Eco-Economy and Future Energy Development: 
The Case of Kazakhstan EXPO-2017

I. Onyusheva¹, N. Trubnikova² and Taridi K. Ridho³

¹Graduate School, Faculty of Business and Technology, Stamford International University, Thailand, Bangkok, 10110, Exchange Tower, 388 Sukhumvit, Klongtoey; Email: irina.onyusheva@stamford.edu

²Russian University of People Friendship (RUDN University), 6 Miklukho-Maklaya st., Moscow, 117198, Russian Federation
Email: trubnikova_nv@rudn.university

³Faculty of Economics and Business, State Islamic University “Syarif Hidayatullah” Jalan Ir. Juanda No. 95 Ciputat 15412 Jakarta, Indonesia
Email: taridi.ridho@gmail.com

ABSTRACT

In this article the concepts of the ecological economy as the main direction in the economy of Kazakhstan contributing to the welfare of the country’s population have been considered in detail. It has been shown the global nature of energy consumption problems as well as their impact on environmental pollution. The necessity of development of eco-economy has been proved through the statistical data analysis, causes and consequences analysis as well as the method of expert assessment. It has been described possibilities of alternative energy based on the case of the Republic of Kazakhstan, in particular, the EXPO-2017 experience held on its territory. Taking into account the global nature of energy conservation problems, the results of the study can serve as the basis for designing the national sustainable development strategy related to the main provisions of international declarations on the transition to the eco-economy.

Keywords: Eco-economy, green economy, alternative energy, development, EXPO, Kazakhstan.
Journal of Economic Literature (JEL) Classification: Q01, Q4, Q5, O1

1. INTRODUCTION

In the contemporary world, in order to improve the quality of life, it is required to increase energy consumption constantly. However, there is a deficit in many types of fuel and energy resources, especially in the case of cheaper and better energy resources. Nowadays, 85% of the energy is produced by burning organic fuels, i.e. oil, coal, and gas. According to general world statistic forecasts, the main energy sources will end in about 40-100 years. Oil reserves can be depleted in 40-50 years, gas - in 80 years, uranium – in 80-100 years, and coal - in 400-500 years (Braun, 2003).

The experts predict that in the next 50 years, world oil consumption will increase by more than 2 times, natural gas by 3 times, and other types of mineral raw materials by 3.5 times (Ushakov et al, 2017). In this regard, the transition to the use of alternative sources is becoming very relevant. To avoid an ecological catastrophe, experts suggest that until the end of the XXI century the share of solar energy
should be at least 65%. In the plans of the European Commission, the share of European energy by 2020, obtained from renewable sources, should be increased to 25% (Cohen et al., 2014).

The development of alternative energy is a priority for Kazakhstan. Kazakhstan has significant reserves of energy resources, including 42% of the energy is received from coal, 39% - from gas, 17% - from oil, and 0.2% - from renewable sources (Kazakhstan in 2016. Statistical Yearbook, Astana, 2017).

The statistical forecasting mentioned above proves the urgency of the research and necessity of looking for new ways and opportunities for new energy sources that can be used in the future.

Thus, in 2012, as a result of voting at the 152nd General Assembly of the International Exhibition Bureau in Paris, Astana city that is the capital of the Republic of Kazakhstan has been declared the venue for EXPO-2017. The topic of this international exhibition has been chosen as the ‘future energy’ that it is not accidentally.

For years ago, in 2013 in the World Economic Forum in Davos, Switzerland, the Greenpeace International Environmental Organization published a report named ‘The Point of Non Return’ which presented the 14 most dangerous climate change projects. These include deep-sea drilling projects in the Gulf of Mexico and Brazil, oil and gas fields, oil sands in Canada and Venezuela, expansion of coal production in Australia, the US, China, Indonesia, shale gas production in the US and natural gas in Africa, expansion of oil and gas production in the Caspian and the Arctic Shelf.

In the report it is noted that by 2020 these projects will increase carbon dioxide emissions by 6.34 gigatonnes per year, i.e. 20% higher than the current level. That contradicts the Kyoto Protocol on the retention of climate change within 2°C. If the current production of greenhouse gases continues, the planet will warm up by 3.5-4°C by 2050. If 14 new projects are implemented, it will be increased the likelihood of the temperature rise by more than 5°C. At the same time that means that the point of no return will be reached by 2020. Other words, humanity will not be able to control climate changes which will lead to global natural disasters, namely, the production crisis and the widespread water shortage. (The point of Non Return. Greenpeace Report, 2013).

