Russia.

It should be noted that in the historical retrospective in Azerbaijan the oil sector has traditionally been the dominant one. The development of agriculture was complicated by the geographical factor and the lack of large fresh water reserves.

After the global financial and economic crisis, the internal situation began to deteriorate. In 2011, GDP growth rates fell to the level of a statistical error of 0.1%, and in 2015, this indicator was 1%. The problems caused by the hypertrophied development of the oil sector have become acute: revenues to the budget have decreased, and the crisis has affected the banking system. In 2014-2015 years. the government of Azerbaijan was forced to weaken the national currency, while the cross-rate of manat to US dollars changed from 1.05 to 1.6. To stabilize the situation, it was necessary to raise funds from the state oil fund. Some of the main macroeconomic indicators of Azerbaijan are shown in Table 4.

Indicator/Year	2010	2011	2012	2013	2014	2015
GDP growth rates	4,9	0,1	2,2	5,8	2	1,1
The share of the largest sectors of the economy						
Industry	51,7	53,7	49,4	45,4	41,0	34,0
Oil sector	45,6	48,0	43,2	39.2	34,3	26,4
Manufacturing sector	4,5	4,0	4,2	4,2	4,7	5,3
Production of electricity, heat, water supply	1,6	1,7	2	1,9	1,8	2,1
Agriculture	5,5	5,1	5,1	5,4	5,3	6,2
Construction	8,1	8,0	10,1	11,6	12,6	12,1
Trade	6,4	6,3	6,7	7,1	7,9	10,0
Transport	5,6	5,1	4,9	4,4	4,6	5,4
Other sectors	22,6	21,7	23,8	26,1	28,7	32,3

Figure 4. GDP Growth Rates and structure of economy of Azerbaijan, 2010-2015. Source «State Statistical Committee of the Republic of Azerbaijan»

In the coming years, the weak growth of the national economy is forecasted. In the period until 2020, according to IMF, the GDP growth rate will not exceed 2.5%, the production of oil products will decrease from 3% to 1%, fuel exports will decrease from 14% to 3% per year.

It should be noted that the idea of accumulating part of the oil revenues to support during the crisis periods and the development of non-primary sectors was proposed in the 90s. To this end, in 1999, the State Oil Fund of the Republic of Azerbaijan (SOFAZ) was formed. With the participation of SOFAZ, various projects have been and continue to be implemented, including the creation and modernization of trunk pipelines, the Baku-Tbilisi-Kars railway, the production of drilling rigs required for operation in the Caspian Sea, the construction of an oil refinery in Izmir Turkey), the construction of the irrigation system on the Absheron peninsula.

In 2006, a subsidiary company of the fund was founded - "Azerbaijan Investment Company", whose activities are aimed at investing in non-primary assets located in various countries of the world. In the geographical structure of its portfolio of foreign investments, the largest share belongs to the EU (43%), India (26%) and the United States (24%). A similar indicator for Australia and Oceania is 4%, the countries of the Near and Middle East and Latin America - 0.1%. The above data clearly demonstrate the priorities of Azerbaijan in the investment sphere.

In 2001-2014, the size of the state fund increased 74 times and reached 37.1 billion US dollars. In 2015 and 2016 the volume of savings decreased to 33.6 billion and 33.1 billion US dollars, respectively. During the period of the fund's activity, the main inflow of capital (about 95% of total receipts to the fund) was provided by receipts related to the execution of the "contract of the century" ("ACG").

The government of the AR repeatedly developed and adopted plans and conceptual documents aimed at overcoming imbalances in the economy, development of non-primary sectors.

In 2004, a plan was launched in the AR to promote non-carbon energy sources and energy-efficient technologies to the market, providing for an assessment of the potential of alternative and renewable resources in the electric power industry, developing measures to increase the efficiency of traditional energy sources, reliability of energy supply, and reduction of CO2 emissions. In 2009, Azerbaijan

became a member of the International Renewable Energy Agency "and established a national profile agency.

