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Integrated Policy Strategies and Regional Policy Coordination for Resilient, Green and Transformative Development: Supporting Selected Asian BRI Partner Countries to Achieve 2030 Sustainable Development Agenda

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Integrated Policy Strategies for Green Industrialisation in Kazakhstan

This paper examines Kazakhstan's integrated policy strategies for advancing green industrialisation in the context of its fossil-fuel-dependent development model. It analyses how carbon pricing, energy sector reforms and industrial policies can be combined to support a just low-carbon transition while safeguarding energy security and growth. The paper reviews Kazakhstan's existing strategic frameworks, including its carbon neutrality strategy and sectoral decarbonisation plans, and identifies key barriers in the power, oil and gas, and coal sectors. It then develops a coherent policy package across seven areas: carbon quotas and pricing; national planning and governance; renewable, nuclear and coal phase-out policies; energy efficiency and grid modernisation; fiscal reforms; technological and industrial upgrading; and just transition and public engagement. Drawing on international experience and regional cooperation opportunities in Central Asia and with partners such as China, Turkey and multilateral development banks, the study proposes concrete measures to strengthen policy coherence, mobilise green finance and build domestic capabilities. By critically assessing current approaches and outlining integrated reforms, the paper aims to support a more sustainable, resilient and competitive pathway for Kazakhstan's green industrial transformation.

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KEYWORDS: Green industrialisation, Decarbonisation, Just transition, Renewable energy, Nuclear Energy, Kazakhstan

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Introduction

Kazakhstan's post-independence development has been shaped by the rapid expansion of its oil, gas, coal and mineral sectors, backed by substantial inflows of foreign direct investment and the development of export-oriented infrastructure. Hydrocarbons and coal-based power generation underpin fiscal revenues, export earnings and industrial activity, and remain central to the country's energy security. At the same time, this resource-dependent trajectory has locked Kazakhstan into a carbon-intensive development path which must be reconciled with its updated nationally determined contribution targets (NDC) under UN climate goals, its 2060 carbon-neutrality strategy and the tightening of climate-related policies in key export markets. The policy challenge is thus to manage growing domestic and external pressure for rapid decarbonisation, while maintaining macroeconomic stability, social cohesion and opportunities for green structural transformation.

Section 1 of this paper situates Kazakhstan's climate policy in its political economy context. It examines the main drivers of climate action, including international commitments, trade and investment dynamics, and domestic concerns over air quality and energy security. It also identifies key barriers, such as institutional and capacity constraints, the weight of incumbent fossil-fuel interests, and the risks of stranded assets and social dislocation in carbon-intensive regions.

Section 2 turns to the sectoral underpinnings of Kazakhstan's emissions profile, focusing on oil and gas, the energy sector and coal. The oil and gas subsection reviews greenhouse gas emissions from the sector, and discusses the main obstacles to reducing them, before outlining key policy strategies to foster decarbonisation in exploration, production, transport and refining. The energy sector subsection assesses the structure of power generation and demand, the dominance of coal-fired plants, and the emerging role of renewables. The coal subsection analyses the current role of coal in power and industry, reviews international best practices in managing coal dependency and stranded assets and proposes policy strategies to support a managed coal transition.

Recognising that effective decarbonisation depends on the strength and coordination of public institutions, Section 3 examines the institutional aspects of Kazakhstan's climate response. It maps the institutions with lead responsibility for mitigation and adaptation, assesses the planning processes for decarbonisation and the role of subnational governments, and highlights gaps in mandates, coordination and capacity.

Section 4 develops integrated policy strategies for green industrialisation in Kazakhstan. It identifies priorities across seven core areas: national strategic frameworks and a master plan for decarbonisation; renewable and nuclear energy promotion and coal phase-out; carbon quotas and pricing; energy efficiency, monitoring, storage and usage; supportive fiscal policies on taxes, subsidies and public finance; technological and industrial upgrading; and just transition, social protection and public engagement. The section also discusses how coordination between governmental and public bodies can be improved and how regional and multilateral cooperation can be leveraged to support green industrial development.

Section 5 addresses the financing dimension of decarbonisation and green transformation. It reviews the role of public institutions in climate finance, presents a green finance scenario consistent with Kazakhstan's NDC, and assesses the cost of achieving a 15 per cent reduction in emissions below 1990 levels by 2030. It then

examines the potential of state budget funding and private sector finance, estimates investment needs to reach NDC objectives, and identifies key barriers to financing decarbonization. The section concludes with recommendations to strengthen climate finance and investment frameworks.

Section 6 draws together the main findings, highlighting the policy priorities for placing Kazakhstan on a more sustainable, resilient and inclusive development path through integrated strategies for green industrialisation.

Section 1: Political Economy Context for Climate Action in Kazakhstan

Climate action is gaining increasing importance in Kazakhstan, but the country's high dependency on fossil fuels, particularly coal, makes decarbonization highly complex. Kazakhstan's coal industry provides about 70% of the country's electricity and, supports 100% of the coking production, and fully meets the fuel needs of the growing economy. While Kazakhstan actively participates in global efforts to reduce greenhouse gas emissions, it is not on track to meet its own decarbonization targets. Moreover, significant domestic political and economic challenges remain.

Key drivers of climate action

- Kazakhstan has been proactive in becoming a party to international climate agreements, signing the UNFCCC in 1992, the Kyoto Protocol in 1998, and the Paris Agreement in 2016 (it was the first member of the Commonwealth of Independent States (CIS) to ratify the Paris Agreement).

- Growing A high-level political recognition to act on climate. commitment to implement the country's carbon neutrality strategy. In 2023, Kazakhstan adopted its Strategy to achieve carbon neutrality by 2060, outlining steps for low-carbon economic development and energy sector transformation.

- Technical and financial support by international financial institutions and organizations. Institutions include the World Bank, European Bank for Reconstruction and Development (EBRD), the Asian Development Bank (ADB), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), United Nations Trade and Development (UNCTAD)and United Nations Development Program (UNDP). Private investors also show interest in renewable energy projects, for which there is considerable potential, and green bonds, encouraging the government to promote green investments.

- Kazakhstan's integration into global markets and compliance with international standards drive its climate actions. Kazakh companies supplying goods or services to the EU and local companies with international shareholders face pressure to align with corporate policies on climate action. Companies that export to the European Union, for instance, must meet the EU's strict climate-related regulations such as carbon reporting and sustainable production standards. Similarly, domestic firms with foreign investors or

multinational shareholders are pressured to adopt the same climate governance and decarbonization policies applied globally within their corporate groups. As a result, external market access requirements and investor expectations are pushing Kazakh businesses and regulators to strengthen national climate policies, adopt greener practices, and align with international standards for competitiveness and investment attractiveness.

- High vulnerability to natural disasters and climate change impacts. This includes strong winds, dust storms, and floods, causing substantial human and economic losses, highlighting the critical need to invest in resilience rather than shoring up finance disaster relief.

Key barriers to climate action

- Inexpensive and abundant coal. Kazakhstan's coal industry provides the cheapest option for electricity production and phasing it out could risk job losses of some 30,000 coal workers. This heavy dependency on coal is a significant barrier to decarbonization.

- The high political cost and negative short-term social impacts of passing the cost of decarbonization onto consumers end users is a key barrier to climate action. The government has implemented a seven-year program to increase electricity tariffs, with annual increases of 27%, aimed at modernizing infrastructure, not necessarily to implement low-carbon technologies. Even these planned increases could lead to social unrest due to the low incomes of the population.

- Kazakhstan has vast gas reserves but struggles to develop them and thus facilitate a switch to a lower emission fuel. Caps on gas prices make investment in the sector economically unattractive. Raising tariffs—especially in western and southern Kazakhstan, where gas is used mostly for electricity and heat production as well as fuel for vehicles—is tricky as it faces significant political opposition.

- The implementation of firm-level decarbonization measures, such as efforts to buy national gas and mining firms to reduce their carbon footprint and invest in green technologies have faced challenges. Significant resistance within the energy sector has likely contributed to delays in adopting essential strategic frameworks for the implementation of national decarbonization commitments, crucial for driving sectoral and institutional decarbonization efforts.

Thus, decarbonization of the Kazakhstan economy is an important and complex process that carries both significant opportunities and significant threats. The transition to a carbon-neutral economy requires major changes in the energy system, industry, transport and other key sectors.

Opportunities offered by decarbonization include economic development and innovation. Adopting advanced technologies and innovative solutions in renewable energy, energy efficiency and waste management can stimulate the growth of new industries and job creation. Accelerating the transition to a green economy helps develop new markets and attract investment in sustainable development. Improved environmental conditions are also a significant benefit. Reducing greenhouse gas emissions and switching to clean energy sources will improve air, water and soil quality, which will positively impact the health of people and ecosystems. Kazakhstan, actively participating in global initiatives to reduce emissions, will be able to strengthen its position in the international arena by

gaining access to international financial and technological resources. Compliance with international environmental standards and requirements will allow Kazakh enterprises to remain competitive in world markets.

However, the process of decarbonization also poses a number of challenges. Economic risks and costs are among the main obstacles. The transition to a low-carbon economy requires significant financial investments and structural changes, which can place a significant burden on budgets and businesses. There may be economic losses and social problems associated with the closure of coal mines and job losses in traditional energy sectors. Technological and infrastructure challenges should also not be underestimated. Lack of modern technology and infrastructure can make it difficult to quickly and effectively transition to renewable energy sources and energy efficient technologies. The need to modernize the energy and transport infrastructure requires significant time and financial resources.

Social and political barriers can also slow down the decarbonization process. Opposition from interest groups associated with the coal and oil and gas industries could create additional difficulties. The lack of widespread understanding of the importance of transitioning to a carbon-neutral economy also poses a significant challenge.