Thus, to avoid it, it is necessary to abandon the grandiose plans to expand the extraction of minerals, replacing them with projects for the development of renewable energy on a governmental level. How to move from a catastrophic model of energy development to the green economy show the Greenpeace Energy Revolution research.

Today renewable sources begin to displace traditional coal power engineering. However, the speed of their development depends entirely on the policies of states. So that the International Energy Agency
(IEA) scenario becomes real, governments will have to subsidize alternative energy projects in the amount of 4.8 trillion dollars (Renewables, Global Status Report, 2016).

This data was published in the annual forecasting report by the International Energy Agency (IEA). This Agency unifies 28 countries that are the largest energy consumers. The Greenpeace regularly publishes its own scenario of sustainable energy development. According to the latest version of the Greenpeace experts, Energy Revolution - 2016, the production of renewable energy should be doubled compared to the IEA forecast. At the same time, the share of alternative energy in global consumption should reach 65% (Renewables, Global Status Report, 2016).

Given the extent to which energy affects today the level of human development, the problem of energy consumption is given considerable attention in all developed countries. For example, in Europe, the USA, Canada, and Japan, the share of renewable energy sources is growing very fast. While in Kazakhstan the use of renewable energy sources (RES) continues to be negligible and lags tens of times behind the developed countries of the world. In this regard, in 2009, the Kazakhstan government adopted the Law of the Republic of Kazakhstan ‘On Supporting Use of Renewable Energy Sources’.

3. THE RESEARCH OBJECTIVE

The research objective is to prove the necessity of development of the eco-economy and to study the possibility of using alternative energy sources on the base of the Republic of Kazakhstan case, in particular, the experience of the EXPO-2017.

The main value of the study are the results of the study can serve as the basis for the development of a national sustainable development strategy that takes into account the main provisions of international declarations on the transition to the eco-economy.

4. METHODS OF RESEARCH

Methods of research are comparative and systematic analyses, causes and consequences analysis, methods of statistic grouping and expert assessment.

5. RESULTS

The ‘eco-economy’ is a very urgent research area in economic science. This is the economy that leads to increasing people’s well-being and a significant improvement in the environment, a reduction in the scarcity of natural resources, prevention of loss of biodiversity, and achievement of sustainable development. It is closely related to the concept of ‘green economy’ based on pure or ‘green’ technologies that provide a wide choice of competitive goods and services while simultaneously addressing global environmental problems. In this regard, the development of the ‘eco-economy’ is the main way in the channel of advanced ideas for the formation and maintaining of sustainable development.
In this sense, in Kazakhstan, the ‘Green Bridge’ program has been developed in which is a serious support for the formation of a model of a national sustainable development strategy. To strengthen the ‘Green Bridge’ program (2009), the ‘Zhasyl Damu’ program (2010) was developed as an initiative at the Astana Sixth Governmental Conference on Environment and Development in the Asia-Pacific region. The Green Bridge program includes projects in the use of renewable energy sources, the production of ‘clean’ products aimed at expanding access to eco-technologies and the introduction of eco-investment projects.

The potential of renewable energy and natural gas is very high in Kazakhstan. In perspective, it is possible to produce electric energy on the basis of gas use and to increase to 20% by 2030, to 2050 - up to 40% of the total consumption. The potential of solar energy and wind energy is 1 trillion kilowatt-hours per year, which in aggregate is 50 times higher than the consumption of all fuel and energy resources. The total potential of small HPPs (with a capacity of less than 10 mW), amounting to 8 billion kWh (Abykayev, 2015).

The Zhasyl Damu program provides for comprehensive measures to transition to low-carbon development. Kazakhstan first proposed the concept of transition to low-carbon development until 2050, while simultaneously reducing greenhouse gas emissions. These problems will be solved on the basis of the gradual replacement of coal as the main fuel in the energy sector for a wider use of gas, modernization of existing coal and gas-oil thermal power plants, as well as wider use of renewable energy sources, which is abundant in Kazakhstan.

