

## **SUSTAINABLE DEVELOPMENT OF ELECTRICITY BRANCH AND QUALITY OF AIR IN KAZAKHSTAN**

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### **ABSTRACT**

Electricity is considered to be the leading industry in the country. The choice of management strategy depends on the degree of sustainability of the economy as a whole. In the energy sector, there are growing multifactorial crisis phenomena, both global and intra-sectoral. Changes in the earth's climate due to excessive air pollution caused by energy companies in the combustion of fossil fuels (coal, oil and gas) is a major contradiction that adversely affects the sustainable development of both the industry and society. In addition, Kazakhstan's electric power industry has mainly worn-out fixed assets and requires regular investment funds, causing a continuous increase in energy tariffs. Further development of these processes, along with the inevitable increase in fuel prices can lead in the long term to extensive development of the economy and industry, and the country. These problems hamper the sustainable development of the electric power industry in the long term. In other words this problem raises the issue of the need to find a new mechanism of industry management to obtain the status of a sustainable industry.

Thus, the dynamically developing economy of Kazakhstan provides stable functioning and development of electricity production. However, the industry is developing due to the huge damage to the environment. The development of territorial production systems (energy facilities) does not take into account environmental interests. The implementation of the concept of transition of Kazakhstan to sustainable development determines the gradual introduction into the economy of an environmentally ideal industrial structure of production, excluding environmental pollution. Therefore, the relevance of the research topic is due to the lack of a mechanism for the transition to the sustainable development of electricity production. The paper considers modern concepts and indicators of sustainable development, provides an overview of a new mechanism of management of sustainable development of the power industry in Kazakhstan. At the same time, this study presents the monitoring of the impact of energy enterprises on sustainable development resources (air basin).

**Keywords:** *sustainable development, power industry, air basin, resources of sustainable development, environmental system.*

### **INTRODUCTION**

Kazakhstan has distinctive features of the sustainable development process as well as a number of internal and external prerequisites for implementing sustainable development policies: the presence of a large number of environmental and social crisis phenomena, political stability as an important prerequisite for the formation of sustainable development, a balanced foreign policy, a stable place in the world,

political space, a high level of public security, a high rate of market reforms, the presence of incentives for a transition to sustainable development, the strategic focus of the country on the development of international relations and favorable geographical position, growing public intelligence, mentality, a tendency to strengthen environmental policies, achieved some progress potential environmental activities and more.

However, there are factors limiting sustainable development as the absence of an expanded definition of the concept “sustainable development”, its criteria, characteristics and indicators; the formation of the main part of capital at the expense of the activity destroying nature, the raw material orientation of the productive forces, etc.

For reference, according to the environmental sustainability index of the Yale Center for Environmental Law and Policy, based on 22 indicators in 10 categories, Kazakhstan ranks 101 with an index of 54.56. At the same time, in 2016 Kazakhstan ranked 69th with an index of 73.29. This index includes such parameters as indicators of the state of ecosystems, environmental stress, environmental aspects of public health, social and institutional capacities, and international state activity, etc. [1]. The world community sustainable development is understood as development that satisfies the needs of the present without threatening the ability of future generations to meet their own needs. Based on the purpose of the study, based on the studies of domestic and foreign authors, we define development under sustainable development, which ensures long-term stable economic growth that does not violate the natural basis for the existence and functioning of industrial production, i.d electricity production. In addition, the transition to sustainable development involves the management of electricity production, which ensures the satisfaction of the basic electricity needs of present and future generations, while maintaining the quality of the environment which will serve as a guarantee for human existence in the natural environment.

