



Conceptual Framework for the Formation of Low-carbon Development: Kazakhstan's Experience

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ABSTRACT

This study aims to analyze the theoretical assessment of formation of low-carbon development in Kazakhstan: The development of approaches and the identification of priority directions. The application of scientific methods in this research will allow studying the process of formation and development of low-carbon economy with the use of two methods. Institutional approach involves investigating of legislative and legal support. The ecological - economic approach, which assumes of analysis of efficiency of the directions and methods of decarbonization. This research confirms that Kazakhstan requires formation and development of low-carbon economy, but we have to understand clearly approaches and choose the correct mechanisms. Further, the authors developed three different approaches of transition to low-carbon development for Kazakhstan. According to the results of this theoretical study proposed that means the category for low-carbon development is a new socio-economic and technological system (model) of economic development that stimulates the reduction of greenhouse gas emissions. In Kazakhstan developed regulatory framework, but is far behind from goals and objectives. However, the system of mechanisms of transition to low-carbon development is at an early stage of formation and supplemented by a wide range of tools.

Keywords: Low-carbon Development, Decarbonization, Energy Resources

JEL Classifications: Q40, Q49

1. INTRODUCTION

The problem of environmental degradation due to expansion of production activity has resulted to the need of change of the relation to environmental management and transition of society to sustainable development.

The Paris agreement builds upon the convention and - for the 1st time - brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort.

The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping a global

temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C (UNFCCC, 2017). Additionally, the agreement aims to strengthen the ability of countries to deal with the impacts of climate change. To reach these ambitious goals, appropriate financial flows, a new technology framework and an enhanced capacity-building framework will put in place, thus supporting action by developing countries and the most vulnerable countries, in line with their own national objectives. The Agreement also provides for enhanced transparency of action and support through a more robust transparency framework (UNFCCC, 2017).

Key condition of achievement of the economic, energy and environmental purposes are ensuring sustainable development of the national, social and economic system of Kazakhstan. In

the conditions of implementation of the concept of low-carbon development is increasing of energy efficiency as way to achieve significant economy of energy and reduction of emissions of greenhouse gases.

The defining role in the solution of tasks corporate, national and global level in the field of sustainable low-carbon development carried out by ecological management as the tool of control system of the economic subject providing systematization of approaches to the questions connected with state of environment and inclusion of ecologically significant purposes in the strategy of business.

The traditional objectives of environmental management of enterprises of Kazakhstan are environmental aspects such as rational use of resources, emissions and discharges of pollutants, generation and disposal of waste, the share recycled or re-used materials; while the majority of Kazakhstan enterprises under the regular perimeter of the business does not include activities in the field of control and reduction of greenhouse gas emissions.

In accordance with the recognition and definition of the global nature of the effects of economic activities for the sustainability of ecosystems increases the urgency of ecological and economic evaluation of enterprise activity from consuming energy resources and greenhouse gas emissions; contribution to climate change; activities in the field of environmental policy, national objectives and fulfill international obligations.

The objective of assessing the effectiveness of ecological management at the enterprise level requires its further investigation, especially in the context of the implementation of the concept of low-carbon development and the greening of production, which causes changes in its technological basis.

The initial theoretical and methodological basis of this research have formed the scientific and practical developments of foreign and domestic scientists in the field of sustainable low carbon development of economy.

The definition of the concept of sustainable development traced in the works of foreign researchers Brown (1982), Losev (2001), Begun (2012). Danilov-Danilyan (2000) and Bobylev et al. (2004) divide sustainable development into three components: Sustainable social development, economically sustainable development and ecologically sustainable development. The formulation ecologically sustainable development considered in the works Steiner et al. (2001), Lemeshev (2011), Shakirov (2011), Gusev (2015). Some scientists analyzed issues of "green economy" and low carbon economy (Bobylev et al., 2004; Belik et al., 2016; Yessekina, 2016).