These measures contributed to the revival of entrepreneurial activity in industry.

In 2004-2014, the output of non-fuel sectors increased almost threefold. The highest figures were achieved in the production of building materials (2.5 times), electrical equipment (2.1 times), metal products (2.2 times), clothing and footwear (2.5 times), as well as paper and paper products, rubber and plastic, products from them. The production of vehicles and trailers was revived.

In the specified period, industrial complexes for the production of aluminum and steel, the Baku Shipyard, were built and put into operation. The construction of gold and copper processing facilities in the cities of Kedabek and Dashkesan, a carbamide plant in Sumgait, and new cement plants in the cities of Karadag, Gazakh and Nakhichevan have been started. In addition, the first objects of innovative infrastructure appeared in the country - Sumgait Technological Park, Sumgait Chemical Industrial Park, Balakhaninsky Industrial Park and High Technology Park.

Despite the expansion of output of goods and services not directly related to the oil and gas industry, the number of large enterprises in the country remains limited. Among them there are six productions: the plant producing tractors and agricultural machinery (Ganja), cars (Nakhichevan, capacity - about 5 thousand units), electronics (Mingachevir), solar modules (Sumgait), metal structures (Karadag), building materials (Adjikabul).

In 2014 years. the "State Program for the Development of Industry for 2015-2020" was approved, the objectives of which are:

- modernization of industry and improvement of its structure;

- Increasing the export potential of the non-oil industry;

- expansion of competitive industrial production, rational use of energy, creating high added value;

- expansion of high technology production;

- Training of qualified personnel for new production sectors.

It is expected that the program will be financed from the state and local budgets, off-budget funds, at the expense of the National Fund for Entrepreneurship Assistance and the Azerbaijan Investment Company, private investors, loans and grants.

In 2016, the leadership of the AR developed "road maps" for the development of the following sectors of the economy:

- oil, gas, including chemical industry;

- production and processing of agricultural products;

- production of consumer goods by small and medium-sized enterprises;

- heavy industry and machine building;

- Specialized tourism industry;

- logistics and trade;

- housing construction;

- vocational education and training;

- financial services;

- sector of telecommunication and information technologies;

- the sphere of public services (production and distribution of electricity and heat, water and gas.

According to British Petroleum, in the period from 1997 to 2016 in the country, proven hydrocarbon reserves increased several times and reached 1 billion tons of oil and 1.1 billion cubic meters. m of gas, which is consistent with the current indicators published by the "Oil and Gas Journal" - 0.95 billion tons and 0.991 trillion. cu. m (as of January 2017). The company "SOCAR", referring to the differences in national and foreign assessment methods, determines the volume of gas deposits more optimistically - in 2.5 trillion. cu. m (2013). Data on reserves, production, consumption of oil, gas and hydropower in the AR are given in Table 5.

Year	1997	2016	2016	2016	2016	2016
Indicator	Reserves	Reserves	Production	Production	Consumption	Total

			period			production
Oil	0,17 billion tons	1,0	23,1	23,1 billion tons	4,6 billion tons	11,2%
Gas	0,6 trillion cubic meters	1,1	65,8	65,8 trillion cubic meters	10,4 trillion cubic meters	26,6%
HPS	…	…	…	…	0,4 billion tons	100

Table 5. Proved reserves, production, consumption of hydrocarbons and hydropower in the Republic of Azerbaijan 1997 and 2016.

CHAPTER II.FUEL AND ENERGY BALANCE AS A TOOL FOR ANALYZING PROCESSES IN THE FIELD OF ENERGY CONSUMPTION AND ENERGY EFFICIENCY

2.1. The basic principles of compiling a fuel and energy balance in international format

The country's fuel and energy balance is the basic tool for comprehensive and systematic analysis of processes in the sphere of energy consumption, energy intensity of the economy and energy saving, self-sufficiency of the country with energy products and other processes associated with this sphere.