Overall, decarbonization of Kazakhstan's economy is a complex but necessary process that requires careful consideration of both opportunities and threats to achieve a sustainable and green future

Table 1. SWOT Analysis of Kazakhstan's Energy Transition

STRENGTHS	**POSSIBILITIES**
– Availability of resources for the development of renewable energy sources and alternative energy *(especially favorable wind conditions, mild sunny climate, hydroelectric potential, large reserves of uranium, hydrogen, biofuel).* There is progress in the development of elements of climate policies and *(emissions trading system, green finance, ESG principles, monitoring, reporting and verification of greenhouse gases (MRV), taxonomy).*	– Creation of domestic industries and technologies / increasing potential and productivity through the development of breakthrough innovations *(in the field of green energy, alternative energy, construction, industrial processes and others).* – Attracting investments into the economy *(increasing transition investments into low-carbon projects/industries, the opportunity to "earn money" on offset projects).* – Increased export of new products with expansion of export geography *(the global energy transition will lead to increased demand for rare minerals available in Kazakhstan, which is also enhanced by its proximity to major high-capacity markets).* – Increasing the adaptability/resilience of infrastructure to changing conditions *(reducing state budget expenses to eliminate the consequences of climate change).* – Improving the environmental situation due to a significant reduction in emissions of greenhouse gases and pollutants into the air, preserving water resources,

	biodiversity and more. – Reduce morbidity and premature mortality, and promote food safety, improve diets and increase physical activity levels in the population.
WEAKNESSES	**THREATS**
– Significant depreciation of fixed assets in the energy sector and thermal power industry – High energy intensity of economic sectors. – Non-market pricing of tariff costs, which does not allow updating fixed assets. *(investments in distribution networks and alternative generation of electricity and heat still remain economically unfeasible, since administratively imposed low consumer tariffs for electricity, heat and fossil fuels impede the modernization of networks and the transition to more sustainable sources of generation).* – Lack of in-house production of "green" equipment *(greater import of low-carbon technologies, lack of established production, excessive cost of construction of "green" facilities).* – Budget dependence on products with a high carbon footprint *(low complexity of Kazakh exports).* – Low level of environmental education of the population *(disinterest of the population in caring for the environment).* – Lack of human resources for transition *(the education system is not designed to train specialists in the field of ecology and green energy).*	– Decrease in demand for fossil fuels *(decrease in export revenue from the sale of raw materials; emergence of bad assets in extractive industries; decline in GDP growth rates; exhaustion of the possibilities of the raw material export model of development).* – Declining competitiveness of domestic production *(declining global demand for goods with a high level of carbon footprint and energy intensity (products of the chemical industry, petrochemicals, metallurgy, agriculture, construction materials industry and other carbon-intensive industries); lag in technological development (including "green technologies").* – Reduced investment attractiveness of the country/companies for large investors *(deterioration of conditions for attracting debt financing; reduction in foreign investment; curtailment of existing projects of large companies in the country).* – Lack of investment in transformation *(declining income from primary industries; maintaining low tariffs in a number of sectors that do not pay off investments in low-carbon technologies; increasing the volume of implementation of low-carbon technologies, requiring large financial and investment resources).* – Insufficient level of technology *(low level of investment in R&D and lack of knowledge about low-carbon technologies and experience with them; the occurrence of direct or indirect losses as a result of the unavailability of IT systems, incorrect settings and operation of algorithms; "transitional technologies" that can delay the introduction of technologies with zero emissions).* – Decrease in the solvency of vulnerable segments of the population *(increasing production costs and, accordingly, prices for manufactured products and services; release of workers who do not have the skills to work in new conditions due to the*

	introduction of new low- and carbon-free technologies at all levels of production and the closure of coal mines).

Section 2: Sectoral aspects of decarbonisation

2.1 Oil and gas

Brief analysis of the current situation

Kazakhstan's oil and gas sector remains the backbone of the national economy, underpinning exports, budget revenues, and industrial growth. With proven reserves exceeding 30 billion barrels[1] of oil and 2.3 trillion cubic meters of gas, the country ranks among the top 12 oil producers[2] and top 20 gas holders globally[3] . About 80 percent of crude oil output is exported[4]—mainly to Europe and Asia—making hydrocarbons central to Kazakhstan's fiscal stability and balance-of-payments resilience. In 2024, oil production reached 87.7 million tons, expected to rise to 96–104 million tons in 2025 driven by output expansion at Tengiz, Kashagan, and Karachaganak.

The hydrocarbon industry attracts major global investors such as Chevron, Eni, and ExxonMobil, with over USD 200 billion[5] in cumulative foreign direct investment since independence. Yet the sector's structural dependence on oil leaves the economy exposed to price volatility and geopolitical shocks. The 2020 pandemic-driven downturn caused a 2.5 percent GDP decline, followed by recovery to 4.3 percent in 2021, but growth moderated again to 3–3.5 percent amid output fluctuations and uncertain energy markets[6] . Oil exports—constituting roughly 54 percent of total exports—remain the

1 BP Statistical Review of World Energy, 2021. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf
2 https://oec.world/en/profile/hs/crude-petroleum

3 3BP Statistical Review of World Energy, 2021. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf
4 https://lsm.kz/eksport-kazahstanskoj-nefti-v-2021-godu-infografika
5 Minister of Energy of the Republic of Kazakhstan. // https://informburo.kz/stati/nuzny-investicii-cto-proisxodit-s-neftegazovym-rynkom-kazaxstana
6 Kazakhstan Economic Update: Shaping Tomorrow: Reforms for Lasting Prosperity (English). Kazakhstan Economic Update Washington, D.C.: World Bank Group. // http://documents.worldbank.org/curated/en/099759502082435630/IDU133466db918b7c14af01903b1ab7f20dfb809

dominant contributor to the National Fund[7], Kazakhstan's sovereign wealth reserve for stabilization and savings[8].

Kazakhstan's production base is heavily concentrated in the western mega fields of Tengiz, Kashagan, and Karachaganak, which together provide around two-thirds of total oil output[9]. These projects operate under long-term production-sharing agreements that ensure continued involvement of international consortia but limit the government's short-term profit share. While these large-scale ventures have modernized industrial capacity and introduced advanced technology, they have also entrenched export dependency, with almost all oil from these fields flowing to foreign markets. National companies—KazMunayGas (KMG) and QazaqGaz—play leading roles across the upstream-to-downstream chain, managing extraction, refining, and gas transport, while joint ventures with international partners oversee key export operations.

The gas sector, though smaller than oil, is strategically vital. Kazakhstan produced 59 billion m³ of natural gas in 2024, projected to reach 62.8 billion m³ in 2025[10]. About 90 percent of gas originates from the same western fields as oil production, with associated gas either reinjected, exported, or supplied to the domestic network. QazaqGaz oversees gas processing and nationwide transportation through an extensive pipeline system that also serves as a regional transit hub for Turkmen and Uzbek gas shipments to Russia and China. The Beyneu-Bozoy-Shymkent (BBS) pipeline remains crucial for domestic supply and eastward export capacity enhancement.

Kazakhstan's export and transit infrastructure is central to sustaining its oil- and gas-based economy. The Caspian Pipeline Consortium (CPC)—the main export route—transports oil from Tengiz to Novorossiysk, handling up to 67 million tons annually. Supplementary lines include KazTransOil's Uzen-Atyrau-Samara and Kenkiyak-Kumkol pipelines, the Atasu-Alashankou route to China, and MunaiTas's Kenkiyak-Atyrau domestic link—altogether forming an integrated network that underpins both export logistics and regional energy trade. Recent policy measures seek to expand non-Russian export corridors under the "Middle Corridor" initiative, enhancing resilience against transit disruptions.

Although the sector continues to attract investment, industrial and environmental challenges persist. Declining foreign inflows in 2023 reflected investor caution stemming from legal disputes, regulatory tightening, and carbon-related compliance costs. At the same time, Kazakhstan's government is attempting to balance expansion plans—including refinery and petrochemical capacity increases—with its climate commitments. The rise of global decarbonisation pressures has begun shaping domestic strategies,

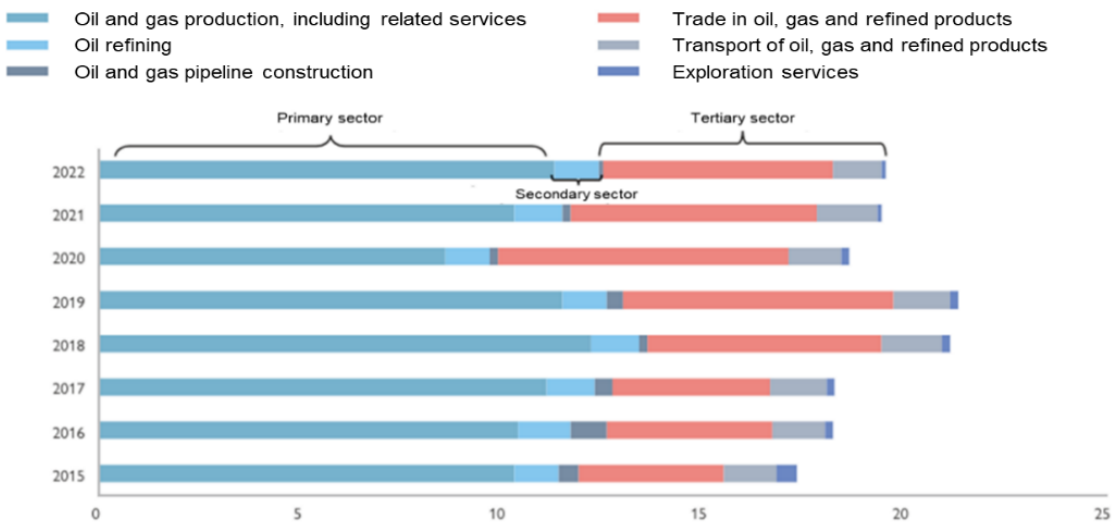
7 The National Fund of the Republic of Kazakhstan (the National Fund) is a state fund of the Republic of Kazakhstan, which is a collection of financial assets concentrated in the National Bank of the Republic of Kazakhstan on behalf of the Government of the Republic of Kazakhstan. The Fund was established in 2000 to ensure stable social and economic development of the country and accumulation of financial resources for future generations.
The Fund has two functions: Saving: provides for the accumulation of financial assets and Stabilisation: to maintain a sufficient level of liquidity. The National Fund has several sources of financing: the budget, investment income from the administration, other unallocated income and from oil sector companies. The latter source is the largest.
The National Bank of the Republic of Kazakhstan performs trust management of the National Fund of the Republic of Kazakhstan on the basis of a trust management agreement concluded between the National Bank of the Republic of Kazakhstan and the Government of the Republic of Kazakhstan.

8 https://stat.gov.kz/ru/industries/economy/foreign-market/publications/115718/
9 https://ar2024.kmg.kz/ru/strategic-report/operating-review/oil-gas-production
10 https://primeminister.kz/en/news/reviews/ministry-of-energy-of-kazakhstan-2024-results-and-strategic-plans-for-2025-29771

pushing oil and gas firms to adopt emission-monitoring systems and explore low-carbon technologies. However, the scale of ongoing upstream investment, combined with strong export demand, underscores the enduring dominance of hydrocarbons in Kazakhstan's economy.