Essence of sustainable development is that present generations have to construct so the economic activity that future generations had economic opportunities and welfare (Steiner et al., 2001). For sustainable development have an important role eco-innovation, which means new products, new technologies and new ways of organizing production (Kireyeva et al., 2018).

The significant contribution to implementation of concept of low-carbon development, as gradual transformation of world

power brought by such foreign scientists as Rifkin (1991) and Sachs (2014). In certain researches highlighted of the area of low-carbon economic development and the transition to low-carbon development carried out Bashmakov (2009), Alinov (2016) and Yessekina (2016).

The formulation of "low-carbon development" in recent years has increasingly attracted the attention of various countries and researchers who provide various interpretations on the concept of low-carbon development. More researches focus on the impact on the spatial structure of the information technology green economy and high-tech industries (Lu, 1999; Kireyeva et al., 2018). An important place occupied researches in the field of explain the nature of the relationship between the factor of high-tech production and agglomeration (Saxenian, 1993; Storper, 1997).

The present research is aim to analyze the theoretical assessment of formation of low-carbon development in Kazakhstan: The development of approaches and the identification of positive effects.

The study divided into the following sections. The Section 2 proposes to consider the theoretical aspects of the formation of low-carbon development. Section 3 sets out the guidelines for the financial and economic approach to the transition to low-carbon development. Section 4 contains the results of this research. Section 5 is a concluding part.

2. THE ORETICAL BACKGROUND OF THE FORMATION OF LOW-CARBON DEVELOPMENT

In 1981, Brown has begun to apply the term sustainable development to development of agriculture, the industry and other spheres of human activity (Brown, 1982). The emergence of the concept of sustainable development, i.e., such development that considers an environment factor in particular in economy, is very important step in the history of a civilization (Losev, 2001).

The term sustainable development was very popular as connected problems of environmental protection, development of economy and ensuring wellbeing of people. Therefore, the term "sustainable development" applied in discussions, for the 1st time in 1972 at the First World Conference on the environment in Stockholm. In 1992, at the United Nations Conference on Environment and Development in Rio de Janeiro, the term was used "as the title of a new concept of the existence of all humanity". The concept of sustainable development has been formulate as a way to overcome the environmental threat that existed in the modern civilization, which existed as a somewhat theoretically reasoned danger, perceives by a relatively narrow circle of scientists and politicians and associated with overpopulation, with non-refundable consumption of natural resources and pollution of the environment (Begun, 2012).

Danilov-Danilyan and Losev (2000) notes that more precisely this the term should be understood as a continuously supported development. Thus, low-carbon development is a development that meets the needs of the present, but does not compromise the ability of future generations to meet their own needs.

A common feature of low-carbon development in different countries use less carbon to promote economic growth in the future (Mulugetta and Urban, 2010).

Some scientists divide low-carbon development into three components (Danilov-Danilyan and Losev, 2000; Bobylev et al., 2004):

1. Sustainable social development. The use of resources should be aim at ensuring the equality of people and social justice. The tasks should be the priority of qualitative improvement in comparison with the quantitative growth. Achievement of sustainable social development is possible only in conditions of social partnership. The most important forms of social capital should be consider social welfare, cultural development, discipline, honesty, etc., this social capital must be renewed and serve as a cultural heritage.
2. Economically sustainable development - maintenance of manufactured capital (material), human capital and natural capital. At the same time, it is necessary to move away from externalization of environmental protection costs (as imposed from outside by the environment) and their internalization, i.e., formation as inherent in the economic system (Bobylev et al., 2004).
3. Environmentally sustainable development - development, in which the preservation of sources of raw materials and the environment as a place of pollution runoff ensure the well-being of people. The emission level should not exceed the assimilation capacity of nature, and the rate of use of non-renewable resources should correspond to their reimbursement by replacement of renewable components (Bashmakov, 2009; Yessekina, 2017).