The summary table of the fuel and energy balance is formed on the basis of the data of the food balances of formation and use by types of energy production, compiled in uniform energy units for all balance sheets. In the columns of the table, the types of energy products (or their groups) are singled out, according to the rows of the table, the sources of the formation of the product's resources and the directions of its use.

Fuel and energy balance is the most important output document of energy statistics, and product balances by types of energy production are its "cornerstones". The balance principle, used to reduce the primary data of energy statistics, makes it possible to verify their completeness and consistency for each energy product taken into account. In combination, a complex of detailed energy mixes detailed by product types and directions makes it possible to compile an adequate picture of the energy flows in the economy and to reveal systemic links within the fuel and energy complex and its connection with the rest of the economy.

The published United Nations International Recommendations on Energy Statistics set out key energy balance targets that convincingly confirm the high importance of completeness of coverage of energy products by statistical accounting:

-improving the quality of energy statistics by providing comprehensive and consistent data on the energy situation in the national economy;
-providing comprehensive information on resources and energy use in the national energy sector with a view to monitoring the situation in energy security, efficient functioning of energy markets, developing energy policy, etc.;
-ensuring the completeness, consistency and comparability of statistical data;
-ensuring comparability between different reporting periods and between different countries;
-providing data for estimating greenhouse gas emissions in the national economy;
-providing a basis for the formation of indicators of the role of energy in the national economy;
-calculation of performance indicators in the energy conversion sector (for example,

in the oil refinery, electricity generation through fuel combustion, etc.);
-calculation of the proportions of various energy products in the structure of the resource part and part of the use (for example, the ratio of renewable and non-renewable energy sources);
-providing input information for the implementation of modelcalculations and the construction of predictive estimates.

From the composition of the methodological principles and requirements for the formation of an information array for the table of the country's fuel and energy balance, in the context of the objectives of the work, the following five provisions should be noted.

1. Harmonization of the production, export and import of types of fuel and energy products with classification groups used in the statistical recording of production and foreign trade.
2. Accounting for energy production, export and import indicators, as well as data on the costs of fuel and energy products used in natural units that best correspond to their aggregate state (for example, tons, cubic meters, kilowatt-hours, calories).
3. Scientific validity of the methods used to translate the indicators of the specific balance sheets of fuel and energy products from natural units of measurement, into a uniform energy unit for all types of products.

In the world practice, various types of standard energy units are used (conditional fuel, oil equivalent, joules, etc.), between which a constant correspondence is established, providing the possibility of a transition from one unit to another.

4.Completeness of coverage of the types of energy products used in the formation of groups of fuel and non-fuel energy products taken into account in the development of the fuel and energy balance.

According to the international accounting rules, primary energy products include "products that are allocated or directly obtained from natural resources. All energy products that do not belong to the primary, but are made from them, are called secondary. " A secondary energy product can also in some cases be obtained as a result of conversion of secondary energy.

Primary energy products are divided into three main categories:
- fossil fuels - coal (coal and brown coal / lignite), peat, crude oil and gas condensate liquids, natural and associated / oil gas, oil shale;

- Alternative energy - atomic energy, hydropower, geothermal, solar energy, wind energy, tides / waves / ocean, etc .;
- combustible renewable energy resources (biofuel) and waste. The latter category includes solid biomass (for example, firewood), liquid biomass, biogas, industrial and domestic waste.

Secondary energy products include:
electricity and heat;
petroleum products obtained during the processing of crude oil;
solid fuels and synthesis gases produced by processing and transformation of coal and peat (for example, metallurgical coke and peat briquettes, coke and blast furnace gas), any fuels derived from renewable energy sources (for example, charcoal obtained as a result of dry distillation and pyrolysis of wood).

5. Provision of a level of detail for economic analysis that is expedient for economic analysis when building up groups of primary and secondary types of energy products and forming "food" balances of fuel and energy products.

