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Towards the Issue of Kazakhstan Economy Decarbonization

Abstract

Object: To identify the features of building the decarbonized economy of Kazakhstan in the context of approaching countries with sustainable development.

Methods: A systematic approach, a retrospective and comparative assessment.

Results: The main approaches to the economy of Kazakhstan decarbonization in accordance with the international practice and the adopted long-term strategy for low-carbon development of the country were analyzed. The socio-economic and institutional conditions of low-carbon development impact on selecting the key instruments for transforming the economy was shown.

Conclusions: The analysis results demonstrate that implementing the institutional measures aimed at stimulating decarbonization in the medium and long term will accelerate the overcoming of barriers for industrial enterprises for transition to renewable energy and energy efficiency. Institutional transformations will deepen coordinated cooperation in the new energy era of the state, business and enterprise as equal partners.

Keywords: decarbonization of the economy, state regulation, Kazakhstan, investments, industry.

Introduction

Being a major energy country, Kazakhstan ratified the Paris Agreement and was the first in Central Asia to mark the transition to "green growth" at the national level by developing an organizational and legal basis for systemic transformations (Decree, 2019; Adilet, 2021; Law, 2004). In 2021, in the sustainable development ranking with participation of 165 countries, Kazakhstan rose from the 65th to the 59th place (Ritm Evrazii, 2021). In the context of the new model of globalization, the strengthening of Kazakhstan position is largely conditioned by the ongoing public administration reforms aimed at transiting from an economic model based mainly on carbon-intensive export goods and energy-intensive production processes to an inclusive, "human-centered" model (Decree, 2019). Achieving sustainable development of Kazakhstan, increasing transparency and predictability of the sphere of subsoil use is facilitated by the country's transition to CRIRSCO international standards, the annual report of city-forming enterprises on sustainable development in the format of the international set of standards GRI (Global Reporting Initiative).

However, despite the success achieved, the World Bank experts classify Kazakhstan as one of the countries least prepared for the scenario of accelerated decarbonization of the world economy (Vidyanova, 2021). In the ranking of countries in transition to new energy sources ETI 2021, Kazakhstan ranked the 83rd among 115 participants in 2021 (E^{2}nergy, 2021). In the climate ranking CCPI 2022, the country is ranked the last 64th in terms of the efficiency index in the field of climate change (Kapital.kz, 2021). In the ranking of countries in terms of the air quality, Kazakhstan ranked the 32nd in the world out of 106 countries with the worst air quality showing the average level of air pollution over the past two years of 21.9 μg/m³ and 23.6 μg/m³, respectively (IQAir, 2021).

Hypothesis

Kazakhstan's transition to a low-carbon and sustainable economy against the backdrop of deepening global competition and the growing importance of geopolitical risks can be accelerated through the coordina-

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tion of mutually beneficial relations between the state, business entities, business, and scientific and educational structures.

Literature Review

In view of this, Kazakhstan will intensify steps to fulfill its obligations in the climate policy agreements, mobilizing its own potential and using the experience of developing countries to minimize risks at the national level in moving towards sustainable development (Beauchamp et al., 2021;. UNFCCC, 2021; Chapagain et al., 2020; Jia et al., 2021; Garschagen et al., 2021).

By studying scenarios and ways of adapting different countries to climate change, taking into account characteristics of their economies (Leiter, 2021; O'Neill et al., 2017; Woodruff & Regan, 2019; Lesnikowski et al., 2016), Kazakhstan is trying to develop its own policy in the field of renewable energy sources (Byrnes et al., 2013), to select environmental policies in the manufacturing industry (Vedel & Kokshagina, 2021; Singh et al., 2021) and the energy sector (Krzykowski et al., 2021; Goldthau, 2014), while striving to achieve social-environmental trade-offs (Galafassi et al., 2017).

Being a country dependent on the export of fossil fuels, Kazakhstan is looking for new trends in climate control based on the country specifics, the desire to strengthen geostrategic positions in the international markets (Gupta & Mason, 2016; Weitz et al., 2018), considering global environmental assessments (Kowarsch & Jabbour, 2017) , the growing importance of foreign investment (Hussain, Bashir & Shahzad, (2021), government-business interactions in implementing renewable energy projects (Cedrick & Long, 2017). When selecting the trends for decarbonizing the economy, Kazakhstan takes into account the inevitable increase in the alternative costs into the fuel and energy sector and related industries, which will negatively affect its global competitive positions.

