I. ФІЗИЧНА ГЕОГРАФІЯ, ГЕОЕКОЛОГІЯ ТА РАЦІОНАЛЬНЕ ПРИРОДОКОРИСТУВАННЯ

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Hasanov S.L., Hasanov E.L.

INNOVATIVE BASIS OF RESEARCH OF ENERGY-EFFICIENT POTENTIAL AND EFFECTIVENESS OF RENEWABLE ENERGY SOURCES

In recent years, countries of the world have been trying to attract new energy sources (wind, sun, biogas, waves, drainage, non-conventional energy sources such as hydroelectric power of small rivers) in their fuel-energy balance. Azerbaijan has renewable natural resources, favorable for its energy-efficient potential, according to the amount of sunny and windy days.

In this article was given total information about renewable energy potential of Azerbaijan Republic. In this article we use information which was given by The State Program on the Use of Alternative and Renewable Energy Sources materials.

Key words: *renewable resources, energy-efficient potential, non-traditional technology, Greenstone technology, Solar energy.*

Introduction. Renewable energy resources are a numerate and quantitative text covering subjects of proven technical and economic importance worldwide. Energy supply from renewable is an essential component of every nation's strategy, especially when there is responsibility for the environment and for sustainability.

The potential of renewable energy sources is endless and does not differ with ecological cleanness, their involvement in economic turnover reduces the use of organic (oil-gas, peat, stone, coal, wood, etc.) fuels, saves energy, improves ecological conditions. One of the issues worrying the world community in modern times is the increasing demand for humanity's energy [20, p. 298]. Even when the energy slander is solved, the world will soon face this problem – with the exhaustion of oil, gas and coal, which are not renewable energy sources [9, p. 4].

Materials and methods. The more these resources are used, the more they are diminished and the more expensive they are. According to calculations, today's coal pumps will reach 400-500 tons, oil and gas will reach a maximum of 100. Exploitation of the Earth's surface and burning of the fuel also destroys the planet, worsens its ecology, and the issue of the use of environmentally friendly, renewable energy sources is becoming more and more urgent. They include only solar and wind

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energy, biological resources are inexhaustible and ineffective to nature, not just for environmental protection, but also to soften the dependence of countries, territories, economic systems on oil and its value. Depending on the nature of the region, this or other source prevails in the structure of alternative energy use. In some countries of Iceland, Denmark and the United States, hydropower facilities with predominantly geothermal sources, and small hydropower in Norway, are used for alternative energy production. In windy regions wind energy is used, and solar batteries in southern regions. Biomass burning technology is widely used in countries with rich forest resources. The use of these sources of energy is largely due to the fact that the renewable source of fuel is present in the given area. There are following types of non-traitional (alternative) renewable energy sources:

- Wind energy;
- Solar energy;
- Hydroelectric energy;
- Biomass energy;
- Geothermal energy;
- Wave energy;
- Energy from nuclear disintegration;
- Thermo-synthesis energy;
- Hydrogen fuel energy;
- Horsepower – energy of shooting;
- Thermal energy of the ocean.

Azerbaijan has renewable natural resources, favorable for its energy-efficient potential, according to the amount of sunny and windy days. The State Program on the Use of Alternative and Renewable Energy Sources in the Republic of Azerbaijan was approved by the Decree of the President of the Republic of Azerbaijan of 21 October 2004, with the Decree of 16 July 2009 to speed up the consistent and effective implementation of the issues arising from the Program The State Agency for Alternative and Renewable Energy Sources has been established within the Ministry of Industry and Energy. This once again demonstrates that alternative energy opportunities are in the focus of our state and that the transition to renewable energy is economically and ecologically efficient. It is important for Azerbaijan, a country of oil and gas, to join the global community in solving global problems.