1. The total volume of energy consumption of the economy. Since all secondary types of energy products are ultimately the result of processes of transformation (processing) of primary energy products, the domestic sector of fuel and energy production can be represented as two subsectors:

– sector of extraction (production, reception) of primary types of fuel and energy products (Xn, n - the index designating the types of primary fuel and energy resources);
– sector of transformation, where production of transformations of secondary types of fuel and energy products going beyond the sector is carried out.

For conversion to secondary types of fuel products, both primary fuel products and imported types of secondary fuel products can be used as raw materials for further processing.

The fuel-energy production aimed at transformation stops its "physical" existence, and the energy stored in it is partially preserved in other, secondary, types of energy products (or types of energy) produced from it, and partially lost. Accounting for this provision is the basis for indicators of the formation and use of energy (energy resources) in the economy without a recounting.

The indices n and m used in the rest of the paper serve for designations of primary and secondary types of fuel-energy production (the purpose of the index i is preserved, it is used to denote any types of fuel and energy products), the symbol "" is used to refer to indicators estimated in physical energy units; i k - designation of the conversion factor of natural units of measure of resources of type i into energy units.

2. The volume of final internal energy consumption.The volume of final internal energy consumption is the total estimate of the internal energy consumption concluded in primary and secondary fuel and energy resources directly used as fuel or energy in the economic sectors, as well as for non-energy purposes (including losses during transportation of fuel products and transmission of electricity and heat energy).

3. Net final energy demand of the economy.The net final energy demand of the economy is determined by the cumulative estimate of the domestic energy consumption contained in primary and secondary fuel and energy resources directly used as fuel or energy in the sectors of the economy.

CHAPTER 3. THE BRANCHES OF THE ECONOMY OF THE REPUBLIC OF AZERBAIJAN.

3.1. Problems and ways of solving the branches of the economy.

Currently, the time of global environmental promotion and changes, and in recent years and catastrophes, the question of "not being" to man and nature is more acute than ever before. In the conditions of rapid, unfortunately extensive, without taking into account the interests of nature, development industry, agricultural production, nuclear energy with its unresolved problems, a question arose that worries everyone: "Will nature preserve our descendants with green, flowering, fragrant, inhabited by myriad living creatures making up their anthem of Great Life?"

Humanity has come very close to that line, beyond which nothing living, now existing, can no longer be! The critical a moment for man and for nature. It all depends on whether the most sensible creature of the earth - man - can at least stay on achieved, and most importantly, whether he will be able to change the whole system, the system of his being, to turn the forces of nature-destroying, nature-restoring. Will

he not only not throw out billions of tons of numerous poisons into the poisoned already chronic diseased biosphere, but will he be able to really help Nature? Here are the main tasks of a person today.

Humanity has a chance to survive. It is necessary only for each of us understand, understand the cause of an imminent catastrophe and, by creating, realizinga universal human survival system.

Nature, regions have no borders and negative phenomena in relation to nature, wherever they are, affect, moreover, negatively, in all spheres of life and in other neighboring, contiguous territories.

The rapid development of human activities led to global environmental problems, excessive exploitation of natural resources and negative impact on the environment. Like the whole world, the modern Azerbaijan faced the problem of irrational use natural resources and the need to protect fragile ecological equilibrium. That is why environmental sanitation became the basis environmental policy of our state. In recent years, in important legal and regulatory documents were adopted laws, and also prepared and approved state programs, corresponding to the main rules and norms of the European legislation.

It is within the framework of these programs that principles of sustainable development. About close attention to ecology says that under the Ministry of Ecology and Natural Resources a special Public Environmental Council was established. But the most important issue of this topic rests on finance - it's not a secret for anyone that the Azerbaijan economy is going through a transition stage, and its potential is insufficient to solve the accumulated environmental problems.