This definition sets a new goal - to achieve high results in the production of electricity while improving the quality of the environment. Realization of this goal is seen when performing the following tasks: the pace and volume of consumption of natural resources must be within the limits of natural ecosystem restoration, production waste must be correlated with the capabilities of the biosphere; the production process should be related to the existing environmental risk factor; development strategies should be based on present and future generations. Returning to the theoretical interpretations of management, management of sustainable development involves the organization of management of the system development process. No wonder the term “sustainable development” is applicable in cases where it is currently invested in it. The sustainability of the development process is determined by the random coincidence of the properties of the system with the requirements of the environment. As a rule, flexible, with high potential adaptation system has a greater likelihood of existence and development. From the standpoint of management theory, the problem of sustainable development is a system that is ready to make fundamental changes. The system should make a transition from the existing influence in relation to the environment, exponential in its development indicators - growth, to a sustainable, self-sustaining, environment-

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friendly development. This means that development should be carried out contrary to internal laws, according to the chosen scheme, it is manageable.[2] The processes occurring in the set, uncontrollably, randomly, respectively, end with random consequences. Sustainable development management involves the organization of the process of controlled and controlled transformation of the system into a different from the existing and customary conditions of existence, not destroying the sustainable global equilibrium in nature. The process requires organization, management. Therefore, when considering the problem of sustainable development, it is necessary to resolve the issue of the possibility of sustainable development of such a system and, if possible, determine the ways to manage this development in order to make it endless and harmless to the environment. The functioning of modern society leads to a constant increase in the consumption of energy resources. The tendency of development of the world economy suggests that by the end of the XXI century, subject to a limited supply of fossil fuels, the annual consumption of primary energy resources will increase three to four times. At the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002, it was noted that the sustainable development of countries is provided with a sufficient amount of energy resources, the use of which should not overload ecosystems and cause irreversible changes in them. Therefore, the further development of the current generation should not be to the detriment of the development possibilities of future generations. In this regard, the gradual replacement of fossil fuel resources used for renewable energy purposes.

The territory of Kazakhstan historically endowed with significant reserves of fossil fuel has become a source for the development of the fuel and energy complex, which makes a significant contribution both to the economy and to the depletion of natural resources. "In other words, the activities of the electric power industry as part of the country's fuel and energy sector, being an indispensable sector in the structure of the economy, lead to the degradation of terrestrial and aquatic ecosystems, a very polluted air basin, surface water and groundwater, the formation of over 30% of solid industrial waste in the country and 79 , 2% of total greenhouse gas emissions. Underground and surface mining of solid fuels lead to large-scale natural losses. Thus, the extraction of oil and gas leads to the alienation of the land, large hydroelectric power plants permanently modify natural habitats and ecosystems, and also transform the landscape and river beds of the dam and dam. In turn, the production of electricity requires the burning of organic fuels, which, as a local negative impact on the environment of the energy industry, has a significant impact on the global climate of the planet. The rapid increase in greenhouse gas concentrations in the upper atmosphere over the past 40 years has been the main cause of global climate change on Earth. Recall that the main anthropogenic greenhouse gases emitted by fuel and energy companies are carbon dioxide (CO<sub>2</sub>) released during the combustion of solid fuel and methane (CH<sub>4</sub>). The publications, scientific papers and international documents contain the terms "sustainable energy" and "sustainable energy development" [3], however, there is no separate term "sustainable development of electricity production", which considers sustainable development in the production of electricity from solid burning fuel, which is important for Kazakhstan, especially for the regions of Kazakhstan. In the course of the study, the definition of the term "sustainable energy development" was found [4],