Recently, the mechanism of economy of rational environmental management includes the following system of elements (Gusev, 2015):

- Creation of the ecological and economic mechanism of innovation activity;
- Formation of a set of economic impacts on the ecologization of production;
- Stimulating the creation of a market for environmental services and products;
- Consideration of the factors of acceptable environmental risk;
- Adequate administrative support.

Essence of sustainable development is that present generations have to construct so the economic activity that future generations had not smaller economic opportunities and welfare (Steiner et al., 2001). For sustainable development have an important role eco-innovation, which means new products, new technologies and new ways of organizing production (Dnishev et al., 2015, Kireyeva et al., 2018).

We consider that the concept of “low-carbon economy” does not substitute the concept of green economy. Nevertheless, it is admitted that the development of the “low-carbon economy” completely depends on the policy based on the principles of sustainable development and green economy. Nevertheless, achieving sustainability is the most important goal of the “low-carbon economy.”

Certain scientists understand as green economy - it is the economy with low emissions of carbon connections, which is effectively using resources and being equitable to the interests of all society (Belik et al., 2016).

The green economy is often consider in the context of combating global climate change and the promising direction of getting out of the financial and economic crisis. The priority feature of its growth is a radical increase in energy efficiency. In this connection, the term “low-carbon” economy is widely used.

Now more and more signs of emergence of new economic model in the world and the certain countries at which it is not necessary to pay for growth of welfare in increase in environmental risks, growth of deficiency of natural resources and environmental pollution observed (Bobylev et al., 2004).

Low-carbon economy is consider as the basis of the green economy and the model of the future economy. Implementation of the concept of low-carbon development assumes the solution of a number of the interconnected tasks: Increasing energy efficiency, using renewable energy, protecting and improving the quality of sinks of greenhouse gases, limiting or reducing emissions, developing technologies for absorbing greenhouse gases, refusing subsidies and other methods of encouraging environmentally damaging activities (Sachs, 2014). The realization of the concept of low-carbon development takes place in the context of the gradual transformation of the world's energy - the transition from fossil fuels as the main source of primary energy resources to other sources of energy (Rifkin, 1991). According to the high-probable scenario of development of a human civilization, the structure of production and consumption of energy with unconditional prevalence of hydrocarbons will change towards increase in a share of renewables in structure of energy consumption (Alinov, 2016).

The formulation of “low-carbon development” in recent years has increasingly attracted the attention of various countries and researchers who provide various interpretations on the concept of low-carbon development.

Now there is no single interpretation for a low-carbon economy. In the report “Low-carbon Way of China's Development by 2050”, the Energy Research Institute of China National Development and Reform Commission Indicate that the essence of low-carbon development in the social economic system, which can be implemented in the form of low-carbon emissions (Energy Institute Team, 2009). Ebinger (2009) states that the potentials of emission reduction in energy efficiency, consumer management, electricity generation from renewable energy sources, low-carbon transport are the main areas of focus of the World Bank.

Under the category of “low-carbon economy,” a new socio-economic and technological system (model) of economic development that stimulates the reduction of greenhouse gas emissions (in comparison with the traditional economy), without affecting the pace of social and economic development of the region or a single country. In this interpretation of the definition of a low-carbon economy today, characterizing the current trends of the global development of macroeconomics, one can only talk

about the process of transition to low-carbon development or the initial stage of the formation of a low-carbon model of the economy. Traditional economic development models, oriented, mostly on the consumption of natural resources and do not have built-in mechanisms for reducing emissions.

Since the beginning of the 21 century, Kazakhstan seen new and efficient ways aimed at identifying, analyzing and resolving issues in order to enhance the competitiveness of regions including one of its promising and globally competitive industries - low-carbon development. Recent advances in economy have had vivid effects on individuals and workplace performance. The low-carbon economy as general - purpose technologies have spread rapidly across all sectors of the economy transforming business organization and increasing competition (Moshiri and Simpson, 2011).