Despite efforts to diversify energy sources, hydrocarbons will remain pivotal for the foreseeable future. The Ministry of Energy's 2025 plans emphasize simultaneous growth in oil and gas output alongside renewable deployment—adding 455 MW of new renewable energy projects this year. This dual approach encapsulates Kazakhstan's broader energy strategy: modernize and expand fossil-fuel infrastructure to secure fiscal revenues, while gradually integrating cleaner technologies to meet international climate obligations and sustain long-term energy security

Figure 1. Contribution of oil and gas industry to GDP of the Republic of Kazakhstan (% of GDP)



Source: National Energy Report KAZENERGY 2023

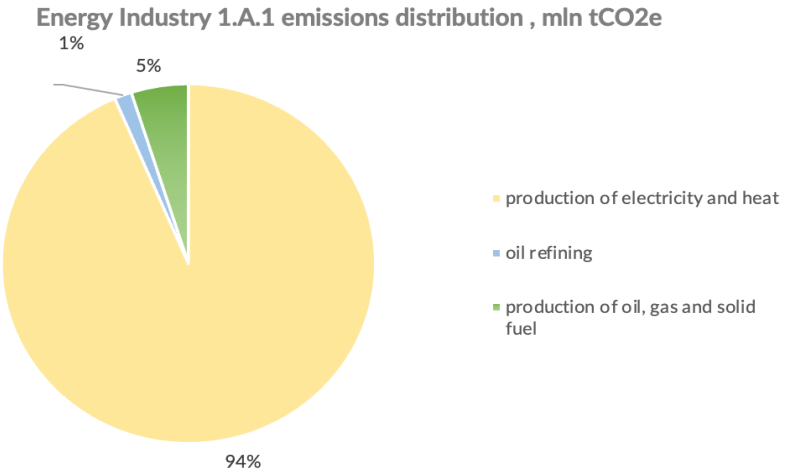
GHG Emissions from the Oil and Gas sector

Kazakhstan's greenhouse gas (GHG) emissions have fluctuated in tandem with its economic cycles. The post-Soviet economic collapse in the 1990s sharply reduced energy demand, leading to a major drop in emissions. With industrial recovery in the 2000s, emissions rose steadily, reaching around 402 million tCO_2-eq in 2018 — about 5 percent higher than 1990 levels [11]. They fell to 352 million tCO_2-eq in 2020

[11] *International Energy Agency, Kazakhstan 2022 - Energy Sector Review, (2022).* *https://iea.blob.core.windows.net/assets/fc84229e-6014-4400-a963-bccea29e0387/Kazakhstan2022.pdf*

(8 percent below 1990[12]), largely due to reduced industrial and transport activity during the pandemic, and then to 341 million tCO_2-eq in 2021.

Figure 2. Distribution of 2021 GHG emissions between subcategories in the Energy Industry (1.A.1) category



Source: "Zhasyl Damu" JSC

Within the energy system, oil refining and extraction dominate emission sources, primarily through fuel combustion, flaring, venting, and leakage. In 2021, fugitive emissions alone reached 41.5 million tCO_2-eq, mainly from oil and gas processes. Oil production, exploration, transportation, refining, and distribution generated 16.2 million tCO_2-eq, while gas operations added 6.5 million tCO_2-eq. Emissions from flaring and venting were 9.0 million tCO_2-eq (3.0 from flaring and 6.0 from venting). Total GHG emissions from the oil and gas sector exceeded 31 million tCO_2-eq in 2021, of which CO_2 accounted for 20.4 million tons and CH_4 for 10.6 million tons.

The sector is regulated under Kazakhstan's Emissions Trading System (ETS), launched in 2013 and currently covering 36 companies with 49 installations across upstream, midstream, and downstream activities. Under the 2022-2025 Allocation Plan, 23.0 million allowances were distributed against 19.5 million tons of actual CO_2 emissions. This oversupply keeps carbon prices low, providing weak incentives for decarbonisation[13] .

Parallel to this, two competing dynamics shape Kazakhstan's energy transition. The government continues to expand its oil and gas chemical complex — commissioning a polypropylene plant, constructing a polyethylene facility, and planning to double the Shymkent refinery's capacity — while international and national producers (KazMunayGas, QazaqGaz, TCO, KPO) adopt emission-reduction programs as global investors demand better climate disclosure and methane control. Yet, the absence of a strong carbon price, together with low domestic energy tariffs, limits corporate incentives to decarbonize operations.

[12] *International Energy Agency, Kazakhstan 2022 - Energy Sector Review, (2022).* https://iea.blob.core.windows.net/assets/fc84229e-6014-4400-a963-bccea29e0387/Kazakhstan2022.pdf
[12] *Ibid.*
[13] *Zhasyl Damu JSC Emissions Trading System //* https://recycle.kz/ru/parnikovye-gazy

The economic feasibility of transition measures is further constrained by expected rises in electricity costs. Ernst & Young's 2024 estimates [14] suggest that meeting Kazakhstan's 2030 NDC target could raise consumer electricity prices by 24.12 KZT/kWh (about 0.05 USD/kWh), driven by capital costs and carbon unit purchases. As renewable power expands and coal use declines, gas demand for grid stability is expected to grow. However, domestic gas shortages are likely to limit exports, forcing cross-subsidization to maintain regulated low prices currently USD 58 per 1,000 m³ compared to USD 379 on global markets[15][16].

Overall, despite policy advances and improving data management, Kazakhstan's low carbon price, dependence on fossil fuel exports, and rising domestic gas demand continue to challenge the decarbonisation of its oil and gas sector. Achieving emissions reductions consistent with international targets will require tightening ETS rules, aligning energy pricing with market realities, and accelerating deployment of cleaner technologies in production and processing.

Barriers to decarbonisation of the oil and gas industry

Decarbonizing Kazakhstan's oil and gas sector presents numerous economic, technological, regulatory, and social challenges, making it a complex and multifaceted process. While the country has adopted various policies and frameworks to reduce greenhouse gas (GHG) emissions, multiple barriers continue to slow progress.

Table 2. Barriers to decarbonisation of the oil and gas industry

Barrier	Description
High Cost of Oil Production	Break-even price ~ $67/barrel, higher than global averages, limiting competitiveness and profitability.
Dependence on Global Oil Prices	Oil sector profitability fluctuates with volatile global prices, impacting investment in decarbonization.
Lack of Financial Incentives	Limited access to green financing and absence of strong incentives or guarantees for emission reduction investments.
Insufficient Carbon Pricing	Low prices in Kazakhstan's ETS reduce economic motivation for companies to lower emissions.
Imperfect Climate Legislation	ETS covers limited installations unevenly, failing to fairly distribute emissions reduction responsibilities across companies.
Weak Enforcement	Compliance penalties are insufficient to promote strict adherence to emissions limits.

[14] *Victor Kovalenko, EY, Is your business ready for the expected strengthening of carbon regulation? // https://www.ey.com/ru_kz/climate-change-sustainability-services/is-your-business-ready-for-expected-increase-in-carbon-regulation*

[15] Order of the Minister of Energy of the Republic of Kazakhstan dated 14 May 2022 No. 172. "On Approval of the Limit Prices for Wholesale Sales of Marketable Gas in the Domestic Market of the Republic of Kazakhstan" // *https://adilet.zan.kz/rus/docs/V2200028050*

[16] *https://index.minfin.com.ua/markets/gas/london/*

Barrier	Description
Limited Access to Low-Carbon Tech	Underutilization of modern technologies like CCUS and methane leak detection due to availability and cost challenges.
Renewable Energy Integration Issues	Infrastructure limitations and intermittent supply hinder effective integration of renewables into oil and gas operations.
Aging Infrastructure	Outdated facilities require significant modernization investments to improve efficiency and emissions.
Regulatory Uncertainty	Unclear future policy and carbon pricing scenarios deter long-term decarbonisation investments.
Domestic Price Distortions	Government keeps domestic oil and gas prices low, reducing revenue available for decarbonization investments.
Energy Supply Challenges	Grid modernization and energy storage investments needed to support the transition to low-carbon energy systems.

Key policy strategies to foster decarbonization in Oil and Gas

Kazakhstan's path to decarbonizing its oil and gas sector requires a comprehensive and coordinated approach that combines regulatory reforms, financial incentives, technological advancements, and stakeholder engagement. Without addressing these challenges, Kazakhstan's oil and gas sector risks falling behind global decarbonization trends, potentially facing trade restrictions, reduced foreign investment, and economic instability. A structured and well-implemented transition plan, supported by government policies, industry collaboration, and international partnerships, is essential to ensure that Kazakhstan can achieve its decarbonization targets while maintaining economic resilience and energy security

Institutionally, consistent and systematic policy frameworks aligned with Kazakhstan's Nationally Determined Contributions (NDCs) are crucial. The government must enhance carbon regulation by redesigning the Emissions Trading System (ETS) to ensure adequate pricing signals and financial additionality for decarbonization projects. Proposals include introducing a price corridor for carbon quotas to enable predictable financial planning, regulating quota allocation mechanisms, and transitioning from fines toward a market-based upper price for carbon allowances. Expanding the ETS scope and considering a national carbon tax for sectors not covered by quotas would spread the decarbonization burden more equitably across industries.

Financially, Kazakhstan faces significant investment needs—estimated at USD 610 billion [17] cumulatively to achieve carbon neutrality, with the state oil company KazMunaiGas targeting over USD 1 billion in emission reductions by 2030 alone. Effective financial incentives are needed to mobilize capital, including access to green financing, guarantees, and guaranteed purchase mechanisms for emission reductions

[17] https://unfccc.int/sites/default/files/resource/Carbon_Neutrlaity_Strategy_Kazakhstan_Eng_Oct2024.pdf

not yet covered by quotas. These incentives should reward efficiency improvements not only in direct emissions (Scope 1) but also indirect (Scope 2) energy use.

Regulatory reforms must foster transparency, enforceability, and innovation. Strengthening enforcement mechanisms and increasing penalties for non-compliance will improve accountability. Linking benchmarking systems to technological processes would promote adoption of the best available technologies (BAT). Furthermore, improving stakeholder engagement helps build trust and supports the shared goal of sustainable transition.

At the firm level, implementation requires tailored strategies recognizing differences in operational assets, emissions intensity, and business models—distinguishing, for example, between oil extraction-focused companies versus gas transport and distribution operators. Organizations must establish comprehensive governance structures, invest in technological innovation such as carbon capture and methane detection, and engage collaboratively with regulators and financiers. The development of baseline organizational and management practices is a necessary precursor for advancing decarbonization programs systematically.

Cross-sectoral policy coordination extends beyond the oil and gas sector to include power generation, renewables integration, and infrastructure modernization. Kazakhstan's energy transition envisions increasing the share of renewables and gas-fired power plants with flexible capacity, necessitating grid investment and support policies. Achieving this balance optimizes energy security, economic stability, and environmental sustainability.