Domestic environmental experts identify the main and most important environmental problems that Azerbaijan has XXI century. First, it is the pollution of water resources by construction waste, as well as transboundary pollution. This problem was largely determined by the situation with a low level of supply of quality drinking water. Drinking water is lost along the way to the consumer, there is a sharp shortage of sewer lines. From irrational economic activities, not only water, but also air, which is polluted by industrial enterprises and vehicles, suffers. We are faced with the problem of degradation of fertile lands in Azerbaijan. Equally important is the disposal of solid industrial and domestic waste. One can not but worry about the decrease in biodiversity, the reduction of forest areas, fish resources and other fauna.

Proceeding from this, I would like to dwell briefly on the ecological the situation in Azerbaijan and the problems that concern the population of the republic.

It's no secret to anyone, this is said a lot and published in the press, many are shown on television that the ecological situation in the republic is pre-crisis. All the resources of nature (air, water, land, bowels, forests, wildlife, etc.) in the country are degraded to the limit, people's lives are in danger! At the same time, the level of environmental thinking of many economic leaders, and now entrepreneurs, those involved in nature management is unacceptably low. This led to the fact that the pollution of atmospheric air, water areas, land areas is much higher than the permissible norm.

The protection of the environment and the rational use of natural resources of the Republic of Azerbaijan are the subject of special and constant concern of the state. It is important to foresee possible changes in the state of the natural environment under the influence of anthropogenic loads and find real ways to reduce them.

In the conditions of modern scientific and technological development, the most a concept that is based on the impossibility of completely eliminating the influence of man's productive activity on nature appears to be real. Therefore, to choose the right solutions when using it is necessary to assess the quality of the environment, which can be "donated" within a certain territory for the sake of obtaining the necessary products, proceeding not only from economic, but also natural prerequisites. This approach acquires great importance in connection with the growing concentration of individual industries in the developed areas, as well as the involvement of new promising areas in production.

At the same time, the lack of a clear idea of sustainability environment does not allow production organizations to correctly formulate an order for the development of standards for maximum permissible the loads that determine the most appropriate regime nature use.

The energy resources of our country, which are the source of economic growth, are huge. Therefore, in the new geopolitical and economic conditions of oil and production on its basis, in the first place turn oil refining, are the main budget-forming branch of the economy, which determines the life of the country, work its

industry, agriculture and transport. The decisive role oil refining in the structural formation of the economy the need to analyze the dynamics of the industry in the present and forecast its development in the future.

Against the backdrop of the intensive development of oil refining in the world Azerbaijan still does not have a system of effective
state regulation in oil refining industry (NPP), resulting in the collapse investment activity and directed increase in prices for petroleum products on the domestic market.

The specificity of ore mining and dressing is to extract andprocessing of huge masses of rocks. Modern technology allows to use only a part of the extracted rock mass, and the remaining part of the rock is accumulated in the form of man-made waste. Of all the variety of man-made objects, it is precisely with the waste of the enrichment factories (tails) that problems are associated, the solution of which is important for both mankind and nature as a whole.

To start recycling, you must first fill the entire volumestore it, allow it to dry and only then proceed torecycling. Great danger for the environment and, above all, for water resources of the areas of deposits and mining enterprises are pumped out from mines and quarries water, drainage and waste waters of tailing dumps of concentrating factories. For their neutralization and cleaning requires the construction of special treatment facilities.

Air pollution is caused by intensive processes of dust formation on the surfaces of tailings, which are mainly in a dry state. Some tailings, despite the termination of their operation, were not spilled with protective layers, or covered only partially. The danger of air transport of the substance of the tailing dumps is also evidenced by the depression of vegetation observed at the windward slope closest to one of the tailing dumps.

Thus, gas-dust discharges of tailing sites lead to the destruction of vegetation and the formation of man-made wastelands.In addition, it is necessary to note the danger of water discharge, freed from the solids of the tail, and also flowing into the tailing dumps of rain and meltwater, through special spillways constructions.

At present, the tailing dump is transferred to a closed loop work of the sewerage system and water supply of the concentrator. As a result, clarified waters are reused

in the technological process of ore dressing. The water from the tailings dump flows through the collector to the chlorinator and into the settling pond. Then the water is distributed throughout the factory. An important role in environmental pollution is played by drainage waters surrounding the territory and nearby watercourses.