The use of renewable and ecological energy sources, along with saving large quantities of fuel burned at thermal power plants, also significantly reduces the amount of harmful emissions into the environment. the use of alternative energy sources by using the country's natural potential paves the way for progressive changes in the future development directions of the electric power industry. Azerbaijan has favorable opportunities and renewable natural resources in terms of its inexhaustible energy potential. The use of alternative energy sources is more promising in areas where this potential is high and that traditional fuel resources are lacking [12, p. 6].

Alternative energy sources with an untapped energy source have already been installed in the "Ecological Park" project implemented by SOCAR in Gala. Solar

panels with a total capacity of 20 kWh and wind power generators with a capacity of 40kWt have been installed in the park to compensate for some of the energy supply in the park by alternative wind and solar energy.

The main purpose of using alternative energy sources at Ecological Park is to attract public attention to this energy. Thus, wide use of ecologically clean alternative sources of energy, with a special role in compliance with the principle of "zero waste" in accordance with SOCAR's "Environmental Policy" document, reducing the amount of harmful emissions into the environment and saving large quantities of natural fuel resources (SOCAR, "In harmony with nature", 2010). One of the main indicators that characterize the DPI is the indicator of energy production and consumption in the country. These indicators include general information on energy generation and consumption per capita, most important and most important of which are renewable, non-depleting alternative energy (traditional energy sources – wood, sun, wind, underground thermal waters, energy generated during laying and laying of water, biogas, alcohol and vegetable oils taken from plants, etc.).

The use of renewable energy in the world differs greatly from one another. The share of renewable energy in the United States is 3.6%, in Australia – 3.7%, in France – 4.7%, in Canada – 4.6%, in Finland – 6.2%. In Azerbaijan, especially in Absheron, the number of sunny and windy days, as well as the wind copy are very satisfactory for alternative energy production, so should be widely used.

Taking this into consideration, a special state program on alternative energy production is being developed and implemented at Absheron Peninsula and its vicinity. In developed countries, thermal waters are used as a major alternative source of energy. This effective method should be widely used in our country (northern, southern, Nakhchivan Autonomous Republic and other regions) as a large source of thermal waters. Having both the necessary conditions and strong personnel potential for the provision of our country with solar, wind, thermal waters and watercourses, provides an important guarantee for the wider use of these energy carriers in our country.

Azerbaijan has recently joined a number of conventions and agreements that have great importance.

Biodiversity conservation, global climate change, ozone layer protection, and so on. Conventions are of great importance. These conventions are dedicated to issues of national, regional and global significance. From this point of view, the programs and projects implemented to prevent and reduce the number of low-water birds in the Caspian Sea, the smallest living in the world, and the decline in the number of valuable fish species (sturgeon, white fish, etc.) are of great importance. Among the existing international standards for environmental management and protection, it is now the driving force that is most primitive and known as the ISO 14000. In

accordance with this standard, every organization operating in all spheres must continually ensure its application by preparing an "Environmental Management System".

This document is a very important document for every organization that covers a wide range of environmental policies, planning, forecasting, goals and tasks, analysis of types of activities and governance, relevant outputs and meeting modern environmental requirements. In recent years, numerous studies have been conducted to explore the potential for renewable energy in Azerbaijan. The potential utilization of renewable energy sources in Azerbaijan based on the technical data presented in various reports is as follows [2, p. 6].

The "State Program on Poverty Alleviation and Sustainable Development in the Republic of Azerbaijan for 2008-2015" confirms the activities that ensure the development of all sectors of the non-oil sector in the near future. The program focuses on the development of new generation capacities based on the use of renewable energy sources by establishing solar energy and small hydropower plants. It is recommended that periodic monitoring and financial sanctions should be applied to minimize negative impact on the environment. Within the framework of the program for sustainable management of the environment, existing monitoring of forest, water and land resources, sustainable biodiversity management and desertification, extensive utilization of renewable energy sources, integrated waste management, mountain and coastal zone, ecosystems, and environmental monitoring system and regulatory framework should be improved, and environmental awareness and awareness-raising measures should be implemented.