At present, the energy intensity of Kazakhstan’s GDP is 1.9, Belarus - 1.17, and Japan 0.1, that is in 19 times lower than the Kazakhstan indicator (Ecological indicators of environmental monitoring and assessment, Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, 2017). In Kazakhstan’s industrial production sectors, the energy intensity indicator is 5 times higher than the value of the indicator in question compared to foreign enterprises. The conducted researches show that the means invested in energy saving technologies pay off in a period of several months to 5 years. When entering new generating capacities, this will take 2-3 times longer. Energy saving can give significant savings in fuel and energy resources. Energy saving for environmental reasons was practically not carried out everywhere, as there were no incentive mechanisms for economical consumption of energy resources (Sevostyanova, 2016).

In connection with aggravating crisis phenomena in the traditional energy sector, energy issues in all developed countries pay special attention to the development of energy security programs, and in each specific case, energy saving and energy consumption analysis is carried out, measures are taken to improve and use energy resources, including the power supply solution.

However, in practice, the implementation of the Law of the Republic of Kazakhstan ‘On Supporting Use of Renewable Energy Sources’ has not received adequate support. The power transmission organizations, because of their lack of interest in purchasing expensive renewable energy, create
barriers in connecting RES installations to the general electric networks. In this regard, the Ministry drafted a law that affects the interests of both investors and private users. It is offered for investors implementing RE facilities to provide preferential tariffs. They will contain investment and operating costs, as well as the cost of connecting to the network. The validity of tariffs for all RES energy will be fixed, and they will be reviewed only after a certain period of time. Such an approach should ensure a guaranteed level of prices for return on investment and risk coverage, guaranteed procurement, as well as the unhindered connection of RES to the network.

For guaranteed purchase of electricity, it is proposed to create a new single buyer structure such as ‘Settlement and Finance Center’. The similar approach is used in Italy and Austria (Fava et al., 2014). Such an organization will be better able to fulfill its obligations to purchase and trade energy in the market of Kazakhstan. This approach provides support for consumers using alternative energy sources, which is especially relevant for residents of remote areas and individual farms that do not have an electrical connection.

The greatest effect in the development of renewable energy can be achieved through the possibility of providing the sale of surplus electricity generated from renewable energy sources in the public network. For individuals who do not have the opportunity to connect to the common energy system, the state will provide financial support for the purchase of RES installations, while 50% of the cost of installation up to 5 kW is compensated from the Republican budget (Abykayev, 2015).

Currently, about 1,200 farms and pastures remain unconnected to public networks. The government plans to cover an annual cost of 4000 households. Today, in the context of the regions, intensive work is being done on the design and construction of renewable energy sources. By 2020, 13 new wind farms will be built in the republic, which will produce 793 MW, 14 HPPs of 170 MW and 4 solar power plants (Abykayev, 2015).

Kazakhstan has a very high potential for renewable energy sources, many times exceeding the country’s need for fuel and energy resources. However, to date, coal and hydropower are the cornerstones of energy, although fuel and energy resources are exhausted.

The main reason for the underdevelopment of alternative energy sources is the considerable low cost of energy produced on the basis of coal. In addition, the fuel and energy resources in the republic are abundant and their use not only at the present stage but also in the future fully satisfies the needs for electric energy. In addition, there is no production base for the production of renewable energy equipment. However, in the future, with the development of renewable energy technologies, their cost will decrease, and the cost of coal technologies will increase.

One of the renewable energy projects of the ‘Samruk Energo’ JSC is the construction of the Erementau wind farm with the capacity of 45 MW, which should also provide facilities for EXPO-2017.

In Bolotov wind farms at the Christmas cordon, in the new Palace of schoolchildren, work in Astana. On the roof of the Eurasian National University named after Gumilyov ‘Solar roof,’ monocrystalline modules
are installed. There are five small hydropower stations on the mountain rivers of the Almaty region. The first project of the solar power plant "Green Trees", which provides electricity and water to a remote settlement, was launched (Upushev, 2015).

A wind farm has been built in the Kordai district, as well as a number of small hydroelectric power stations on the Karakystek river and the Tasotkel reservoir in the Zhambyl region. The RES project is also being implemented in Kyzylorda and Kostanay regions. By 2050, RES should account for at least 50% of all consumed electricity (Upushev, 2015).