The theory of low-carbon development has a rich global experience of use of methods of research, taking into account generalization and systemic analysis of the existing theories and models, similarities and differences of their structure and development of the low-carbon formation of low-carbon development in Kazakhstan, the development of approaches and the identification of positive effects.

3. RESEARCH METHODS

The proposed research aimed to study the process of formation and development of low- carbon economy considered with the use of scientific methods of research, taking into account generalization and systematic analysis of the existing theories and models, similarities and differences of their structure and development of the low-carbon approach. The application of scientific methods in the project enabled to explore and systematize the existing theoretical views. In scientific research in a complex available data by means of the theoretical analysis will allow investigating and systematizing application of general scientific methods. In particular, this study used the following methods:

1. Institutional approach is approach, which considers or investigates various aspects, legislative and legal support, which is laws, the official rights, institutes, etc. Institutional approach is often use for the analysis of political and economic processes (North, 1991). In our scientific article, we investigate institutional approach as the tool of a research of functioning of economic system in which the special attention will be distinguish to a role of social, political and economic institutes.
2. The ecological - economic approach, which assumes assessment of economic validity, the analysis of efficiency of the directions and methods of decarbonization, ecological and financial processes (Becker, 1974). In our scientific research, we use the ecological - economic approach for creation of the matrix interfacing bases of the direction of decarbonization.

The initial theoretical basis of this research was the scientific and practical developments of foreign and domestic scientists in the field of sustainable development, increasing the energy

efficiency of issues of using energy-saving resources and low-carbon development. A comprehensive study of which allowed us to develop the context of theoretical and methodological support for this study.

One of the basic sectors of the national economy of Kazakhstan is the oil and gas complex, which provides energy to other sectors. A successful policy of energy saving and increasing energy efficiency in the oil and gas will ensure the energy and environmental safety of the country. In addition, the provision of improved energy efficiency stimulates the introduction of new innovative technologies and solutions, which in turn stimulates the active interaction of the development of science and technology transfer.

3.1. Institutional Approach to Transition to Low-carbon Development

It is necessary to develop, move from a raw material economy to a service-technological one, to use natural resources reasonably. Low carbon economy will become a real factor in humanizing economic growth. Neo-institutional direction in the economic theory by Coase - the lack of clearly established property rights to resources and environmental benefits. If this defect is eliminate, and if a number of them are observed (they are formulated as Coase's famous theorem), it is possible to provide the optimal quality of the environment on a market basis, and the state should only establish these market rights. Management of a low-carbon system is an integral set of methods and tools for socio-economic and environmental management. However, specific methods for managing a low-carbon system are determine by the specific features of the sphere of nature management and environmental protection.

- Infrastructure character of products and services of the environmental sphere;
- The duration of the main reproductive processes in nature management and the interlacing of economic and natural processes;
- Specificity of property relations to natural resources;
- The specificity of market relations in the environmental sphere and the significant role of the state in environmental management.

In general, an effective approach to managing low-carbon systems should take into account these features and rely on both administrative, economic, social, political, psychological, ethical tools. The approach to managing a low-carbon system requires personnel, scientific, technical and information support subsystems.

Significant measures that create conditions for energy conservation and improve the energy efficiency for Kazakhstan present in Figure 1.

The increasing influence of global processes on the reduction of natural resources and an urgent need to increase competitiveness of the national economy led to the adoption of the State Program for Industrial and Innovative Development (further - SPIID) of the Republic of Kazakhstan approved by the decree of the President of the Republic of Kazakhstan No. 874 dated 1 August 2014 (Table 1) (SPIID, 2014).

SPIID is a continuation of State Program on Forced Industrial and Innovative Development (SPFIID) of the Republic of Kazakhstan for 2010-2014, which laid the foundation for innovative development of the country's industrial sector (SPFIID, 2010). The main goal of this program is to increase the level of competitiveness of manufacturing industry and appropriate diversification of the national economy. The program includes information on the development of individual manufacturing sectors, analysis of the current situation, objectives, target indicators, priority projects, etc., Sectors represented by basic industries, market-oriented and innovative, such as ferrous, non-ferrous metallurgy, oil refining, oil and gas chemistry, food production, agro chemistry, production of chemicals for industry, electrical equipment, etc.).