The program aims to create a Carbon Fund for financial support to enterprises to reduce greenhouse gas emissions, to minimize negative effects of climate change on the ecosystem, population health and the country's economy, and to prevent pollution of atmospheric emissions into larger cities, installation, and a range of activities aimed at the development of renewable energy sources. In terms of its geographical location, climatic conditions and economic infrastructure, Azerbaijan has great potential for the development of renewable energy sources. There are favorable conditions for the use of solar, wind, small hydropower and biomass resources [2, p. 5-6].

Compared with Germany and Denmark, which has achieved great success in the field of alternative energy, Azerbaijan has three more potential opportunities for developing this field. The main document adopted by the Government of Azerbaijan in the field of renewable energy sources is the "State Program on the Use of Alternative and Renewable Energy Sources". The main objectives set out in the program are to identify the potential of renewable energy sources in electricity generation, to increase the efficiency of using the country's energy resources by exploiting them, to provide additional jobs through the creation of new energy

production facilities, increasing its power, thereby improving the country's energy security.

In recent years, numerous studies have been conducted to explore the potential of renewable energy in Azerbaijan. Solar, wind, hydro, biomass energy and decomposition energy are taken into account when evaluating the potential of using renewable energy sources in Azerbaijan based on the technical data provided in various reports. The climatic conditions of Azerbaijan create a great basis for the production of heat and electricity through solar energy. The XXI century has been regarded as the century of transition to alternative energy. For this purpose, alternative energy sources are widely available in developed countries around the world, with no refusal of traditional fuels. The fact that our country is joining this initiative is the most demanded day of the day. It also improves the ecological situation and plays a major role in preventing global warming.

The most common reason for the effect of glaze effects and global warming gases (especially sulfur and nitrogen oxides) is that of fuel transported mainly by motor vehicles. At this time, the gases involved in the atmosphere violate the ecological state of the biosphere, ecosystems and biological diversity, have a negative impact on human health and have various respiratory diseases (pharyngitis, laryngitis, rhinitis, haymoritis, frontitis, bronchitis, tracheitis, pneumonia, bronchial asthma, lung cancer, etc.). Polluting of air pollution with toxic gases does not go beyond our republic, causing negative consequences and causes very serious concern. Each car exports 1.3 tons of toxic gases (sulfur, nitrogen, carbon dioxide, oxidized ethanol, hydrocarbons, etc.) to the atmosphere. Cars in Baku annually produce 1 million tons of toxic and very dangerous gas for human health [2, p. 6].

Main results.

1. All types of fuel used in our country (gasoline, diesel, gas, etc.) must comply with European standards. Car transport is very polluted by toxic gases, has a negative impact on the health of the population, poisoning the environment, reducing the productivity of plants and animals.

2. Solar energy recently, helio-energy (solar energy) is considered to be a very promising method in developed countries of the world (USA, Japan, Turkey, England, France, Germany, Russia, etc.).

3. In order to increase the energy efficiency and development of RES it is necessary to stipulate in the legislation the legal standards regarding the following aspects:

- Special tools for credit provision (renewable funds; credit lines);
- Funding by the third parties;
- Tax concessions for investment activities;
- Complex application of energy certification;

• Presence of the programs and companies regarding informing, education and training.

Conclusion. Given the above, classic traditional energy used in industry, agriculture and transport should be abandoned and environmentally friendly, use of energy resources. This is the fateful question of humanity and the most important demand of the time, and there is no other alternative. This vital issue is of paramount importance both to the UN and to other influential international organizations. Refusal from traditional fuels and their transfer to alternative types of energy, serves to improve the ecological situation, ensure human health and prevent environmental pollution, minimize carbon, sulfur and nitrogen contamination in the atmosphere. The main purpose of the transition to alternative energy is to prevent humanity from facing ecological disasters and to protect our planet from severe crises and natural disasters. Otherwise, mankind will be threatened by two ways – to live, to survive, or to destroy.