The above-said confirms the need to study possible ways of achieving structural decarbonization of the economy of Kazakhstan, the relevance of this problem, its comprehensive study.

Methods

During the study, the methodology of assessing the transition to a new world economic order based on the UN, OECD, WEF, and international financial institutions research was used. The regulatory legal acts relating to the energy transition of Kazakhstan, statistical data of the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan were considered. The publications in scientific journals and industry sources that reveal various aspects of the economy decarbonization of the developed and developing countries were analyzed. The authors assume that despite the specifics of each country and the diversity of world practices, there are common methodological techniques that Kazakhstan can borrow to develop its own decarbonization policy**.**

Results

To decarbonize the economy in the country, the Doctrine of achieving carbon neutrality until 2060 and the Roadmap for 2022–2025 have been developed, the nationally determined contribution to reduce emissions has been updated, and the State Fund for Environmental Information has been organized.

Kazakhstan is one of the major emitters of greenhouse gases in Europe and Central Asia. By 2030, the country plans to reduce greenhouse gas emissions by 15 % from the 1990 level. To do this, a system of trading carbon credits for greenhouse gas emissions between enterprises within the country has been developed. It covers the key industries, 50 % of greenhouse gas emissions and enterprises whose annual emissions exceed 20 thousand tons of CO_2 equivalent (Adilet, 2021; Adilet, 2017).

In the energy balance of the country, 49.3 % of electricity production comes from coal, 24.8 % from oil, 24.5 % from gas, the share of renewable energy sources, whose producers are exempted from paying for the services of energy transmission enterprises for the transmission of electricity, is only 1.4 % (hydropower 1.2 %, biofuels 0.1 %, wind, solar, etc. energy 0.1 %) (KAZENERGY, 2021).

However, despite the fact that 124 renewable energy sources with the rated capacity of 1922 MW (31 wind plants, 48 solar power plants, 40 hydroelectric power plants and 5 bioelectric power plants) operate in the country aimed at reducing greenhouse gas emissions, there is an increase in the production of "green" energy, there is no formal reducing of greenhouse gas emissions from these plants (Tables 1 and 2). So far, no renewable energy plant has received a certificate for reducing greenhouse gas emissions. The steps taken by the state authorities to adapt the institutional framework of Kazakhstan to the EU standards, which involve optimization of greenhouse gas emissions control systems, have not yet led to significant results.

Table 1. Economic indicators of Kazakhstan

Indicator	2013	2014	2015	2016	2017	2018	2019	2020
The volume of electricity generated by renewable energy facilities, billion kWh	0.5	0.6	0.7	0.9	1.1	1.4	2.4	3.2
Share of RES in total electricity generation, %	0.6	0.6	0.8	1.0	1.1	1.3	2.3	3.0
Share of TPP (thermal power plants) in the total volume of electricity generated, %	84.4	83.9	81.6	79.4	80.5	81.3	81.1	80.3
Investments aimed at protecting the environment								
- total, billion tenge	77.5	78.7	62.5	32.2	32.5	80.2	117.4	157.1
- share in total investment, %	1.3	1.6	1.2	0.6	1.0	1.0	1.6	1.7
Compiled by the authors based on the Statistics Committee of the Republic of Kazakhstan. Tourism of the Republic of Kazakhstan.2016-2020(www.stat.gov.kz)								

Table 2. Electric power production in Kazakhstan y the energy sources, %

Indicator	2016	2017	2018	2019	2020
Non-renewable energy sources	88,0	89,0	90,0	90,0	89,0
Hydropower	12,0	11,0	10,0	9,0	9,0
Solar energy	-	-	-	-	1,0
Wind energy	-	-	-	1,0	1,0
Compiled by the authors based on the Bureau of national Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan					

Owing to transformational steps that improve the investment environment for mobilizing foreign investments and advanced technologies for the development of alternative energy, in 2014-2020 for the construction of renewable energy sources, the capacities of which have increased by more than 10 times, investments worth 1.5 billion dollars have been attracted. In accordance with the obligations under COP26 (the 26th session of the Conference of the Parties to the UN Framework Convention on Climate Change), 25 renewable energy sources with the capacity of 600 MW and investments of about $510 million were put into operation. 23 projects for 381 MW were planned for 2021: 13 WPPs (wind power plants), 5 HPPs (hydroelectric power plants) and 5 SPP (solar power plants). By 2025, more than 60 new renewable energy projects with a total capacity of 2,400 MW and investment investments exceeding $2.5 billion should be brought to their design capacity (EnergyProm.kz, (n.d.)).