In addition to the above normative and programmatic documents, there is a Forecast Scheme of the territorial-spatial development of the Republic of Kazakhstan up to 2020, which also reflects the state's vision of low-carbon development.

The forecast scheme provides for an ecological component of the territorial and spatial development of Kazakhstan's macro regions. In the context of regions, the potential for introducing low-carbon technologies is seen as a competitive advantage and a criterion for the allocation of zones of balanced development for macro regions.

A number of activities are planned for this:

- Technical re-equipment of industrial enterprises, replacement of treatment plants, installation of new blast furnaces and so on;
- Introduction of environmentally friendly technologies at the enterprises, air pollution control systems, strengthening

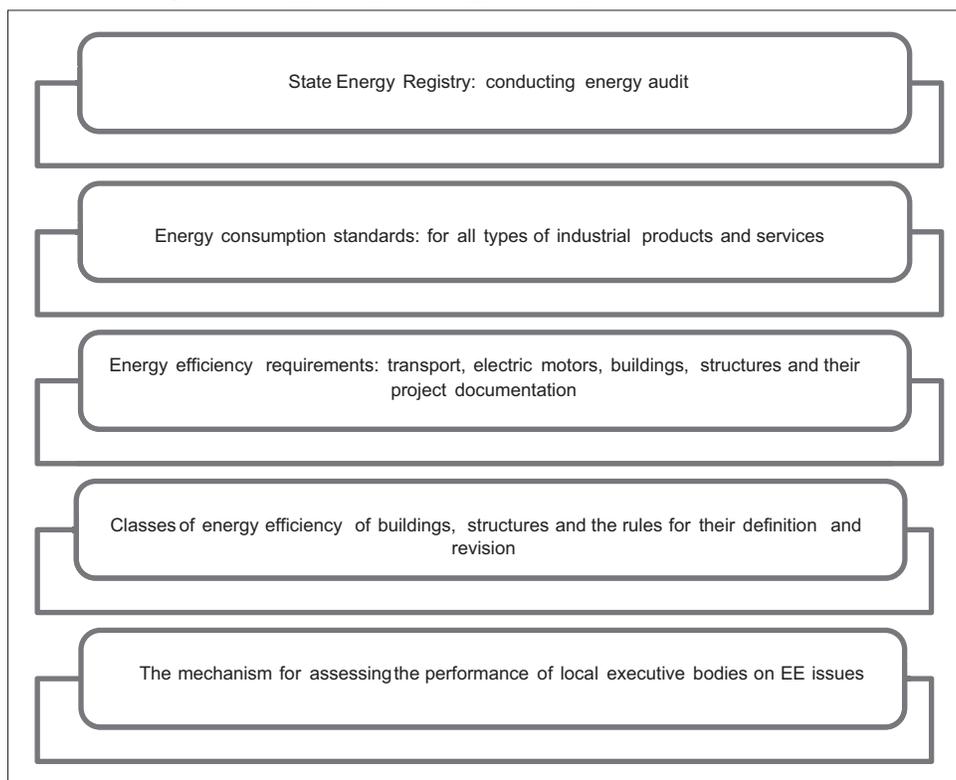
control over observance of emission standards for pollutants in the environment;

- Expansion and organization of networks around the clock, automatic monitoring of air quality;
- Increase of forest cover and landscaping of settlements of macro regions, especially desert territories;
- -Creation of "green" infrastructure in regions with high potential for ecotourism development. Characteristic for the Kostanay region (Naurzum district), Akmola region (Shchuchinsk-Borovskaya recreational zone), Central-Eastern macro-region (Pavlodar, Karaganda and East Kazakhstan regions).