Another direction of eco-economy is related to green utilization methods of population life products. According to various estimates, at present, there are 25-30 billion tons of waste accumulated in the country, which is approximately 1,800 kg per person. In Kazakhstan, only about 5% of the waste is disposed of, and the rest is stored in landfills or forms a spontaneous landfill. Effective solution of the problem with waste is important for our environmentally unfavorable country (Kazakhstan in 2016. Statistical Yearbook, Astana, 2017).

According to experts, 95% of the rubbish lies in the open air, polluting the environment (Gouvea et al., 2015). In this connection, a garbage processing plant was built in Almaty in 2007, which currently does not function. A similar plant was build and launched in Astana in December 2012. Two methods of processing are used: the first is a traditional waste-processing plant, incoming solid waste is sorted and processed into additional products, and the rest is compressed into briquettes and sent to a landfill for burial. It is positive to reduce the area under the landfills and obtain a secondary product.

An alternative to traditional processing is a plant that operates on the basis of plasma recycling. The process of incineration of waste, in addition to construction debris, occurs at a very high temperature. The gas produced during decomposition of the product does not escape to the atmosphere but is directed to the generation of electrical energy. In addition to the resulting gas, a small amount of solid glassy sediment forms, which can be used in the construction of roads, bridges, or added to concrete and erect buildings and structures. The compared technologies have significant advantages and disadvantages. Therefore, it is important to combine different ways and combine technologies in one complex, as a result, we will get maximum benefits and minimum damage to the environment. Foreign experience shows that it is best if the state deals with processing.

For example, in Sweden, a national program for generating electricity from waste is being implemented. Moreover, Sweden does not have enough of its waste, and therefore 800,000 tons of waste are purchased annually in neighboring states (Patel, 2013).

In Kazakhstan, the main pollutant is the fuel and energy complex, in which coal deposits are particularly prominent (Ecological indicators of environmental monitoring and assessment, Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, 2017). The exploitation of the brown
coal deposit, which is prone to re-grinding during extraction and storage, leads to environmental and economic problems. Warehousing of substandard coal significantly pollutes the soil on a huge area of agricultural land and, accordingly, reduces the yield of agricultural crops and worsens the ecological situation.

In the mining industry, one of the most effective ways to solve this problem is briquetting substandard coal. The use of substandard coal screening for briquetting does not require the creation of dumps and therefore excludes additional emissions of pollutants into the atmosphere.

In addition, Kazakh scientists have developed a technology for obtaining the humic drug from brown coal. The effectiveness of the preparation for the growth of crops on low-productive soils is determined. The agro-processing of presowing seed treatment with a solution of the preparation on serozems and light chestnut soils provided a stable increase in the yield of winter wheat by 24-36%, soybean - by 35%, rice - by 37%, and sorghum and Sudan grass - by 23-25% (Kalenova et al., 2017).

The structure of the fuel and energy balance in the world is changing rapidly. There is the development of alternative fuel, the transition from coal to gas. In this regard, we should emphasize the prospects of using methane in industrial production proved by the international experience of its effective use in coal mines for energy production.

At present, a technology has been developed to maximize the use of methane from coal seams, its large resources in the bowels not only the Karaganda basin but also in other coal-gas-bearing basins of Kazakhstan. The use of methane in industry and energy, the gasification of the private sector, the transfer of vehicles to gas - all these aspects provide a huge socio-environmental and economic impact and will help reduce greenhouse gas emissions into the atmosphere.

In this regard, all these urgent eco-economic issues have been collected and unified to be discussed and shared the world experience within an international exhibition called ‘EXPO-2017’ hosted in Astana capital city from June 10 till September 10, 2017.

It needs to mention that there are two types of EXPO exhibitions by Bureau International des Expositions (BIE). Each of them has its own differences. There are the world or universal Expos called International Registered Exhibition. And there are international Expos or International Recognised Exhibitions.

As a rule, Universal Exhibitions held every 5 years. The last was in 2015 in Milan, next it is going to be in 2020 in Dubai.

The specialized international exhibition held between the main universal and last from 6 weeks till 3 months. Such exhibition is devoted to a concrete and relevant topic. The topics of such exhibitions are
more specific and, as a rule, reflects the scientific, technological and economic achievements of the host country in a particular field, including humanitarian, social and environmental aspects. For example, the exhibition in Zaragoza in 2010 was devoted to ‘Water and sustainable development’, in Yeosu in 2012 it was devoted to ‘Life of the ocean and the coast’. At the same time, the subject of the exhibition must necessarily be coordinated not only with the bureau but also with other world organizations, including the UN.