Since 2016, the inclusion of renewable energy projects, in which the share of Kazakhstani content is still extremely low in the list of investment projects has opened the way to preferences (exemption from customs duties and VAT on imports, state in-kind grants) under the investment contracts. In 2020, the assignment of these projects to priority investment projects added tax preferences (exemption from property, land, corporate and income taxes, an increase in the term of the contract for the guaranteed purchase of electricity by the RES Operator up to 20 years).

In 2018, due to the introduction of the auction mechanism for the selection of RES projects, the transparency of the selection process increased, the tariffs for green energy decreased: the maximum reduction in tariffs for individual projects was 64 % for SPPs, 30 % for WPPs, and 19 % for HPPs. In 2018–2020, for renewable energy projects, auctions were held in electronic format with the total capacity of 1.5 GW with participation of 172 international companies. To encourage investors to reduce auction prices for new projects, since 2021 the period for concluding contracts with them at auction rates has been extended from 15 to 20 years. In the future, to reduce auction prices, it is necessary to improve the conditions for financing projects in the national currency (soft loans and reduced interest rates).

The development of renewable energy implies achieving the progress while eliminating the accumulated problems of the Unified Energy System: almost 50 % depreciation of generating equipment, isolation of the Western Energy Zone and the shortage of electricity in the Southern Zone. In addition, since 2014, six percent of regulatory losses of electricity have been maintained, the turnover of personnel in the electric power industry is growing from 4 % in 2015 to 15 % in 2020. One of the technical limitations for the development of the energy sector in general and RES in particular, is limited available balancing capacity, so the most important task of the industry is to develop a reserve capacity that stabilizes the system. The shortage of maneuverable capacities, which will require natural gas to build up (10.5 billion cubic meters till 2025, 13.2 billion cubic meters till 2030), exists despite the surplus of electric energy (2000 MW) (Law, 2004).

The brake for the promotion of the renewable energy industry is unpreparedness of the energy system infrastructure for its integration with thermal energy, the absence of free land plots for promising hydro generation facilities. There cannot be ignored investment risks (including currency risks) and the fact that the development of RES will lead to a significant increase in the cost of energy for the end user.

The heat and electric power industry receives state support: in 2020 it made 33.2 billion tenge, in 2021-2022 it made 20.7 billion tenge. However, with the existing tariffs, it is impossible to reduce the average level of depreciation of power networks, to keep the tariff for the end consumer, and to accelerate the transition of large power plants to environmentally friendly technologies by attracting investments in new assets and technologies. Low tariffs in the energy sector are currently the main barrier to carbon neutrality.

Thanks to the acting in 2009-2015 mechanism of "tariff in exchange for investment", there were attracted about 6.8 billion dollars for the technical equipment of power plants. Due to the fact that the introduction of the capacity market in 2018 to provide long-term guarantees for investors and evenly distribute the costs of developing new production capacities among all the electricity consumers was accompanied by price restrictions and non-transparent mechanisms of selecting projects for modernization of power plants, prices did not decrease. Moreover, the volume of investments in the development of electrical capacities sharply decreased (Table 3).

Table 3. Changing the investments in electric power plants as a result of introducing the power market, billion tenge

Indicator	Mechanism of limiting tariffs for electric power										Mechanism of the power market		
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Investments	65.4	109.7	135.0	185.0	197.1	158.8	137.0	88.9	67.8	60.1	9.3	22.5	20.5
Compiled by the authors based on the Bureau of national Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan													

In the medium term, the growth of electricity tariffs by 1-2 tenge per kWh with the maximum increase of 2.9 tenge per kWh will not cover increasing the cost of purchasing electricity from renewable energy sources. The new limiting power market tariff does not cover even half of the fixed costs of power plants. Considering that modernization of power plants at the expense of the power market does not include the costs of introducing the best available technologies (BAT), one of the tools for ensuring environmental safety, the issue of stimulating investments in the re-equipment of industry and transition to new environmental ones remains open (Skobeleva, 2019).