In summary, Kazakhstan's oil and gas decarbonization hinges on an integrated policy strategy featuring institutional reforms to enhance carbon market design, robust financial incentives to drive investment, and regulatory upgrades to enforce compliance and encourage technology adoption, complemented by company-led tailored efforts and cross-sector cooperation toward a low-carbon energy future.

2.2 Energy sector

Analysis of the current situation

The global energy sector is rapidly shifting towards cleaner, sustainable solutions to combat climate change and meet growing electricity demand. In 2023, global electricity demand grew 2.2%, slightly slower than in 2022, but is expected to accelerate to an average 3.4% annual growth through 2026, driven largely by economic expansion across advanced and emerging economies. Key growth sectors include electrification of homes, transport, and data centers, with data centers alone projected to more than double electricity use by 2026.

Table 3. Global electricity supply, TWh

	2021	2022	2023	2026
Coal	10284	10442	10613	10088
Natural gas	6556	6609	6639	6785

Other non-renewables	852	857	782	705
Renewables	7925	8549	8959	12158
Nuclear	2809	2668	2741	2959
Total	28426	29125	29734	32695

Sources: IEA Electricity report 2024 (IEA, 2024a)

Approximately 85% of the additional electricity demand through 2026 will come from emerging markets and China, with significant growth rates in China (around 5%), India (6%), and Africa (4%). In developed regions like the US and EU, electricity demand will increase moderately, supported by electric vehicles, heat pumps, and data centers.

Renewables continue to gain market share, expected to rise from 30% of global power generation in 2023 to 37% by 2026, led by cost-effective solar PV deployment. Nuclear power remains a crucial low-carbon energy source, currently accounting for about 9.2% of global electricity, with around 411 reactors in operation globally. Nuclear capacity is forecast to expand significantly by 2050, potentially tripling electricity generation and increasing its share in the energy mix, though with uncertainty due to costs, development timelines, and public opposition.

Kazakhstan's energy sector heavily relies on fossil fuels—oil, gas, and coal—legacy of Soviet-era infrastructure and policies. In 2023, Kazakhstan produced 162.9 million tons of oil equivalent energy, of which 99.2% was fossil fuels. Domestic energy consumption and final energy use remain fossil fuel-dominant, with coal and natural gas playing major roles.

The energy sector can be analysed by looking at its energy balance as in table 4 below.

Table 4. National energy balance of 2023, million tonnes of oil equivalent

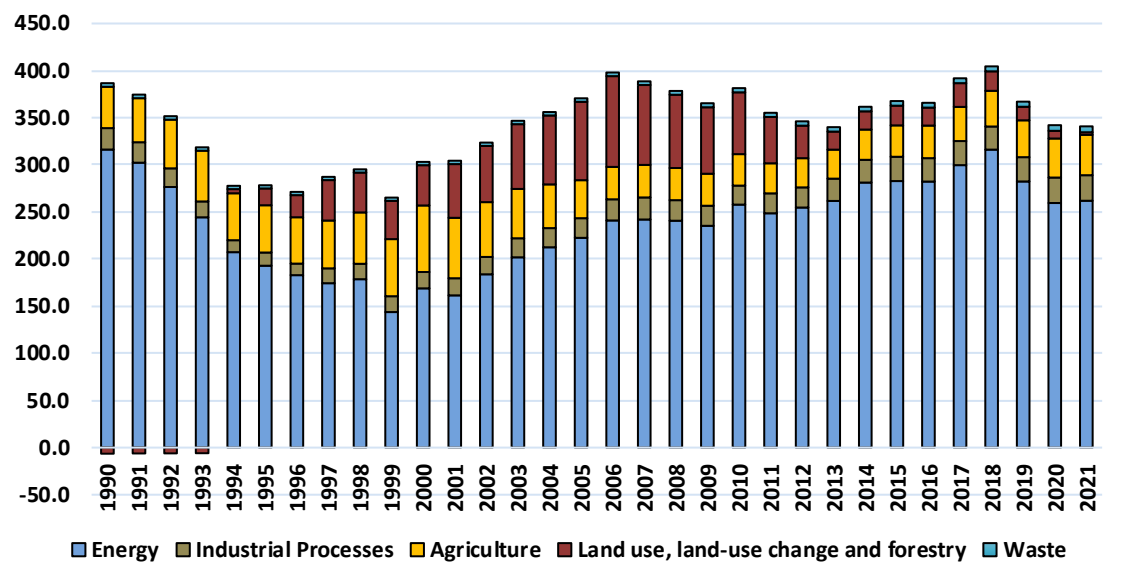
	Coal	Natural gas	Oil	Hydro	Solar	Wind	Biofuel	Electricity	Heat	Total
Primary energy production	50.4	25.4	85.8	0.8	0.2	0.3	0.039			162.9
Import	0.6	1.1	1.4				0.006	0.4		3.5
Export	-14.2	-6.2	-69.2				-0.008	-0.2		-89.8
Bunkering and changes	-0.4		-2.1				-0.002			-3.2
TPES	36.4	19.6	15.9	0.8	0.2	0.3	0.035	0.2	0.0	73.4
Statistical discrepancies	0.00	-0.76	-0.03							-2.06
Transformation sectors	27.2	11.1	0.1	0.76	0.16	0.3	0.016	-9.8	-9.2	20.6
Own use, losses and others	0.8	2.2	2.4					3.4	2.6	11.4
TFC	8.4	7.1	13.5				0.019	6.5	6.6	43.4
Industry	4.0	1.5	1.4				0.001	3.5	1.3	12.3
Transport	0.0	0.0	8.2					0.3	0.0	8.6
Buildings	4.3	5.6	2.1				0.016	2.5	5.3	19.9

Others	0.1	-0.1	1.7				0.002	0.2	0.1	2.7

Sources: Fuel and energy balance of the Republic of Kazakhstan (BNS RK, 2023a)

The oil industry is a linchpin of Kazakhstan's economy, holding the 12th largest oil reserves worldwide. In 2023, Kazakhstan produced 89.9 million tons of crude oil with most (78.4%) exported. National greenhouse gas emissions have mirrored economic trends, peaking in 2018, followed by reductions linked to the COVID-19 pandemic.

Figure 3. The GHG emissions of Kazakhstan by main categories, million tons CO2-equivalent



Sources: National Inventory Report of Kazakhstan on GHG emissions (NIR RK, 2023)

The energy sector is the largest emitter, contributing 76.9% of Kazakhstan's GHG emissions in 2021. Kazakhstan's power sector, vital to national economic growth, generated 112.8 billion kWh in 2023, slightly below consumption driven by rising demand, signaling future capacity challenges. The government regulates the sector to ensure reliability and sustainability, with over 222 power plants and an installed capacity of 24,641.9 MW.

Kazakhstan actively promotes renewables through legislation, auctions, and financial incentives. As of 2023, renewables accounted for nearly 6% of electricity generation, exceeding targets thanks to 144 renewable installations with over 2,868 MW capacity primarily from wind and solar. The government aims to escalate this with international investor participation, though challenges remain in integrating renewables with grid stability.

Kazakhstan holds 12% of the world's uranium reserves and is the largest uranium producer, contributing 40% of global production in 2023, using environmentally friendly in-situ recovery methods. Nuclear power presents opportunities for low-carbon energy expansion but faces challenges from high costs, long timelines, and public opposition, mirroring global trends.

In summary, Kazakhstan's energy landscape is transitioning amid rising global electricity demand, growing renewable penetration, and persistent dependence on fossil fuels.

Balancing economic growth, energy security, and climate commitments demands continued investment in clean technologies, flexible energy systems, and strategic policy to foster sustainable development.

Table 5 Barriers to decarbonisation of the energy sector

Barrier	Description
Intermittency & Grid Stability	Variability of wind and solar energy challenges reliability; energy storage solutions are considered but underdeveloped and costly.
Lack of Forecasting & Smart Tariffs	Limited renewable forecasting tools and absence of time-of-use tariffs hinder grid management and peak load balancing.
Underdeveloped Distributed Generation	Small-scale renewables face financial and regulatory barriers despite recent legislative improvements for household/business uptake.
Regulatory Uncertainty & Investment Risk	Frequent policy changes and administrative issues create investor uncertainty; transparent, stable frameworks needed.
Aging Infrastructure	Outdated grid infrastructure from Soviet era limits renewable integration; modernization and expansion required.
Nuclear Safety Concerns	Public skepticism due to historic nuclear testing and global nuclear incidents; transparency and oversight needed to build trust.
Radioactive Waste Management	Need for comprehensive nuclear waste strategies, including secure disposal and advanced containment technologies.
High Capital & Long Timelines	Nuclear plants require costly, long construction periods, less attractive than faster renewable deployment; state/foreign support needed.
Competition with Renewables	Nuclear expansion may divert resources from renewables; balancing investments is key to energy security and decarbonization goals.

Policy strategies to decarbonise the energy sector

The development of a robust clean power sector in Kazakhstan presents a strategic opportunity to modernize its outdated power system, bolster energy security, stimulate economic growth, and contribute meaningfully to global carbon emission reduction efforts. The *government and public bodies have a crucial role in orchestrating this transition* by formulating comprehensive policies, mobilizing resources, and coordinating stakeholders at national and international levels.

Kazakhstan's energy transition strategy must be anchored in a *master plan* that integrates decarbonization goals with renewable energy deployment and system modernization. Public institutions are responsible for enhancing renewable energy forecasting capabilities and reinstating differentiated time-of-use tariffs to promote efficient grid management and demand-side participation. The government must also establish clear, phased plans for coal facility phase-out, including timelines, investment requirements, and fair compensation mechanisms for plant owners[18].

To maintain grid reliability while expanding renewables, the construction and operation of *flexible gas-fired combined cycle plants* should be pursued, alongside strategies to transition coal-based combined heat and power plants to cleaner gas fuel. Energy storage pilot projects are vital to mitigate renewable intermittency and balance daily loads, supported by national research efforts to advance technological innovations and adapt policies to international best practices.

Nuclear energy, including emerging technologies like small modular reactors, forms a key pillar of Kazakhstan's long-term energy strategy. Public bodies must develop a comprehensive, transparent roadmap for nuclear power expansion, addressing safety concerns, waste management, and public engagement to build trust and ensure regulatory compliance.

Demand-side management programs and deployment of advanced digital technologies can optimize energy usage and reduce transmission losses, further strengthening the overall system efficiency. The government's role extends to fostering capacity building in research and engineering, ensuring the nation develops homegrown expertise to steer the energy transition resiliently.