At the above level of pollution of the aquifer impact of contaminated sewage tailings, the maximum content of base metals in the discharge channel
of the oxidation pond corresponds to the following values: cyanides up to 23.4 mg / l, copper to 6.1 mg / l, lead to 0.8 mg / l, zinc to 0.7 mg / l. These data show that toxic wastewater tailing dump by direct discharge into the river and by inflation to the level groundwater flow into natural water sources at a concentration of pollutants exceeding the ecological standards in tens and thousands of times.

As a result of industrial development, intensive air, water and soil pollution, degradation of animal and plant life, depletion of natural resources, deep ecosystem disturbances, desertification processes and significant losses of biological and landscape diversity.

The development of deposits in many cases causes quite a significant damage to the natural environment. In addition, mining and processing are associated with significant losses of minerals. And these losses - part of the balance reserves, not extracted from the bowels during their development, sent to the dumps left in the places of storage and transportation. Damage from losses is compensated at the expense of other deposits, which leads to the reflection of new lands and additional pollution of the environment. Thus, similar losses, in addition to economic damage, cause significant damage to nature. And mining by underground means leads to a disturbance in the balance of the rock mass, deformation of the surface, measurement of the regime and contamination of groundwater.

Issues of protection of the environment during operation mining enterprises is a complex environmental-economic problem in connection with the need to develop and implementation of a number of environmental measures that wouldminimizing the negative impact of contaminated wastewater and industrial waste on soils, surface and groundwater,atmosphere.

The main issues here are construction and operation purification facilities for discharged mine-mine waters and wastewater from concentrator factories.One of the most serious problems in the domestic and foreign practice associated with the formation of regular waters, is their

use, since their number is significant, and the chemical composition often involves a complex method of cleaning.

The main measures to protect reservoirs from pollution heavy metals in regular waters and rational use of water is chemical cleaning before discharge and use in the water treatment system of concentrating plants.

Like the whole world, modern Azerbaijan is faced with a problem irrational use of natural resources and the need to
protection of fragile ecological balance. That is why recovery environment became the basis of our environmental policy.
state. In recent years important regulatory and legal documents and laws have been adopted in the republic, and state programs corresponding to the main rules and norms of European legislation have been prepared and approved.

In connection with the development of industry there was intense pollution air, water and soil, the degradation of the animal and plant world,
depletion of natural resources, deep ecosystem disruption, desertification processes and significant losses of biological and landscape
diversity.

CONCLUSION

In the modern world, the severity of energy problems has increased substantially.Their radical solution lies in the technological field, first of all the issue of the development and mass distribution of replacement technologies (in the production of electricity, in manufacturing industries, etc.), which significantly reduces the dependence of economies and economic growth on fossil energy sources. State scientific and technical, economic (including energy, environmental) policies play an extremely important role in creating incentives for activating processes in the field of energy efficiency and energy saving in the economic sectors. The adoption of state decisions in this area and the development of effective measures for their implementation must be based on the consideration of the tasks of the national economy, the peculiarities in the structure of the national economy, and the study and elucidation of patterns in the nature of the relationship between the dynamics of energy consumption and the rates of development of the national economy and the trading partner countries.

An important influence on the promotion of energy efficiency processes is provided by the state policy that is being implemented in many countries today. State policy can be conducted both in the form of direct state regulation, and in the form of creating economic incentives for enterprises to resource economy. Direct measures include the establishment of mandatory minimum energy efficiency standards, requirements for mandatory labeling and labeling of goods, indicating the class of its energy efficiency, requirements for compulsory energy audit, and a number of others. Financial and tax initiatives (investment subsidies, tax incentives, investment tax credits, etc.) relate to economic instruments of influence on energy saving and energy efficiency.

The main problems of the oil and gas industry are the depletion of the resource base and the complexity of exploration for new offshore deposits in the border areas. To resolve these issues, it is necessary to differentiate the water area of the Caspian Sea between Azerbaijan, Turkmenistan, Kazakhstan and Iran.