Since electricity and power markets are price capped, they cannot encourage long-term investments in the industry. Moreover, the introduction of RES with the existing support system increases the financial load of power plants and in 2025 will exceed 20 % of their income (Adilet, 2018).

The foregoing leads to the following conclusion. In order not to exceed the limits of renewable energy capacities for the operation of the Unified Energy System of Kazakhstan, when placing renewable energy facilities in the regions, the resource potential, the need for electricity, the readiness of infrastructure should be taken into account. Full-scale digital generation of facilities is needed to monitor their condition in real time. This will increase the ability of the energy system to integrate additional volumes of renewable energy through the launch of gas-fired power plants, and will accelerate the commissioning of new flexible generating capacities, which will make it possible to regulate the imbalance of the energy system during peak hours.

Achieving the goals of decarbonization of the economy of Kazakhstan largely depends on the diversification of the electric power industry fuel balance with decreasing the share of coal generation, which accounts for the bulk of greenhouse gas emissions. Almost 90 % of electricity in Kazakhstan is generated from thermal resources, especially natural gas and coal, which has the largest carbon footprint and is the main source of energy. Natural gas will play the key role due to its lower emissions as a fuel, as well as the potential for base load coverage and flexible generation. The development of gas and hydropower should reduce the dependence of the energy balance on coal combustion.

Reducing the share of coal-fired generation in the energy balance from 69 to 40.1 % and increasing the share of gas to 25 % by 2030 will be facilitated by the transfer of mining and smelting enterprises and thermal power plants to gas. To this end, it is planned to introduce a model contract for subsoil use in the field of oil and gas production that contains fiscal and regulatory preferences that stimulate investments in oil and gas production.

The transformation of the mining and metallurgical industry is hampered by depreciation of the equipment used, the high cost of the equipment being introduced, and the length of its depreciation periods. Risk situations will be developed by introducing a carbon tax in the EU, which in 2020 accounted for 39.1 % of all exports, with 73 % of all external supplies made up of mineral products and 15 % of metals and their products. Since the imposed tax will apply to these groups of goods, this will negatively affect the competitiveness of mining and metallurgical products.

Compliance with environmental requirements and reduction of carbon dioxide emissions will be facilitated by the transition of the country's mining enterprises since 2025 from the current environmental regulation "at the end of the pipe" to the integrated environmental permit in accordance with the principles of BAT, implementation of which will be carried out according to the "one" window principle. However, it should be taken into account that, while accelerating the innovative development of the industry, increasing the BAT costs will simultaneously increase the costs of energy-producing enterprises, and subsequently, due to the growth in electricity prices, will negatively affect other industries and public services.

Based on the results of the technological audit of enterprises (82 enterprises that carry out 80 % of emissions underwent a mandatory on-site examination in 2020-2021; the remaining 47 enterprises are inspected in-house). By 2023 it is planned to develop 30 industry-specific BAT reference books in offline and online formats; in 2024 enterprises will prepare documents for obtaining an integrated environmental permit. From 2025, objects of the first category (oil refining, oil production, heat and power generation, mining and metallurgical industry, ferrous and non-ferrous metallurgy) will be able to receive it and, in accordance with the environmental efficiency program, implement BAT in the next decade. Enterprises that have transited to the principles of BAT will be completely exempted from payment for emissions otherwise, a progressive rate of fines will be applied: 2, 4, 8 times.

The first in Kazakhstan to start implementing BAT for environmental protection in accordance with the BAT Reference Documents of the European Union (BREF), and applied in the OECD (Organization for Economic Cooperation and Development) countries since 2022, will be the Ust-Kamenogorsk metallurgical complex "Kazzinc" specializing in extraction of minerals and metallurgy.