In line with international experience, Kazakhstan's policies should *incentivize private sector participation through predictable regulatory frameworks*, transparent auction mechanisms, and targeted financial instruments such as green bonds[19] and guarantees. Integration of renewables and flexible generation capacity requires adequate infrastructure investments, anchored by policy certainty and comprehensive stakeholder engagement.

Ultimately, by implementing these multifaceted policy recommendations, Kazakhstan can safeguard sustainable, secure, and cost-effective development of its clean power sector, enhancing its global competitiveness and fulfilling its climate commitments.

[18] https://policy.asiapacificenergy.org/sites/default/files/Concept%20on%20Transition%20towards%20Green%20Economy%20until%202050%20(EN).pdf

[19] https://aifc.kz/news/development-bank-of-kazakhstan-placed-green-bonds-on-aix/

2.3 Coal

Analysis of the current situation

Kazakhstan's coal sector remains vital, providing about 67% of electricity and 80% of thermal energy[20], but is also the main source of CO2 emissions, contributing 70% of national emissions. The sector supports economic stability by supplying essential energy for industries, transport, and social services. Kazakhstan holds around 29.4 billion tons of coal reserves[21], mostly hard coal, producing about 110-113 million tons annually, with domestic consumption at 72% and exports primarily to Russia.

The coal industry lacks a national operator but is dominated by Bogatyr Komir LLP, a quasi-state company. Coal contributes roughly 0.7–1.1% of GDP and employs around 40,000 people. Investments have increased significantly, funded by enterprises' own resources. Coal-fired power generation remains dominant, accounting for two-thirds of electricity and 80% of thermal energy.

Kazakhstan plans to add 4-5 GW of coal capacity by 2035 as part of its electric power sector development, alongside a target of 12 GW renewable capacity, aiming to have coal represent 34.3% of installed capacity by 2035. The transition includes gradual integration of renewables and expansion of natural gas as a bridge fuel.

Greenhouse gas emissions from coal mining and combustion declined by 20.5% between 1990 and 2021, though coal combustion still produces over 60% of related emissions, primarily CO2, with methane emissions reduced due to declining underground mining. Coal is extensively used in public electricity and heat production, manufacturing, and for producing steel, cement, and chemicals like syngas and fertilizers, key to Kazakhstan's industrial competitiveness.

Overall, Kazakhstan's coal sector faces a complex path balancing economic reliance and environmental commitments, with planned gradual reductions in coal dependence alongside diversification into cleaner energy sources and coal chemical industries.

Table 6. Key Challenges in the Coal Sector

Risk Category	Description	Impact Examples
Reduced Competitiveness	Declining global demand for high carbon footprint, energy-intensive goods (chemicals, petrochemicals, metallurgy, agriculture, construction materials).	Export losses due to EU Carbon Border Adjustment Mechanism (CBAM) starting 2026; estimated export loss $157-352M[22].
Investment Attractiveness Decline	Deterioration of financing conditions, lower foreign investment, project curtailment.	Kazakhstan attracts <1% of international climate finance (~$490M/year vs $80B globally); worsening debt financing.

[20] https://www.kazenergy.com/upload/document/energy-report/NationalReport23_ru.pdf
[21] https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf
[22] https://unctad.org/system/files/information-document/unda2030d21-kazakhstan-green-transformation_en.pdf

Risk Category	Description	Impact Examples
Socioeconomic Deterioration in Coal Regions	Job losses in coal mining communities with limited worker retraining; impacts on regional economies (e.g., Karaganda, Pavlodar).	Coal sector employs ~40,000 people (0.7% employment share); risk of social instability.
Economic Cost of Coal	Coal extraction and combustion costs exceed sector revenues; health, subsidy, and environmental costs are externalized.	Total indirect costs >$50/ton coal vs profits of $6.8/ton; unaccounted climate damages ~$16/ton.
Stranded Assets & Economic Risks	Declining demand for fossil fuels can cause asset stranding and GDP impact; raw material export model becomes unsustainable.	Risks more acute in carbon-intensive and energy sectors may exacerbate regional inequalities and tensions.
Price & Cost Pressures on Consumers	Rising production costs and tariffs increase utility bills, straining vulnerable households.	Utility costs projected to rise from 6.4% to 21.7% of household expenses by 2029, pressuring living standards.
Financing Transition Costs	High investment needed for energy transition to low-carbon technologies; government funding covers small share.	Estimated $610 billion net investment for carbon neutrality to 2060; only 3.8% directly from government.

Comparative Analysis of International Best Practices in Managing Coal Dependency and Addressing Stranded Assets

Countries/jurisdictions that have made significant progress in achieving coal phase-out goals are generally high-income and tend to have advanced technological and financial capabilities - the UK, Germany, Greece, the Czech Republic, the US and select Canadian states.

In general, countries/jurisdictions can be divided into the following main categories with regard to their coal strategies:

Historical leaders in coal phase-out strategies (UK and Germany). The UK began phasing out coal in the 90s and aims to complete it by 2024. Since the process began, the UK has seen a 50-fold reduction in coal production. The share of electricity production from coal-fired power plants decreased by 29 percentage points between 2010 and 2020 (less than 1% of total electricity production). Germany is an example of another 30-year strategy to reduce coal production and consumption: the country achieved a fivefold reduction in coal production between 1990 and 2020 and halved the share of electricity generation from coal combustion (or 24% of total electricity production).

More recent coal phase-out strategies based on natural gas (Greece, Czech Republic, Poland, Israel, South Korea, USA). Between 2010 and 2020, the share of coal generation decreased from 53.7% to 12.9% in Greece, from 57.9% to 40.1% in the Czech Republic,

from 87% to 69.3% in Poland, from 58.5% to 28.1% in Israel and from 43.9% to 38.7% in South Korea. These countries are aiming to complete their coal phase-out strategy by 2050.

Coal phase-out strategies based on energy sources other than natural gas. This category includes the UK and Germany already described above, as well as Bulgaria, Hungary, Nova Scotia and Ontario (Canada). These latter have also recently committed to coal phase-out and carbon neutrality, which, based on the historical and techno-economic context of the country, will largely depend on nuclear and renewable generation. Some of these jurisdictions, such as Hungary, Nova Scotia and Ontario (Canada), are also seeking to reduce their dependence on natural gas.

Large producers, consumers and exporters of coal with a reduction in national coal consumption. This category includes countries such as Australia, China, Mongolia and South Africa. These countries increased or maintained the same level of coal production as in 2010, but at the same time reduced local coal consumption. The share of coal-fired power generation fell from 71.3% to 55% in Australia, from 77% to 64.1% in China, from 95% to 85.3% in Mongolia and from 93.2% to 87.7% in South Africa between 2010 and 2020. Further commitments to coal generation and phase-out and carbon neutrality are not well established and face various socio-economic and political barriers.

Currently, of the 43 countries with coal phase-out plans in total, 24 have pledged to pay approximately US$209 billion in compensation.

Policy strategies for decarbonization in the coal sector

To ensure a smooth transition towards a low-carbon economy while maintaining energy security and economic stability, Kazakhstan must implement a comprehensive and phased strategy for coal sector transformation. This strategy should encompass energy diversification, technological innovation, financial mechanisms, and social support measures to facilitate a just transition. The following policy recommendations outline key areas of intervention:

1. Gradual and Systematic Reduction of Coal Dependence

- Kazakhstan should implement a long-term strategy to gradually decrease coal reliance while increasing the share of renewable and alternative energy sources. The planned energy transition should align with the national energy security agenda to prevent supply disruptions. The following steps are essential:
- Reduce the share of coal-fired power generation to 34.3% by 2035 while increasing renewable energy to 24.4% and gas-based power generation to 25.8%.
- Expand the use of natural gas as a transitional energy source to ensure stability in power supply while phasing out coal.
- Retire coal-fired power plants that have exceeded a 30-year operational lifespan, prioritizing decommissioning based on economic efficiency and emissions intensity.
- Introduce carbon capture, utilization, and storage (CCUS) technologies for remaining coal-fired capacity, supported by international mechanisms such as the Asian Development Bank's Energy Transition Facility.

2. Development of Coal Chemistry as an Alternative Industrial Pathway

- Given Kazakhstan's extensive coal reserves, the country should shift from traditional coal combustion to high-value coal processing industries. Key initiatives should include:
- Promoting coal gasification and liquefaction technologies to produce synthetic fuels, methanol, ammonia, and other chemical products.
- Through Samruk-Energo and national research institutes, supporting research and development (R&D) initiatives for coal-based carbon materials, such as graphene and advanced composites.
- Attracting private investment and international partnerships to develop large-scale coal chemical projects, leveraging Kazakhstan's untapped $25 billion potential in this sector.

3. Methane Emission Reduction in Coal Mining

- Methane emissions from coal mining must be addressed through technological upgrades and regulatory mechanisms. Key recommendations include:
- Implementing methane capture, recovery, and utilization technologies, such as mine methane recovery and ventilation air oxidation.
- Establishing methane management standards for coal mines, with incentives for operators to invest in emission reduction technologies.
- Strengthening monitoring and reporting systems to ensure accurate measurement of methane emissions and track progress in reduction efforts.
- The Ministry of Ecology and Natural Resources should impose mandatory monitoring and reporting protocols, create tax incentives for methane recovery projects, and establish partnerships under UNECE and ADB methane reduction programs.

4. Reforming Fossil Fuel Subsidies and Redirecting Savings

- Phasing out inefficient fossil fuel subsidies and reallocating financial resources can enhance economic efficiency and support vulnerable populations during the transition. The following measures are recommended:
- Gradually eliminate coal and fossil fuel subsidies, reallocating savings towards renewable energy investments, social protection programs, and energy efficiency measures.
- Utilize fiscal savings from subsidy phase-out (estimated at $39.2 billion for 2023-2029) to support low-income households, ensuring that energy costs remain affordable.
- Develop direct financial assistance programs for affected communities, including retraining initiatives and employment support for workers transitioning from coal-dependent industries.
- A transparent, multi-agency fiscal policy framework should ensure that resources flow toward productivity-enhancing, low-emission technologies.

5. Strengthening Carbon Regulation and Market Mechanisms

- Kazakhstan must enhance its carbon pricing policies to incentivize emissions reductions and attract climate finance. Key recommendations include:
- Expanding and strengthening the national emissions trading system (ETS) as a central element of carbon regulation.

- Aligning Kazakhstan's ETS with international carbon markets to improve liquidity and attract foreign investment.
- Implementing additional carbon pricing instruments, such as carbon taxes or performance-based incentives, to encourage industrial decarbonization.
- Carbon revenues should be used to finance clean energy infrastructure and regional "just transition" funds.