on the basis of which we will try to give a scientific and practical definition of “sustainable development of electricity production”. The report “The World Conservation Strategy” (1980), presented by the International Union for Conservation of Nature and Natural Resources, gave the definition of “improving the quality of human life while maintaining the sustainability of supporting ecosystems”. The publication of the report “Our Common Future” (1987) prepared by the United Nations Commission on Environment and Development, headed by the Prime Minister of Norway Gro Harr Brundtland, stated a different definition as “development that meets the needs of the present menia, does not compromise the ability of future generations to meet their own needs.” The conclusions of this report became a theoretical-methodological and conceptual basis of decisions about the need for civilization to switch to a model of sustainable development, adopted at the 1992 Conference in Rio de Janeiro. Academician AD Ursul proposed his own definition of "" ... the concept of SD assumes that both humanity and the biosphere will interact in such a way that n; indefinitely long times it will be possible their joint or mutual harmonious co-development, or co-evolution of society and nature, which can lead to the gradual (evolutionary) formation of a sustainable society, or the noosphere (noospheric civilization) ". V.I Danilov-Danilyan formed his understanding of the term as “development in which the anthropogenic impact on the environment corresponds to the assimilation potential of the environment”. Prof. Zh.Adilov suggested a different definition for discussion in the framework of his research: “sustainable economic development was understood as such development, which ensures long-term stable economic growth that does not destroy the natural basis of the existence and functioning of its production. This is a development in which the environment is the anthropogenic impact corresponding to the assimilation potential of the environment." [5] The scientist, Ph.D., Ismagulova, G.E., proposed her definition as “under sustainable energy development is considered an energy development that does not threaten the sustainability of both the global climate of the Earth and local ecosystems”. [6] Based on the above definitions, we propose the following definition as by sustainable development of electricity production “we understand the stable development of electricity production while maintaining the quality of the environment within the territorial limits of the energy facility without causing damage to present and future generations”. Sustainable electricity production is a reduction in the share of electricity per unit of output, as well as the tightening of energy standards in the country. By “sustainable development of electricity production” we understand the stable development of electricity production while maintaining the quality of the environment within the territorial limits of the operation of an energy facility without harming present and future generations. Thus, the reduction of greenhouse gas emissions due to the activities of electricity generation is possible, in our opinion, on condition that: introduction of innovative and technical developments in the technological structure of electricity production, transportation and distribution of electricity, toughening requirements for energy efficiency and energy saving in all sectors of the economy. Only such conditions today can create a transition to a new type of economy, to an economy with an environmental component.

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The Republic of Kazakhstan fulfills its obligations in the field of climate change and reduction of greenhouse gas emissions, which is the political will of the Government of Kazakhstan. Based on the above, based on the opinion of authoritative experts on climate change, for the power industry it is possible to recommend economical consumption of raw materials, increase efficiency in the management of enterprises and a gradual transition from hydrocarbons to other types of energy carriers, eliminating waste. Otherwise, the greenhouse effect will reach a level dangerous for the existence of ecosystems and the person himself. Even if the Kyoto Protocol is not effective, the way it indicates is the only correct one. But start following immediately to give the right signal to the industrial world. [7].

### RESULTS

Industrial production is one of the main consumers of resources and the main source of environmental pollution. One of the most important objectives of industrial policy is to create the basis and conditions for a highly competitive and competitive industrial sector, ensuring stable sustainable development. Until recently, there was a definite tendency to view the development of industrial production and the interests of the environment as polar, but the transition to a model of sustainable economic development implies the preservation of environmental quality and natural resources while simultaneously achieving economic growth. Thus, industrial production becomes not only part of the problem, but also part of its solution. Consider the state of the environment in the country. On the territory of the republic, only 3.5 thousand industrial enterprises located in 80 cities characterized by classes 1-5 of sanitary hazard are air pollutants. According to the priority list of cities of the Republic of Kazakhstan on the level of air pollution in 20 cities, mainly regional centers have a negative impact on the degree of quality of atmospheric air. Industries that directly put pressure on air pollution are among the leading industries in the overall structure of production of the Republic of Kazakhstan. The largest contribution to air pollution, in most cities makes the industry - energy. Being the locomotive of the national economy sectors, this industry produces over 70 billion kWh, while the emissions to the atmosphere are about 785.5 thousand tons. in year. So, non-ferrous metallurgy - Atmospheric air pollution index- (AAPI<sub>5</sub>). According to calculations, the standard index and the highest repeatability, in September 2018, the class of very high levels of pollution included: 3 cities (the standard index is more than 10, the highest frequency is more than 50%). High levels of pollution (standard index - 5-10, the highest repeatability - 20-49%) are characterized by: 7 cities and 1 point. The increased pollution level (standard index - 2-4, the highest frequency - 1-19%) includes: 15 cities and 2 points. Low pollution (standard index - 0-1, the highest repeatability - 0%) is characterized by: 11 cities 8 points. High and very high levels of air pollution in populated areas by such pollutants as: nitrogen dioxide, carbon monoxide, sulfur dioxide, formaldehyde, hydrogen sulfide, suspended particles, phenol, ammonia are due to: 1) road congestion by urban transport - the complexity of gasoline and diesel fuel emissions from motor vehicles is one of the main sources of pollution of atmospheric air of settlements with nitrogen dioxide, carbon monoxide, organic substances, etc., and roads in cities even with good airing capacity leads to the accumulation of harmful impurities in the air. 2) dispersion of emissions from