As the main indicator of the Human Development Outlook, the environmental situation, energy resources, their biosphere and ecologically harmless to human health are taken into account. Greater importance is given to ecologically clean and pure energy resources. Energy resources are a key indicator of the country's economic development and are part of the state policy. It is forecasted that energy consumption will be 15 times higher than in the previous one in 2050 and 80% of the Earth's existing energy resources.

Thermal power stations, which are considered to be a good source of energy in all the countries of the world, but ecologically dangerous, have had a negative impact on the ecological situation of our planet. Each kilowatt creates an atmosphere of 30 kilograms of sulfur dioxide per day, 3 kg of carbon dioxide and 2.4 t of ash, contaminating the atmosphere, damaging the ozone layer, creating a heat effect, and breaking heat exchange between the Earth's atmosphere and the atmosphere, generates global climate volatility causing severe environmental consequences [10, p. 5].

Solar energy recently, helio-energy (solar energy) is considered to be a very promising method in developed countries of the world (USA, Japan, Turkey, England, France, Germany, Russia, etc.). This type of energy is used in all areas of the Earth, is environmentally safe, endless and inexhaustible, has no negative impact on the environment, it does not cause difficulties to convert it to thermal energy by direct absorption and absorption with semiconductor photovoltaic modifiers. Establishing power plants with a capacity of up to 3000 KW in solar power can save about 13,000 tons of fuel a year and reduce carbon dioxide in the atmosphere by up to 23,000 tons. At the moment, unmanned taxis are produced in the United Arab Emirates. They will still be used between Abu Dhabi terminals. These taxis will be made in the new Masdar Ekosaur, which is completely free of ecologically clean and

polluting gases. As Masdar is a very modern city, it will be the only city in the world where there is no car yet. Built with the investment and financial support of many countries around the globe, this city will be the only environmentally friendly and the only city in the world, with a huge flow of tourists coming to the richest city of the city. Climate conditions of Azerbaijan allow producing heat and electricity by using solar energy. The annual number of sunny hours in the United States and Central Asia is 2500-3000 and 500-2000 in Russia, whereas 2400-3200 in Azerbaijan. The use of solar energy would help solve energy problems in several regions of Azerbaijan. In recent years, some developed countries in the world have begun to implement extensive photovoltaic programs (PVRs). The involvement of Azerbaijan in that program can play an important role in the application of such energy systems.

The effectiveness of solar installations depends on the country's climate and geographical location. The annual fall in solar energy to the US is 1500-2000, in Russia – 800-1600, in France – 1200-1499, in China – 1800-2000, and in Azerbaijan – 1500-2000 kW/m^2. So, the intensity of the sun in Azerbaijan is much higher than in other countries. This is an important factor in attracting investment to use that energy. The solar energy center is more suitable for river valleys, northern and north-eastern regions. According to the Ministry of Industry and Energy, schools, road signals and so on.it is envisaged to launch pilot projects to build solar power plants in the near future, to build 250 sq km solar systems, to build a solar battery in the home environment and to build a 5mv wind power plant in the new Greenstone Technology. At present, electric vehicles with solar energy batteries have been used in Russia, Japan, North Korea and other countries [2, p. 6].

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Анотація

Гасанов С.Л., Гасанов Е.Л. **Інноваційна основа дослідження енергоефективного потенціалу і ефективності джерел відновлюваної енергії.**

Останніми роками багато країн світу намагаються залучити до свого паливно-енергетичного балансу нові джерела енергії (вітер, сонце, біогаз, енергію хвиль, нетрадиційні джерела енергії, такі як енергія малих річок). У Азербайджані також є відновлювані природні ресурси, придані для розвитку його енергоефективного потенціалу, зокрема враховуючи кількість сонячних і вітряних днів.

У цій статті представлена загальна інформація про потенціал відновлюваних джерел енергії Азербайджанської Республіки. У ній ми використовуємо інформацію, надану Державною програмою з використанню матеріалів альтернативних джерел і поновлюваних джерел енергії.

Ключові слова: *відновлювані ресурси, енергоефективний потенціал, нетрадиційні технології, технології Greenstone, сонячна енергія.*