The transition to sustainable development of Kazakhstan is possible only with the sustainable development of its regions. Meanwhile, the higher degree of heterogeneity and imbalance of the regions is noted in almost many respects and parameters of economic growth in Kazakhstan. The foremost, the study of the problems of reduction of regional differences, gaps and deviations in economic development becomes particularly relevant (Nurlanova et al., 2018).

Based on the above, it should be noted that at present a sufficiently developed regulatory and legal framework created in the country, creating the necessary conditions for the transition to low-carbon development (Table 2). However, the achievement of the planned goals and indicators carried out with a great lag behind the tasks in the program country documents. The most effective results, in our opinion, strengthening of monitoring and reporting on the implementation of each normative, strategic and programmatic document is required. Proper monitoring and control, as well as the

Figure 1: Energy saving and energy efficiency measures in Kazakhstan



Source: Compiled by the authors

subsequent elimination of identified barriers to the implementation of activities would lead to indicators that are more effective.

3.2. The Financial and Economic Approach to the Transition to Low-carbon Development

In the process of substantiating the fundamentals of the system of mechanisms for implementing the strategy of transition of Kazakhstan to low-carbon development, it is expedient to dwell on the main features of this type of economy. Given that the terminology in this area is new and not fully established, it is appropriate to note the existence of some discrepancies in the definition of a low-carbon economy.

Based on the realities of the current stage of development of energy and other technologies that determine the consumption of certain types of energy, it is more correct to call the process of improving energy consumption and corresponding economic relations not decarbonization, but a decrease in the carbon intensity of the economy. At the same time, the main criterion of this process, which at the international level was the reduction of greenhouse gas emissions, specifies both the policy of supporting appropriate measures, and the content and set of mechanisms for implementing this policy.

It should be noted that this process is already underway in Kazakhstan - according to the National Energy Report, "in the period since 2000, the production of electric power by gas turbine power plants grew on average by 11% per year in comparison with the growth in production of other thermal power plants, which was 5%. As a result, the share of gas in electricity generation reached 20% in 2014 (coal share - 69%, fuel oil - <2%, hydropower - 9%, RES - about 0.1%), and gas turbine stations increased the generation of electricity from 1999 to 2014, 11 times - from 0.8 to 8.2 billion kW/h.

It should be noted that the current program documents of Kazakhstan envisage not only the development of renewable energy, but also the further replacement of coal with gas. Thus, concept for transition of the Republic of Kazakhstan to "green economy" provides for transfer of combined heat and power in the gasified regions from coal to gas "to improve the quality of atmospheric air". All three scenarios for the development of the

energy sector suggest a significant increase in the share of gas generation in the energy balance (Concept, 2013).

Kazakhstan is the first country in Central Asia and Asia which had introduced an GHG emission trading system.

Similar to other systems in their beginning it is still in its developing and piloting phase and trading experiences are still not significant (Opitz, 2015).

The ambiguity in the choice of directions of transition to economy with low-carbon emissions (low-carbon economy) requires careful justification of the choice of priorities for this transition, comparisons of costs and outcomes, the implementation of certain technologies, the allocation of funds to support them - public funding and indirect incentives, which also have monetary value for the public finance. In this regard, in our view, the hierarchy of mechanisms for implementing a low-carbon development strategy should provide, as a basic, primary element, a clear economic justification for identifying the priorities, directions and methods that will ensure the implementation of this strategy.

The mechanism for assessing the economic feasibility and comparative analysis of the effectiveness of competing trends and methods of decarbonization, along with the consistency of their selection, should be an obligatory attribute of the entire system of mechanisms for transition to low-carbon development. In our opinion, this mechanism should take the place of the initial component, the basic block of the entire system of decarbonization mechanisms, and can be schematically represent in the form of the following matrix that matches of priority directions of decarbonization and methods of its stimulation and state support (Table 3) (Yessekina, 2017).