industrial enterprises - the result of production processes during the combustion of industrial products is the entire list of harmful substances causing a high level of air pollution. Dispersing them in an air basin over the territory of settlements significantly affects the quality of the atmospheric air of cities, suburbs and towns. 3) low ventilation of the atmospheric space of populated areas - airborne pollutants accumulate in the surface layer of the atmosphere and their concentration remains at a very high level. Analysis of environmental pollution, in particular, atmospheric air of certain types of economic activity in recent years, shows that in this matter the leaders are: the production and distribution of electricity, gas and water; manufacturing industry; metallurgical industry; mining industry; extraction of materials for energy; extraction of crude oil and natural gas; transport and communications. An interesting fact is that, on average in the republic, 154 kg of various chemical compounds are released into the atmosphere by industrial stationary sources per year (793.4 kg in the Karaganda region, 547 kg in the Pavlodar region, 397 kg in the Atyrau region, etc. ). [8] The total mass of other organic substances is about 8 thousand tons per year. Summarizing the above, atmospheric air is under the direct influence of the energy sector of the economy. In this regard, we consider the relationship of the activity of this sector with the pollution of the atmosphere by its emissions.

The energy sector in Kazakhstan is the main source of pollutant emissions into the atmosphere in the form of ash, sulfur and nitrogen oxides, and carbon monoxide. In 1990, enterprises of the energy sector emitted about 2.3 million tons of pollutants into the atmosphere, which accounted for 35% of the total amount of emissions into the atmosphere (or 53% of emissions from stationary sources). In 1996, this figure was about 1 million tons or 28% of total emissions (41% of stationary source emissions). Significant amounts of air pollution by the energy sector are explained: firstly, the use of low-quality coals in power engineering, secondly, the poor equipment of thermal power plants and boiler systems for exhaust gas cleaning [9]. The republic's energy sector has a significant impact on greenhouse gas emissions. According to the results of the Kazakhstan inventory, the total emissions of gases with a direct greenhouse effect in 2017 amounted to 154.7 million tons of CO<sub>2</sub>-equivalent, including 122.5 million tons of emissions from all energy activities, 13 million tons from industrial processes, 16 million tons from agriculture [10] and 3.3 million tons from the category of waste. The absorption of CO<sub>2</sub> by forests was 8.3 million tons. Thus, net emissions, taking into account the absorption (sequestration) of CO<sub>2</sub> by forests, are estimated at 147.5 million tons of CO<sub>2</sub> - equivalent. Total CO<sub>2</sub> emissions are 120.8 million tons without carbon absorption by forests, and taking into account absorption - 112.5 million tons. Total specific emissions of greenhouse gases in 2017 were more than 10 tons per capita, of which about 8,1 tones accounted for CO<sub>2</sub> only. Thus, having significant reserves of energy resources and a developed energy industry, Kazakhstan has an energy-intensive economy, the production of heat and electricity is accompanied by high specific consumption of mineral fuels and significant atmospheric pollution with harmful emissions and greenhouse gases, and the population does not have sufficient energy supply. Therefore, measures to reduce the energy intensity of the economy, improve the efficiency of production and consumption of energy resources, together with