6. Ensuring a Just Transition for Coal-Dependent Regions

- To mitigate the socio-economic impacts of coal phase-out, Kazakhstan should implement a comprehensive just transition framework. This should include:
- The government should institutionalize a Just Transition Fund managed jointly by the Ministries of Energy, Labour, and National Economy, providing targeted support for workers and communities in coal-dependent regions such as Karaganda and Ekibastuz through job creation programs, skills development initiatives, and economic diversification strategies.
- Establishing regional transition funds to finance infrastructure development and investment projects in alternative industries.
- Encouraging public-private partnerships to develop new economic opportunities in affected areas, including renewable energy projects and industrial transformation initiatives.

By implementing these measures, Kazakhstan can replicate proven international successes while adapting them to its national reality. A government-directed, inclusive transition—anchored in long-term planning, fiscal equity, and technological modernization—will position Kazakhstan to phase down coal responsibly, safeguard employment, and build a competitive, low-carbon economy consistent with global climate and development goals. A well-planned shift from coal will not only reduce greenhouse gas emissions but also create new economic opportunities and improve long-term energy security.

Section 3: Institutional aspects of decarbonization

3.1 Institutions with lead responsibility for decarbonisation

The **Environmental Code**[23] provides a legal foundation for environmental management and addressing climate-related issues, though it does not establish a comprehensive framework specifically for climate change. Article 3 of the code outlines one of its key objectives as ensuring Kazakhstan's contribution to strengthening the global response to climate change within the context of sustainable development. Additionally, the code sets medium-term quantitative targets: **Article 286 requires the development of a carbon budget aligned with Kazakhstan's national contributions under international treaties, while Article 283 stipulates a reduction in the carbon balance of at least 15% from 1990 levels by December 31, 2030**, consistent with the unconditional target outlined in the updated NDCs. Furthermore, Article 313 emphasizes

[23] https://adilet.zan.kz/rus/docs/K2100000400

the integration of climate change impacts into medium- and long-term socio-economic development plans as a fundamental principle of climate adaptation. Despite these provisions, the Environmental Code lacks a unified framework for addressing climate change, as the relevant provisions are dispersed across various sections of the legislation.

In Kazakhstan, climate change is still primarily treated as a subset of environmental protection and is often positioned as a co-benefit of sustainable growth. However, the global trend, particularly among OECD countries and the EU, **increasingly favors the adoption of dedicated climate laws**. Such legislation serves as a powerful signal, elevating the visibility and urgency of climate action. A standalone climate change law would establish a comprehensive framework for both mitigation and adaptation efforts, clarifying roles, mandates, and coordination mechanisms—areas where Kazakhstan currently faces notable gaps.

The Ministry of Ecology and Natural Resources (MENR) holds the official mandate for climate policies in Kazakhstan; however, there are ambiguities concerning thematic leadership and coordination. Within the MENR, the Department of Climate Policy serves as the primary body responsible for these tasks. At the local level, climate policy implementation is carried out through local executive bodies under the MENR's oversight. Climate policy development, planning, and execution are supported by the MENR in collaboration with key sectoral ministries, including the Ministry of Energy, the Ministry of Water Resources and Irrigation, the Ministry of Industry and Construction, and the Ministry of Agriculture.

The MENR also supervises JSC "Zhasyl Damu," which plays a critical role in managing the greenhouse gas (GHG) inventory and operating the carbon trading system, ensuring effective emissions monitoring and reporting. Additionally, the **International Green Technologies and Investment Projects Center**, another entity under the MENR's purview, is responsible for advancing green technologies by developing recommendations on the best available technologies and promoting their adoption. Despite these structures, clearer delineation of roles and enhanced coordination mechanisms are needed to strengthen Kazakhstan's climate governance framework.

Kazakhstan's state institutions and ministerial departments face significant resource and capacity constraints. Although the Ministry of Ecology and Natural Resources (MENR) has been entrusted with critical control and regulatory functions related to climate policy, it operates with limited resources and insufficient programmatic and operational capabilities. This undermines its ability to effectively influence other central government bodies and departments.

Furthermore, there is a notable **shortage of experts** in key areas such as state regulation of climate policy, climate modeling, and energy management. This gap **adversely affects the management, implementation, and monitoring of climate policies and regulations**. While the government recognizes this challenge, it has yet to develop a comprehensive strategy to address these systemic issues. Strengthening institutional capacity and investing in specialized expertise will be essential for enhancing Kazakhstan's climate governance and achieving its climate goals.

The Council for the Transition to a Green Economy, chaired by the Prime Minister of the Republic of Kazakhstan, has the potential to play a more prominent role in providing political leadership and focus on climate-related issues. Established in 2014

as a consultative and advisory body, the Council currently oversees the implementation of **the *Concept for the Transition of Kazakhstan to a Green Economy***. However, its thematic focus is primarily limited to mitigation, with occasional attention to non-climate-related issues such as pollutant emissions and unauthorized solid waste landfills. According to its operational regulations, the Council is responsible for developing recommendations and strategies to advance the *Concept for the Transition* and is required to convene meetings at least twice a year. The Council comprises representatives from all relevant ministries, including the Ministry of Finance, as well as non-governmental organizations, and has the authority to establish subcommittees involving private sector representatives, NGOs, and experts.

The effectiveness and operational framework of the Council should be reassessed to enhance its impact. Specifically, the Council's mandate should be expanded to explicitly address climate-relevant issues, encompassing both mitigation and adaptation. To strengthen its role, the Council could be granted additional powers and potentially renamed the *Council on Climate Change and Adaptation* to better reflect its broader responsibilities. This restructuring would align the Council's objectives with the urgent need for comprehensive climate action and ensure it serves as a central coordinating body for Kazakhstan's climate agenda. Greater transparency, such as the public disclosure of meeting minutes and follow-up actions, would also improve accountability and stakeholder engagement.

3.2 Analysis of the planning process for decarbonisation

Kazakhstan has ratified the Paris Agreement and submitted its updated Nationally Determined Contribution (NDC) in April 2023. However, progress on implementation has been hindered by resistance from the energy lobby. The NDCs outline Kazakhstan's commitment to reducing greenhouse gas (GHG) emissions by 15% below 1990 levels by 2030 (unconditional target) and by 25% (conditional target). The latest update includes more details on adaptation, though the primary focus remains on mitigation.

The government has also developed a **Roadmap for NDC Implementation (2021-2025),** which identifies sectoral and institutional decarbonization measures, estimates their GHG reduction potential, investment requirements, spillover effects, and risks of non-achievement. It also outlines measures to address barriers, assigns responsibilities, and sets deadlines. Additionally, the Roadmap proposes improvements to the national Monitoring, Reporting, and Verification (MRV) system, with key indicators to track progress toward NDC targets. However, this Roadmap has yet to be formally adopted.

The *Strategy for Achieving Carbon Neutrality by 2060*[24], adopted in February 2023 and submitted to the UNFCCC in October 2024, serves as the key guiding document for mitigation efforts. Aligned with the updated NDCs, the Strategy was developed through extensive stakeholder engagement. The Strategy calls for national-scale GHG emissions assessments in ten-year intervals up to 2060 but does not mandate sector-specific assessments. It outlines a single scenario for achieving net-zero emissions by 2060, considering the balance of emissions and removals, and describes the economy's development trajectory over this period. Regular updates to the Strategy are planned, with implementation details to be defined in a forthcoming roadmap.

[24] https://unfccc.int/sites/default/files/resource/Carbon_Neutrlaity_Strategy_Kazakhstan_Eng_Oct2024.pdf

As of February 2025, there is no legally binding action plan or roadmap for either the NDCs or the *Strategy for Achieving Carbon Neutrality by 2060*. A working group comprising government and non-government stakeholders is currently developing the Strategy's implementation roadmap, which is expected to define clear objectives, milestones, performance indicators, and a designated entity to oversee and coordinate implementation. However, the entity responsible for monitoring progress, ensuring compliance, and addressing implementation challenges has not yet been formally established.

Kazakhstan currently lacks a comprehensive adaptation strategy that includes vulnerability assessments and specific adaptation targets. While the carbon neutrality strategy briefly mentions adaptation, detailed planning is absent. The Strategy's roadmap is expected to outline concrete adaptation measures, including responsibilities, deadlines, and monitoring mechanisms. However, effective adaptation planning is unlikely to materialize until a dedicated National Adaptation Plan (NAP) is developed and implemented. Although the 2021 Environmental Code acknowledges the importance of adaptation, the responsibility is delegated to sub-national governments, requiring regional authorities to conduct vulnerability assessments and develop adaptation plans as part of Territorial Planning. Given chronic underfunding and limited capacity at the local level, this approach has proven ineffective. Adaptation needs to be addressed as a strategic priority, independent of mitigation efforts.

In 2023, Kazakhstan adopted a State Planning System comprising a set of interrelated strategic documents, including the National Development Plan, government body development plans, regional development plans, and national management holding development plans. The *Strategy for Achieving Carbon Neutrality until 2060* is a key goal-setting document within this framework. However, further efforts are needed to ensure full alignment with national development plans and sectoral strategies. For instance, while the agricultural policy acknowledges climate impacts, it lacks concrete measures. Other critical strategies, such as a national forestry strategy to guide afforestation, sustainable land management, and water supply improvements, are entirely absent.

Kazakhstan has established an institutional and regulatory framework for urban planning that aligns with modern principles of sustainable development and risk management. The framework emphasizes inclusivity, multi-hazard risk assessments, and integration with socio-economic development goals. Urban planning processes are required to utilize multi-hazard risk data from Kazhydromet and other agencies to mitigate risks associated with natural and anthropogenic hazards.

Kazakhstan's hydrometeorological monitoring system, operated by Kazhydromet, is robust and supports climate adaptation and resilience efforts. The system includes a network of observation stations that collect decades-long time series data on climatic and environmental parameters, enabling trend analysis and the generation of probabilistic hazard maps for floods, droughts, and extreme weather events. Kazhydromet has developed a dedicated webpage for short-term extreme weather alerts, supported by the World Meteorological Organization (WMO) and the World Bank. While the website provides resources and alert maps, more detailed hazard mapping is needed to support localized risk assessments and mitigation strategies.

Kazakhstan has established Monitoring, Reporting, and Verification (MRV) mechanisms for GHG emissions, administered by the MENR. The MENR oversees emissions data collection from various economic sectors, with support from JSC Zhasyl Damu, which

specializes in GHG emissions reporting and prepares the national inventory report. International experts regularly review the national report under the UNFCCC framework.