The emissions trading system (ETS) has been widely used in the world as a way of counteracting greenhouse gas emissions and can be divided into several types: Based on quotas, based on norms and the system of trading in credits for emissions.

The most efficient and universal model of the system, which allows achieving emission reductions with minimal public and administrative costs and in a short time to form a liquid market for greenhouse gases, is a trading system based on emission quotas.

Table 1: Institutional bases in the field of low-carbon development of Kazakhstan

Title of documents	Years
Laws	
Ecological code of the republic of Kazakhstan	2007
The law of the republic of Kazakhstan "on supporting the use of renewable energy sources"	2009
Law of the republic of Kazakhstan "on energy saving and energy efficiency improvement"	2012
Strategic documents	
Strategy "Kazakhstan-2030" prosperity, safety and improvement of well-being of all Kazakhstan citizens	1997
The strategic development plan for the Republic of Kazakhstan till 2020	2010
Strategy "Kazakhstan-2050:" The new political course of the state	2012
Concepts and programs	
The concept of the transition of the Republic of Kazakhstan to "green economy"	2013
The program "energy saving-2020"	2013
The concept of development of the fuel and energy complex of the republic of Kazakhstan until 2030	2014
The state program of industrial and innovative development of the republic of Kazakhstan for 2015–2019	2014
The expected scheme of territorial and spatial development of the republic of Kazakhstan till 2020	2011

Source: Compiled by the authors

Unlike most environmental policies, (further - ETS) involves two entities: The state (all administrative bodies and organizations) and pollution sources (enterprises). Another positive side of this policy is the existence of market mechanisms that are responsible for the existence of economic incentives.

The key subject of any environmental program is naturally a state or regulatory body that exercises supervisory and coordinating functions for all participants of the program, and imposes fines and penalties for non-fulfillment of the program conditions. Regarding the formation of ETS, the state creates an aggregated emission ceiling, which is the maximum permitted amount of emissions from sources of pollution (enterprises) participating in the system, for a certain period. Then the state issues a permit (quota) for each emission unit (usually 1 ton). The sum of all emission quotas determines the emission ceiling.

The process of allocating quotas for emissions between enterprises follows this. The distribution procedure can be of three types: Free allocation of quotas, through auction redemption or a mixed system (partially free, partly through an auction). Next, market mechanisms take effect, and the responsible body from the state fulfills the functions of an observer and a controller.

The end of each reporting period is a reference point for verifying that the actual emissions of each company are in line with the emission allowances received or purchased by it. If there are not enough quotas, then the state should impose penalties for violation of obligations.

For the successful operation of ETS, it is necessary to collect information on emissions that occurred prior to the implementation of the program in order to establish the optimum emission ceiling and distribute quotas in the most rational way. Moreover, the evaluation of the results of the program requires complex technologies and considerable efforts to process a huge amount of information. State bodies can independently engage in this work or with the involvement of research institutes, non-governmental organizations and companies.

In many ways, the success of ETS depends on the enterprises involved in trade. No matter how the state tries to improve the ecological situation in the country, if the enterprises resist public policy, which can be expressed in information concealment, forgery of data and violation of the program conditions, even the most thoughtful policy will not bring success. Therefore, to participate in the process of reducing emissions, it is necessary not only to establish restrictions that will be additional costs for producers, but also it is necessary to create economic incentives that would compensate for the inevitable costs.

4. CONCLUSION

This work marks a starting point for further research in the field of sustainable development and low-carbon economy. It provides some suggestions for improvement of future studies dealing with

Table 2: Characteristics of the institutional base of low-carbon development in the republic of Kazakhstan