Since 2020, Kazakhstan has been advancing in the field of green finance using various sustainable development instruments designed to finance projects in the field of environmental protection (green bonds). Thus, for the first time, “green” bonds of the Damu fund with the participation of UNDP were issued on the AIX stock exchange. In 2018, the KASE Stock Exchange and the International Financial Corporation IFC updated the sectoral specifications taking into account the ESCG (Environmental, Social, and Corporate Governance) management criteria. The exchange of the Astana International Financial Center (AIFC) that has developed the national taxonomy of green projects using EU methods and promotes green finance instruments in the Eurasian region together with the EDB (Eurasian Development Bank), has adopted the rules for circulation of green bonds using the principles of the ICMA green bonds.

To achieve carbon neutrality, Kazakhstan needs large investments in updated low-carbon technologies, taking into account the high physical wear of equipment, new structural measures will be required to improve the investment environment to attract investments including private ones. According to experts, Kazakhstan, like other EAEU countries, will not be able to cover the investment needs for decarbonization until 2030 without international assistance.

At the moment, investors from 10 countries of the world including large international financial institutions, are engaged in the green energy sector, memorandums for $613 million have been signed. In 2021, the accumulated volume of investments in the country's renewable energy exceeded $1.8 billion; the international financial institutions invested more than one billion dollars. In 2018–2020, foreign investors financed 21 green projects for $1.2 billion. For 2021, there were planned 22 projects with the capacity of 450 MW with the investment of $445 million; for 2022–2025 there are planned 60 projects with the capacity of 2400 MW and investments of 2.5 billion dollars. As a result, by 2030, there should be implemented 180 projects with the capacity of 9 GW. The driver for stimulating green projects, for example, through increasing cross-border investment activity within the framework of the EAEU mobilizing the existing domestic investment potential, a mechanism for subsidies or involving state development institutions, is the state.

To achieve these goals, a lot of effort remains to be made, as the requirements for financing green projects are constantly tightened. For example, the ADB (Asian Development Bank), the EBRD (European Bank for Reconstruction and Development), International Finance Corporation, to ensure the safety of investments in the long term, do not finance green projects with unfavorable ESG characteristics.

In 2021–2060, Kazakhstan plans to invest $650 billion in low-carbon technologies (Gov.kz, 2021). The busiest years will be 2020–2024, when annual investments will amount to approximately 1.8 % of the country's GDP (gross domestic product). The growth of investments in modernization of the energy sector and the development of renewable energy sources, in particular construction of solar and wind power plants with the capacity of 4 GW in Kazakhstan, is associated with long-term cooperation between the Samruk-Kazyna JSC and the Abu Dhabi Developmental Holding Company (ADQ) fund.

Summing up, it should be noted that the low-carbon, and subsequently climate-neutral development of Kazakhstan involves the adoption of specific systemic measures in the energy industry affecting the reduction of energy intensity, the renewal of generating equipment, and the solution of issues of the balancing market for electric energy and microgeneration. For Kazakhstan, this is important from the standpoint of achieving the country indicators for renewable energy, attracting international financial institutions and private investors to the oil and gas and energy sectors by providing state guarantees to ensure the solvency of renewable energy producers.

Institutional measures are called upon to accelerate formation of the foundations for achieving the carbon neutrality goals: introducing an internal carbon tax, developing a Carbon Fund to accumulate funds received from the carbon tax for implementing climate projects to decarbonize the economy, tightening the emissions trading system, special government support mechanisms (“green” loans and green bonds) of the offset projects to reduce emissions.

Conclusions

Planned for 2026-2030 deep decarbonization of the economy of Kazakhstan and joining the 30 developed countries-exporters of clean energy depend largely on the effectiveness of institutional changes in 2021-2022, which make it possible to determine at the national level the contribution to reducing emissions and adapting to climate change. This requires solving the problems of high external debt in relation to GDP, the export structure, the quasi-public sector, the return on government programs that directly affect the economy diversification.

Further approach to the set goal will be determined by the adoption in 2023-2025 of the technological decarbonization measures based on the restructuring of investment policy in combination with technological modernization, introducing BAT and real state support with the involvement of business.

Within this period, Kazakhstan will face external factors of a geopolitical nature: the flow of capital from emerging markets to developed countries, the introduction of the EAEU Single Electricity Market since 2025 and the carbon footprint tax in the EU since 2023. Internal threats will be largely due to increasing the prices for fuel resources, which will have an extremely negative impact on the institutional measures of decarbonization and the energy security of the country, requiring additional efforts to maintain socio-political stability.