Climate action integration across key sectors in Kazakhstan varies in depth and commitment. The energy sector, driven by decarbonization goals and the *Strategy for Achieving Carbon Neutrality by 2060*, is leading with increased investments in renewable energy and efficiency measures. The transport sector is making progress in electrification and public transit improvements but remains hindered by the dominance of fossil fuel vehicles. Agriculture and irrigation have adopted some climate-resilient practices, though modernization and sustainable water use face funding and technical challenges. The water and sanitation sectors lag behind, with outdated infrastructure and limited adaptation to changing conditions. While progress is evident, significant gaps remain in aligning sectoral strategies with national climate targets.

The *National Development Plan to 2029* includes medium-term Key Performance Indicators (KPIs) for decarbonization, such as “Maximum greenhouse gas emissions, % (relative to 1990 levels).” These indicators are further broken down into annual targets within the Carbon Budget and the National Carbon Quota Plan. However, the Plan lacks specific metrics for adaptation outcomes.

The inclusion of the *Strategy for Achieving Carbon Neutrality* into the State Planning System as a target-setting document has elevated the climate agenda’s role in shaping Kazakhstan’s strategic vision. All lower-level strategic documents must now align with carbon neutrality goals, ensuring that national policy reflects global trends in sustainable development and climate mitigation. However, as this reform is relatively recent, significant adjustments to existing strategic documents are still needed. This includes revising the National Development Plan, government agency plans, regional plans, and national company plans to align with long-term carbon neutrality goals. Enhanced interagency coordination and the use of digital decision-support tools, including generative AI, can facilitate this process. Peer learning from countries like Ireland, which have robust climate action frameworks, could provide valuable insights for Kazakhstan.

3.3 Subnational government and decarbonization

Kazakhstan’s *Law on Local Public Administration and Self-Government (2001)* established a three-tier system of sub-national governments (SNGs). At the upper level, there are 14 oblasts (regions) and two Republican cities, Almaty and Astana, which hold special status. These are headed by regional governors (regional/city akims) appointed by the president, with regional/city councils (maslikhats) elected by universal suffrage. At the intermediate level, there are 38 cities of regional significance and 177 districts (17 city districts and 160 rural districts). Their executives (akims) are appointed by regional governors (or mayors in the case of city districts), while their councils (city or district maslikhats) are directly elected. The local level includes 47 “cities of district significance” and 2,398 villages and rural communities (auls), along with approximately 4,325 rural settlements.

Sub-national governments in Kazakhstan have a limited legal mandate for climate action, primarily focused on climate adaptation. Local executive bodies are tasked with adaptation planning, assessing climate impacts and local vulnerabilities, and providing this data to the Ministry of Ecology and Natural Resources (MENR). They are also required to develop and implement projects to protect against natural disasters and improve infrastructure, integrating adaptation measures into state and regional

programs. However, these tasks are rarely carried out effectively due to challenges such as limited staff capacity. Mitigation efforts are addressed indirectly; for example, the Environmental Code mandates local executive bodies to conduct inventories of stationary sources of air pollutant emissions and outlines measures to reduce pollutants from vehicles, which indirectly contribute to GHG emission reductions. Comparative analysis shows that granting sub-national authorities a clear mandate in climate policy significantly enhances the effectiveness of climate action.

Horizontal coordination mechanisms in Kazakhstan are limited in effectiveness, highlighting the need for improved cooperation between governance levels to advance climate action. Coordination is hindered by inconsistent policy implementation at the regional level, limited capacity for policy execution in local administrations, and insufficient alignment of regional development plans with national climate goals. This fragmentation results in uneven progress on climate initiatives and underscores the need for stronger interregional cooperation and a unified framework to ensure cohesive climate action across the country.

There are no specialized institutional structures or staff positions dedicated to climate action within local administrations. Only a few departments within local governmental bodies address climate-related functions. **The Department of Natural Resources and Environmental Management**, one of 24 local-level departments, focuses on adaptation through forest and wildlife protection, fire and pest control, and monitoring natural resources to aid ecosystems in adapting to climate change. It also promotes sustainable forest management for carbon absorption and emission reduction. Another department, the **Department of Energy and Housing and Communal Services**, focuses on improving infrastructure and ensuring sustainable gas supply, helping communal systems adapt to climate change. It also supports energy-saving programs and energy-efficient technologies, which have the potential to reduce GHG emissions and support carbon neutrality goals. However, these energy-saving measures are not mandatory at the municipal level.

International experience demonstrates that dedicated local structures can significantly enhance climate governance and resilience. In the United Kingdom, local authorities have climate adaptation teams integrated into planning departments to improve climate resilience. Cities like London and Manchester have dedicated climate offices focused on reducing emissions and improving infrastructure. The Netherlands has implemented Regional Adaptation Strategies (RAS), requiring local governments to appoint climate officers responsible for managing flood risks and promoting sustainable development, supported by national funding and technical assistance. In Australia, cities like Melbourne have climate action offices overseeing the implementation of local climate strategies, with a focus on emissions reduction and renewable energy adoption. Germany employs municipal climate protection managers who coordinate local climate actions in energy efficiency and urban development, contributing to sustainable city growth (Box 4).

There is an urgent need to better integrate climate considerations into regional development planning in Kazakhstan. According to the *Carbon Neutrality Strategy*, national strategies guide central executive bodies, while local governments in regions, sizable cities, and the capital are responsible for implementing sectoral and regional plans for emissions reduction and climate adaptation. However, **implementation at the local level remains inadequate**. Regions such as South Kazakhstan, North Kazakhstan, and Zhambyl face heightened risks from natural disasters, which impact urban planning. Almaty, Kazakhstan's largest city, with a population expected to double

to 4 million by 2040, is particularly vulnerable to earthquakes, mudflows, and hurricanes. **The country's state planning system, which includes five-year Regional Development Plans focused on social infrastructure and investments, lacks specific climate change measures**.

Land use planning in Kazakhstan aims to regulate land relations and ensure rational land use and protection. Article 5 of the *Land Code* mentions adaptation to climate change, but climate considerations are not systematically integrated into land use planning processes. This gap hinders effective land resource management and undermines the country's ability to adapt to climate change impacts.

Sub-national governments in Kazakhstan are not required to monitor, report, and verify GHG emissions or develop subnational GHG inventories. At the local level, environmental considerations are weakly integrated into regional administration, significant cities, and capital city policies. These entities oversee water management, waste management, environmental protection initiatives, and land use regulations. A significant focus is placed on preventing and managing local emergencies, with measures including infrastructure development, population protection strategies, and mobilization readiness to mitigate emergency impacts. Funding for these activities typically comes from national-level annual transfers based on local budget requests. Strategic planning of budget expenditures is guided by territorial development programs, which may be adjusted following assessments of regional vulnerability to climate change, though specific capital investments targeting adaptation were not identified.

3.4 Recommendations to strengthen the institutions responsible for climate mitigation and adaptation

- Enact a dedicated climate law based on international best practices to govern Kazakhstan's climate actions, clarify roles and responsibilities, and improve coordination among climate institutions.
- Reassess the role of the Council on Green Economy to ensure strong political leadership in both climate change mitigation and adaptation efforts.
- Develop new mechanisms for interdepartmental collaboration to improve the coordination and implementation of climate policies, involving the Ministry of Ecology and Natural Resources (MENR) and other relevant ministries, such as the Ministry of Energy, the Ministry of Water Resources and Irrigation, the Ministry of Industry and Construction, and the Ministry of Agriculture.
- Implement training and re-training programs for civil servants in climate policy, strengthen the involvement of climate experts in government structures, and increase capacity by hiring additional staff.
- Finalize and adopt the Roadmap for the Carbon Neutrality Strategy, setting clear timelines and assigning responsibilities. Regularly publish progress reports on its implementation.
- Accelerate efforts to develop and approve a National Adaptation Plan as a dedicated framework for climate adaptation planning.

- Ensure that national development plans and sectoral strategies explicitly incorporate climate change considerations, aligning them with NDCs and the Decarbonization Strategy. Enforce the implementation of these plans to meet climate targets.

- Amend legislation to include climate-related risks in annual fiscal risk reporting, requiring regular updates to reflect changing climate conditions.

- Introduce green budget tagging and tracking mechanisms, starting with a Public Expenditure Review (PER), to transparently track climate-related expenditures, including those that hinder climate action, such as fossil fuel subsidies. Extend this mechanism to state-owned enterprises (SOEs) and subnational governments.

- Revise legislation to mandate the consideration of climate change in infrastructure and asset management. Develop regulatory acts and guidelines to incorporate climate risks into the planning and implementation of infrastructure projects, ensuring compliance at all governance levels.

- Establish clear green and sustainability criteria for public procurement of works, services, and goods, prioritizing key sectors to ensure effective implementation of sustainable public procurement practices.

- Assign clear responsibilities to subnational authorities for contributing to national climate objectives, requiring them to develop and implement strategic plans for decarbonization and climate adaptation.

- Provide grants to support the implementation of local climate change mitigation and adaptation plans.

- Strengthen vertical coordination by including subnational government representatives in relevant councils and working groups.

- Establish a dedicated parliamentary body to oversee the implementation of climate policies.

- Develop a communication strategy to build stakeholder support and public understanding of Kazakhstan's approach to sustainable economic development and climate resilience.

Section 4: Integrated policy strategies for green industrialization in Kazakhstan

The analysis of Kazakhstan's energy and industrial sectors and of the country's current institutional framework identifies several policy recommendations that would support the country's green transformation. An integrated policy strategy for green industrialization should take into account the need for clear plans at the national and regional level, coordination between relevant governmental and public bodies, a process for transitioning to different industrial activities and sources of public revenue, and the need to support the losers from decarbonization.

4.1 Priorities for an integrated policy strategy for green industrialisation

4.1.1. National strategic frameworks and a master plan for decarbonization

Ensure policy coherence with NDC and carbon-neutrality goals.
Align climate, energy, industrial, and fiscal policies in a consolidated framework that reduces regulatory uncertainty and provides clear long-term signals to investors.

Adopt a National Master Plan for Decarbonization.
Develop an integrated roadmap to 2060 that links power sector reform, industrial electrification, transport decarbonization, and green industrialization targets, with explicit milestones and investment needs.

Embed a coal phase-out and energy transition strategy within national plans.
Set time-bound targets for reducing coal's role, expanding renewables and gas (as a transition fuel), and integrating emerging options like nuclear and CCUS, while maintaining energy security.

Develop a national nuclear energy strategy.
Clarify the role of large reactors and small modular reactors in the long-term power mix, including siting, financing models, and alignment with safety and non-proliferation standards.

4.1.2. Renewable and nuclear energy promotion, and coal phase-out

Scale up renewable energy deployment and integration.
Expand utility-scale solar and wind, strengthen forecasting, grid flexibility and digitalization, and accelerate deployment of storage (batteries, pumped hydro, long-duration solutions) to manage intermittency.