Normative, legal and policy documents	Responsible coordinator and/or performer	Institutional structures that facilitate the implementation process
Ecological code of the republic of Kazakhstan (in the part relating to PTS) The law of the republic of Kazakhstan "on supporting the use of renewable energy sources"	Ministry of energy of RK	JSC zhasyl damu Commodity exchange" caspian" LLP "settlement and finance center for support of renewable energy sources"
Law of the republic of kazakhstan "on energy saving and energy efficiency improvement" Program "energy saving-2020" SPIID of the republic of Kazakhstan for 2015–2019 (2014)	Ministry of investment and development of the republic of Kazakhstan	JSC "Kazakhenergi ekspertiza" ALE "Kazakhstan association of energy auditors" Council of national cluster of the republic of Kazakhstan AOE "national agency for technological development" "Nazarbayev university" Special economic zone "Park of innovative technologies" National chamber of entrepreneurs
Forecast scheme of the territorial-spatial development of the country until 2020	Committee for affairs and construction of housing and communal services of the ministry of national economy	

Source: Compiled by the authors

Table 3: Evaluation of economic feasibility and competitive analysis of the effectiveness of directions and methods of decarbonization

General support mechanisms	Development of RES	Improving energy efficiency	Introduction of new technologies in traditional energy	Increased greenhouse gas absorption potential
Tax Credit	Privileges Trading in quotas	Carbon tax Financing energy saving projects	Privileges Subsidizing	The greenhouse gas emissions tax Joint implementation projects and clean development mechanisms
Budget expenditures	State subsidies	Gradual reduction of all subsidies for domestic energy consumption	Release of labor resources	Increase in greenhouse gas emissions quotas

Source: Compiled by the authors

this subject. This study attempts to systematize the knowledge and synthesize theoretical concepts, institutional aspects, environmental and economic pillars of decarbonization. One of the most important outcomes of the present study is to improve environmental legislation, taking account of the reference to sustainable development and to review environmental regulations and standards, methods and tools of forecasting, planning and programming of environmental activities. Measures that create conditions for increase of energy efficiency of Kazakhstan's economy. We believe that these measures can be use also in the CIS countries, such as Belarus, Kyrgyzstan, Ukraine, etc.

Based on these research findings of this paper, the practical implications listed below:

Firstly, the economy of Kazakhstan is at the stage of structural transformation and implementation for the second program of industrial and innovative development, designed to change the raw material orientation and to eliminate economic imbalances in development of industries that create new benefit. This means that the key to problem solving under the category of "low-carbon economy" is a new socio-economic and technological system (model) of economic development that stimulates the reduction of greenhouse gas emissions (in comparison with the traditional economy). We proposed the definition of a low-carbon economy as the process of transition to low-carbon development or the initial stage of the formation of a low-carbon model of the economy. Traditional economic development models, oriented, mostly on the consumption of natural resources and do not have built-in mechanisms for reducing emissions.

Secondly, Kazakhstan on the level of carbon intensity of gross domestic product exceeds 3–5 times the organisation for economic co-operation and development countries, which together reduces the competitiveness of domestic products on world markets and creates serious risks to the preservation of the environment. Thus, it should be note that developed regulatory and legal framework has been create in the country, creating the necessary conditions for the transition of Kazakhstan to low-carbon development. However, the achievement of the planned goals and indicators carried out with a great lag behind the tasks in the program country documents. The most effective results, in our opinion, strengthening of monitoring and reporting on the implementation of each normative, strategic and programmatic document is required.

Thirdly, a complex system of mechanisms that ensure the transition of Kazakhstan to low-carbon development is at the initial formation stage and may be supplement by a wide range of tools. Finally, it should be note that such mechanisms might not be limited to the level of state regulation, and to extend to a higher level of international cooperation, and the level of economic entities, which can also contribute to the implementation of technologies that promote decarbonization through new business models. For the successful operation of ETS, it is necessary to collect information on emissions that occurred prior to the implementation of the program in order to establish the optimum emission ceiling and distribute quotas in the most rational way. State bodies can independently engage in this work or with the

involvement of research institutes. In addition, to participate in the process of reducing emissions, it is necessary not only to establish restrictions that will be additional costs for producers, but also it is necessary to create economic incentives that would compensate for the inevitable costs.

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