The EXPO 2017 falls under the category of a specialized international exhibition. In addition to the scale and significance of the difference, the countries participating in the Universal Exhibition construct facilities at their own expense, and in a specialized one, at the expense of the host country.

The international exhibition EXPO-2017 in Astana is devoted to the topic of ‘Future Energy’. It is intended to widely highlight the relevant problem of energy supply and the introduction of alternative energy sources, such as solar, wind, energy resources of the sea, Oceanic, thermal waters and etc.

The preparation to this large-scale event has been initiated since 2012. According to the official data, the total cost of EXPO-2017 project including building of the exhibition objects and organizing exhibition events will be 400 billion tenge approximately. During 5 years it has been built 113 hectares, where a pavilion complex will be located on 25 hectares, and the remaining 88 hectares are allocated for the accompanying modern and innovative infrastructure: parking, restaurants, hotels, etc. This place is called the ‘City of EXPO-2017’. The area is equipped with cameras, through which the exhibition will see 2 billion Internet users around the world, and it is called ‘Digital EXPO’ project.

At the world specialized exhibition in 2017, the participating countries will demonstrate achievements and perspectives in the field of using renewable energy sources and their advantages, such as environmental cleanliness, low operating costs, and harmlessness to the environment.

After the international exhibition’s completion, it is planned to create the Astana International Financial Center as well as set of scientific and research centers headed by the Nazarbayev University (Official Website of EXPO-2017).

6. DISCUSSION AND CONCLUSION

According to the official data, the EXPO-2017 international exhibition has been attended by more than 100 participating countries and more than 15 international organizations. In general, more than 2 million visitors are expected, each of which, according to the forecast, will visit the exhibition 2 times or more. Thus, the preliminary total number of visits will be 5 million (Official website of the EXPO-2017).
During the opening, the first days of the exhibition were very crowded. 85% of the total number of visitors are made by Kazakhstani, and 15% consists of citizens of foreign countries. Most of them will come from the CIS countries and China. A significant number of tourists are from Europe, Japan, and the US. Undoubtedly, it has been put before Astana a rather complicated task or even ‘challenge’ while positioning the EXPO-2017 as a large-scale and very prestigious project that will help to have a significant impact on its political image, while not expecting a big economic effect. It now requires rational attraction and implementation of innovative projects for qualitative changes in energy, including, first of all, the development of alternative energy sources and new ways of its transportation. Analyzing official statistic data of the BIE, international exhibitions of recent years shows that one visitor brings in revenue of about 130 US$. Hypothetically, that total income of EXPO-2017 is supposed to be from 520 million US$ to 910 million US$ (Official website of the Bureau International des Expositions).

At this moment, total expenses have not yet been fully determined, as the exhibition is in progress. It is assumed that this project will not become a simple waste of the state budget money. Otherwise, it can lead to negative consequences, especially, a negative perception of citizens.

Will the exhibition in Astana be profitable? Will the EXPO-2017 have reached the goals and objectives? Time will show. Meanwhile, we are planning to conduct the detailed analysis of the profitability and socio-economic effectiveness of this large-scale project after its completion and official information updating and disclosure.

At the same time, we consider that the EXPO-2017 will become one of the most significant national brand event reflecting the power and real economic development progress of the Republic of Kazakhstan. It has been the first experience of hosting such large-scale international exhibition in the Central Asian and the CIS countries.

The transition of the Republic of Kazakhstan to the eco-economic country, the formation of the National Sustainable Development Strategy, holding of the international exhibition EXPO-2017 is an urgent and significant direction in the development of Kazakhstan's economy.

To conclude, in this article, the concepts of the ecological economy as the main direction in the economy of Kazakhstan, contributing to the welfare of the country's population, have been considered in detail.

It has been shown the global nature of energy consumption problems as well as their impact on environmental pollution. The necessity of development of eco-economy has been proved through the statistical data analysis, causes and consequences analysis as well as the method of expert assessment. It has been described possibilities of alternative energy based on the case of the Republic of Kazakhstan, in particular, the EXPO-2017 experience held on its territory.
Taking into account the global nature of energy conservation problems, the results of the study can serve as the basis for designing the national sustainable development strategy related to main provisions of international declarations on the transition to eco-economy.

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