In general, despite mobilization of the institutional and technical potential, it is not possible to link the socio-economic and environmental goals of sustainable and low-carbon development with long-term sectoral plans by including in state, sectoral and regional programs the assessment of the contribution to reducing emissions and adapting to the effects of climate change (Decree, 2018). The economic model of Kazakhstan is still poorly adapted to international environmental standards.

The planned medium-term capacity growth will reduce the energy efficiency of the manufacturing industry, holding back international commitments to reduce greenhouse gas emissions. It is possible that selecting between decarbonization and socio-economic priorities will initially involve coal, oil and gas, which will inevitably increase greenhouse gas emissions. Therefore, the problems of improving the system of regulating greenhouse gas emissions, increasing the transparency of the system of monitoring and reporting emissions, supporting the use of renewable energy sources, and increasing the energy efficiency are more relevant than ever.

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Қазақстан экономикасын декарбонизациялау мәселесіне

Аңдатпа

Мақсаты: Тұрақты дамуы бар елдерге жақындау контексінде Қазақстанның декарбонизацияланған экономикасын құру ерекшеліктерін анықтау.

Әдісі: Талдамалық зерттеу әдістемесі Қазақстанның энергетикалық ауысуын бағалауды болжайтын жүйелі тәсілге негізделген. Қазақстан өнеркәсібін энергия сыйымдылығы аз өндірістер жағына қарай әртараптандыруды ретроспективті және салыстырмалы бағалау, жалпыға белгілі тұжырымдамалар мен ұғымдар қолданылды.

Нәтижелері: Халықаралық практикаға және елдің төменкөміртекті дамуының қабылданған ұзақ мерзімді стратегиясына сәйкес Қазақстан экономикасын декарбонизациялаудың негізгі тәсілдері талданды. Төменкөміртекті дамудың әлеуметтік-экономикалық және институционалдық жағдайларының экономиканы түрлендірудің негізгі құралдарын таңдауға әсері көрсетілген.

Қорытындылар: Талдау нәтижелері орта және ұзақ мерзімді кезеңде декарбонизацияны ынталандыруға бағытталған институционалдық шараларды іске асыру, өнеркәсіптік кәсіпорындардың жаңартылатын энергетикаға көшу және энергия тиімділігін арттыру кедергілерін еңсеруін жеделдететінін көрсетті. Институционалдық қайта құрулар тең құқықты әріптестер ретінде мемлекеттің, бизнес пен кәсіпорынның энергетикасының жаңа дәуіріндегі үйлестірілген ынтымақтастықты тереңдетеді

Кілт сөздер: экономиканы декарбонизациялау, мемлекеттік реттеу, Қазақстан, инвестициялар, өнеркәсіп.

Г.М. Аубакирова, Г.И. Рудько, Ф.М. Исатаева, С.К. Мажитова

К вопросу декарбонизации экономики Казахстана

Аннотация

Цель: Выявить особенности построения декарбонизированной экономики Казахстана в контексте приближения к странам с устойчивым развитием.

Методы: Методология аналитического исследования базируется на системном подходе, предполагающем оценку энергетического перехода Казахстана. Применены общеизвестные концепции и понятия, ретроспективная и сравнительная оценка диверсификации промышленности Казахстана в сторону менее энергоемких производств.

Результаты: Проанализированы основные подходы к декарбонизации экономики Казахстана в соответствии с международной практикой и принятой долгосрочной стратегией низкоуглеродного развития страны.

Показано влияние на выбор ключевых инструментов трансформации экономики социально-экономических и институциональных условий низкоуглеродного развития.

Выводы: Результаты анализа показали, что реализация институциональных мер, направленных на стимулирование декарбонизации в средне-и долгосрочном периодах, ускорит преодоление промышленными предприятиями препятствий перехода к возобновляемой энергетике и повышению энергоэффективности. Институциональные преобразования углубят координированное сотрудничество в новой эпохе энергетики государства, бизнеса и предприятия как равноправных партнеров.

Ключевые слова: декарбонизация экономики, государственное регулирование, Казахстан, инвестиции, промышленность.

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