The Republic of Azerbaijan has the opportunity to use renewable resources. The largest energy potential is concentrated in the sectors of wind and solar energy. Development of the RES and energy saving sectors requires large-scale investments

and support from the state, but the financial resources of the country are limited. In this regard, in the medium term, a rapid increase in the power of RES-stations is not expected.

At present, the Republic of Azerbaijan conducts a balanced energy policy based on an adequate assessment of the international situation and its own capabilities, seeking to avoid ideologizing interstate relations and infringing the national or religious characteristics of partner countries. The government's activities are aimed at building pragmatic and friendly relations with all participants of the oil and gas markets - producers and consumers of primary fuel and energy resources, the states participating in the transit of energy resources.

On the external side, Azerbaijan solves two main tasks: (A) to strengthen its positions in the market of the countries of the united Europe and (B) not to miss opportunities to develop cooperation with neighboring extracting states, first of all Russia, Kazakhstan, Turkmenistan and Iran, and China.

Azerbaijan develops cooperation with the CIS countries, studies the experience of cooperation between the states within the framework of the EAEC and the SCO, however, the settlement of the Nagorno-Karabakh conflict remains one of the main factors holding back its rapprochement with the EAEC.

In general, even in conditions of a favorable world situation, the period of oil and gas prosperity of the Republic of Azerbaijan is limited to two nearest decades.

In our opinion, it is expedient for our country to pursue a policy aimed at the integration of the Republic of Azerbaijan in the EAEC. This will allow Russia and other Union members to strengthen their economic positions in the South Caucasus and the Caspian region, gain new opportunities to enter the markets of European countries, the Middle East, move to the African continent, and improve security in their part of Eurasia. Paraphrasing well-known expressions, it's time to collect stones, or we will be dashed one by one. At the same time, there is no need for haste, "it is just necessary firmly and conscientiously, calmly and humbly go its own way, not chasing ghosts, surrogates of unity."

REFERENCES

Samuelson P, Economics 1964 p.840

1.https://www.imf.org/en/Publications/WEO/Issues/2016/12/31/Subdued-Demand-Symptoms-and-Remedies

2.https://tradingeconomics.com/azerbaijan/indicatorshttps://ourfiniteworld.com/tag/energy-consumption/

3.https://www.worldenergy.org/data/efficiency-indicators/

4.https://tradingeconomics.com/azerbaijan/indicators

5.Schumpeter J.,The Theory of Economic DeveIopment p. 52

6. Ozturk, I., 2009. A Literature Survey on Energy-Growth Nexus. Energy PoIicy, 38

(2010), pp. 350-355.

7. SoIow, R., 1974. IntergenerationaI Equity and ExhaustibIe Resources. The Review of Economic Studies, Vol. 41, Symposium on the Economics of Exhaustible Resources (1974), pp. 29-45. 7 Stiglitz, J., 1974. Growth with exhaustible natural resources: efficient and optimal growth paths. The Review of Economic Studies, Vol. 41, pp. 123-137.

8. BaumoI, W.J., 1986. On the possibility of continuing expansion of finite resources. KykIos 39, pp. 167–179.

9.http://www.iea.org/publications/freepublications/publication/CO2EmissionsFromFuelCombustionHighlights2013.pdf

10.Bullard, C. and R. Herendeen, 1975. Energy Impact of Consumption Decisions.

11..Herendeen, R. and C. Bullard, 1974. Energy Costs of Goods and Services, 1963 and 1967.

12. Griffin, J., 1976. Energy Input-Output Modeling. Palo Alto, CA: Electric Power Research Institute, November.

13.Blair, P., 1979. Multiobjective Regional Energy Planning.
14.http://databank.worldbank.org/data/views/variableSelection/selectvariables.aspx?source=world-development-indicators

15. http://www.iea.org/publications/freepublications/publication/name-31287-en.html