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measures to support the energy supply of the population are necessary to ensure sustainable development and improve living standards in Kazakhstan.[11]

Kazakhstan has great potential for energy saving. Currently, work continues on the preparation of projects that are acceptable for implementation under the Kyoto Protocol. Energy enterprises that do not have their own funds for technological upgrading can participate in CDM projects. Through this mechanism, such enterprises can receive on credit modern technologies in exchange for certified greenhouse gas emission reduction units, which the investor will receive after the project implementation. Enterprises with funds for the modernization of technology can participate in the joint implementation of greenhouse gas emission reduction projects in Kazakhstan. At the same time, they receive the investment funds that are lacking for modernization and undertake to return to the co-investor after the project implementation its share of certified reductions in greenhouse gas emissions. The energy undertaking can use its share of “reductions” at its own discretion [12]. The successes achieved and plans for the country's entry into the 30 competitive countries of the world require a review of the existing view on the development of Kazakhstan. The stable development of the energy production process, which is responsible for the uninterrupted and high-quality supply of electricity and heat to all sectors of the economy, plays a priority role in the process of achieving economic growth in the Republic of Kazakhstan [13]. However, the rapid growth of world energy consumption leads to an increase in the impact of energy on the environment, which contradicts the basic principles of sustainable development. The development of global energy in the direction of searching for substitutes for traditional natural fuel and energy resources (FER), which is caused not only by their depletion, but also by the harmful effect on the environment, which grows with increasing low-grade fossil fuels, mainly coal, increasing energy production and increasing volumes and cost of its transport. This is reflected in the degradation of the natural environment, the extraction of non-renewable natural resources, the imbalance of the mining and processing industries. The impact of energy on the environment is manifested in the removal and consumption of natural resources, in the effects of energy production waste, and also in-side effects.

### CONCLUSION

The Republic of Kazakhstan is a potential leader among states claiming the right to acquire the status and functions of the state - the guarantor of global sustainable development. However, the further development of the country in the outlined rates faces a number of problems directly opposed to the basic tenets of sustainable development. Thus, the country's economy is in a certain dependence on the commodity sector, with the increasing pace of the industry, and a significant lag in the field of high technologies. Overcoming barriers to Kazakhstan should be implemented in the shortest possible time, since in order to achieve leading positions it is necessary to ensure acceleration of socio-economic progress.

Thus, being an indispensable sector in the structure of the economy, energy remains the main environmental polluter in the country. Relying on the main priorities reflected in the Concept of Transition in the Republic of Kazakhstan to overcome the instability factors caused by the influence of the energy industry in

order to ensure sustainable economic development, the following types of activities should be implemented: development of domestic “breakthrough technologies” based on stimulating science and innovation; wealth from unsustainable environmental management through the introduction of joint economic and environmental standards of national accounting resources; introduction of modern science-based approaches to environmental management, including environmental methods of using natural resources; improving the energy efficiency of the domestic economy through the implementation of effective government programs, competent policies for overcoming energy losses; technological re-equipment of economic sectors by encouraging the creation and introduction of modern technologies and a ban on import and use of imported obsolete technologies and equipment; the share of enterprises exploiting natural resources in the structure of the national economy is crumbling, the development of knowledge-intensive, resource-saving, high-tech industries; elimination of historical pollution through the possible recovery and partial use of valuable materials accumulated at landfills; stimulation of the introduction of resource-saving and waste-free technologies in all areas of activity; support for environmentally efficient energy production, including the use of renewable sources and secondary raw materials; to achieve sustainable development in the industrial sector, it is necessary to create a system of national energy planning based on the use of renewable energy sources and clean energy strategies that link available energy resources and the development of technology programs to national security and sustainable development scenarios.

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