Promote distributed generation and household participation.
Reform regulations and tariffs to support household and SME-level generation, net-metering or surplus sales, and local storage solutions, enhancing system resilience and local value creation.

Plan and implement a managed coal phase-out.
Adopt a national coal exit plan with clear retirement timelines, criteria based on age and emissions intensity, and measures to repurpose or retrofit plants, including where viable with Carbon Capture, Utilisation and Storage (CCUS).

Develop a balanced nuclear rollout anchored in safety and public trust.
Combine a long-term nuclear roadmap with robust safety and waste management regulations, transparent independent oversight, and structured public engagement and consultation.

Modernize industrial energy use in fossil-fuel-intensive sectors.
Expand renewables within oil and gas operations, pilot CCUS for enhanced oil recovery, and progressively shift coal use from combustion toward higher-value applications where compatible with decarbonization goals.

Deepen international and private-sector collaboration.
Use clean-energy auctions, co-financed storage projects, and nuclear/renewables partnerships to bring in foreign capital and technology, with strong national regulatory steering.

4.1.3. Carbon quotas and pricing

Consolidate and deepen the Emissions Trading Scheme (ETS)
Expand sectoral coverage, tighten caps, increase the share of paid allowances, and use scientific, data-driven methods to allocate quotas and revise benchmarks in line with best available technologies.

Stabilize and strengthen the carbon price signal.
Introduce a price corridor and a transparent upper price for quotas, reduce overallocation, and ensure the possibility of banking/borrowing to support long-term investment planning.

Extend carbon pricing beyond ETS sectors.
Complement the ETS with a carbon tax or performance-based pricing for non-quota sectors, creating an economy-wide incentive to cut emissions.

Use carbon revenues strategically.
Channel ETS and carbon tax revenues into clean energy infrastructure, industrial greening, and regional just transition funds.

Support market liquidity and project finance.
Align the ETS with international carbon markets, guarantee the purchase of verified decarbonization credits (including from non-ETS projects), and offer efficiency incentives (tax breaks, grants) for operators that overachieve on emissions reductions.

4.1.4. Energy efficiency, monitoring, storage and usage

Raise efficiency standards across sectors.

Strengthen building codes, industrial efficiency norms, and appliance standards; complement regulation with financial incentives for retrofits and energy-saving technologies.

Introduce smart pricing and demand-side management.
Implement time-of-use tariffs and demand-response programs, leveraging digital meters, smart grids and AI-based management tools to shift loads and reduce peak demand.

Invest systematically in energy storage.
Support pilot and large-scale deployment of short- and long-duration storage (batteries, pumped hydro, compressed air, flow batteries) as core infrastructure for a renewable-rich system.

Digitalize the power system for better monitoring and control.
Roll out real-time monitoring, advanced forecasting and grid automation to reduce technical losses, optimize dispatch, and improve system reliability.

4.1.5. Supportive fiscal policies (taxes, subsidies, public finance)

Reform fossil fuel subsidies and subsidise a just green transition.
Gradually phase out inefficient coal and fossil fuel subsidies, while recycling part of the savings into renewable investments, efficiency programmes, and targeted social protection.

Design green-oriented tax and transfer policies.
Introduce or refine carbon taxes and environmental levies where appropriate, while using tax incentives (accelerated depreciation, reduced tax rates, or tax credits) to crowd in private green investment.

Use public finance to de-risk private green investment.
Establish guarantee schemes, concessional credit lines, and guaranteed purchasing mechanisms for verified emission reductions and storage services, particularly in early-stage or higher-risk projects.

Maintain affordability for vulnerable groups.
Pair energy price reforms with direct income support, lifeline tariffs, or targeted subsidies to avoid regressive impacts and sustain public support for the transition.

4.1.6. Technological and industrial upgrading

Foster firm-level low-carbon strategies.
Encourage large emitters and strategic enterprises to adopt decarbonization plans with clear targets, technology roadmaps, and disclosure aligned with national climate goals.

Build domestic green manufacturing capabilities.

Develop industrial strategies and incentives for local production and assembly of renewable energy and storage equipment (solar PV, wind components, batteries), linking to export markets and regional value chains.

Promote high-value and lower-emission uses of coal.
Support R&D and pilot investments in coal gasification, liquefaction and coal-based chemicals, conditional on robust methane management and alignment with overall emission-reduction pathways.

Accelerate deployment of CCUS and methane-reduction technologies.
Pilot CCUS in oil and gas (including enhanced oil recovery), scale up methane capture and utilization in coal and hydrocarbons, and integrate these into regulatory and financial support schemes.

Mainstream digital and efficiency technologies in industry.
Support adoption of smart energy management systems, advanced process control, and electrification of industrial processes to reduce energy intensity and emissions.

4.1.7. Just transition, social protection and public engagement

Design and implement a national just transition framework.
Identify coal-dependent regions and communities, and develop integrated regional transition plans covering employment, infrastructure, SMEs, and social services.

Protect workers and communities in transition.
Establish re-skilling and upskilling programmes, job-creation schemes in emerging green sectors, and targeted income support to cushion job losses and avoid social dislocation.

Create and capitalize regional transition funds.
Use budgetary resources, carbon revenues, and international climate finance to support diversification projects, local infrastructure, and community-led initiatives in affected regions.

Engage the public transparently on energy choices.
Conduct structured consultation and information campaigns on coal phase-out, renewables, and nuclear power; ensure nuclear safety oversight is visibly independent and responsive to public concerns.

Leverage international partnerships for inclusive transition.
Work with development partners, neighbouring countries and private investors to mobilize finance and share best practices on just transition, social dialogue, and participatory planning.

4.2 Coordination between governmental and public bodies

Table 7: Key governmental and public bodies responsible for coordination in forming policies for green industrialization in Kazakhstan

Policy area	Lead governmental & public bodies	Main objectives
1. National strategic frameworks and master plan for decarbonization	Ministry of National Economy; Ministry of Energy; Ministry of Ecology & Natural Resources; Prime Minister's Office / relevant inter-ministerial commissions	Ensure policy coherence; give long-term visibility to investors; align energy, industrial and climate strategies with carbon-neutrality and energy security goals
2. Renewable energy promotion, and coal phase-out	Ministry of Energy; KEGOC and regional grid operators; nuclear safety and regulation authorities; Samruk-Kazyna / Samruk-Energo; Kazakh Invest	Rapidly scale low-carbon generation; manage an orderly decline of coal; diversify the power mix with renewables and nuclear while maintaining security of supply
3. Carbon quotas and pricing	Ministry of Ecology & Natural Resources; Ministry of Finance; Ministry of National Economy; ETS regulator / "Zhasyl Damu" JSC	Create a robust, predictable carbon price signal; drive economy-wide emissions reductions; mobilise domestic resources for clean investment and just transition
4. Energy efficiency, monitoring, storage and usage	Ministry of Industry & Construction (incl. housing/utilities); Ministry of Energy; KEGOC and distribution companies; Ministry of Artificial Intelligence and Digital Development	Reduce overall energy demand; smooth peak loads; improve grid reliability and flexibility; cut system losses and support high shares of renewables
5. Supportive fiscal policies	Ministry of Finance; Ministry of National Economy; Development Bank of Kazakhstan, DAMU Fund and other public financial institutions; Ministry of Labour & Social Protection	Re-align price signals with climate goals; de-risk private green investment; protect vulnerable groups and maintain public support for the transition
6. Technological and industrial upgrading	Ministry of Industry & Construction; Ministry of Energy; national R&D institutes and universities; QazInnovations; Samruk-Kazyna portfolio companies (KazMunayGas, QazaqGaz, Samruk-Energo, metals SOEs); Ministry of Artificial Intelligence and Digital Development	Move industry up the value chain; cut energy and carbon intensity; build domestic capabilities in green technologies and services; preserve competitiveness in a low-carbon world
7. Just transition, social protection and public engagement	Ministry of Labour & Social Protection; Ministry of National Economy and regional akimats; Ministry of Energy; Ministry of Ecology & Natural Resources; Prime Minister's Office; social partners and civil society councils	Protect workers and communities; ensure social cohesion and political viability of the transition; enable bottom-up participation and trust in long-term energy and climate policies

4.3 Regional and multilateral cooperation for green industrialization

Kazakhstan's strategic position as a regional energy hub—handling gas transit from Turkmenistan and Uzbekistan while expanding non-Russian export corridors through the

Middle Corridor—provides a unique platform to advance green industrialisation through Central Asian, Chinese and Turkish partnerships[25].

Central Asia Regional Cooperation

Kazakhstan should lead a regional green industrial platform anchored in the 2026 Regional Environmental Summit in Astana[26], building on existing energy infrastructure synergies. QazaqGaz is already managing the Beineu-Bozoy-Shymkent (BBS) Main Gas Pipeline, the second section of Kazakhstan-China Gas Pipeline. Joint ventures could develop shared renewable manufacturing clusters (solar PV, wind components, battery storage) across Kazakhstan, Uzbekistan and Kyrgyzstan, leveraging Kazakhstan's mineral wealth and Uzbekistan's solar potential. A Central Asian Bureau for Best Available Techniques (BAT)—proposed by IGTIPC [27] —could harmonise environmental standards and facilitate cross-border technology transfer. Regional cleantech accelerator programmes, such as UNIDO's Global Cleantech Innovation Programme[28] can support mobilisation of blended finance for green technologies.

Cooperation with China.

Kazakhstan's Atasu-Alashankou oil pipeline and eastward gas routes position it as a key Belt and Road partner for green industrial upgrading. Joint initiatives with Chinese firms could localise production of solar modules and EV batteries in Atyrau or Almaty, using Kazakhstan's lithium, copper and rare earths[29]. Public-private partnerships under the China-Kazakhstan Green Industrial Zone could mirror successful models like the Khorgos dry port, with technology transfer for CCUS deployment in Kashagan and Tengiz fields to support China's net-zero supply chain requirements.

Partnerships with Turkey

Turkey's growing role as a Middle Corridor logistics hub offers opportunities for green manufacturing collaboration. Astana and Ankara could establish a Turkey-Central Asia Green Technologies Corridor, co-locating Turkish wind turbine and hydrogen electrolyser production with Kazakh mineral processing. Turkish expertise in grid flexibility and energy storage—demonstrated in its own renewable expansion—could support KEGOC's grid modernisation, financed through joint investment funds and frameworks developed by the Organization of Turkic States.

[25] https://unctad.org/system/files/information-document/unda2030d21-kazakhstan-green-transformation_en.pdf
[26] https://astanatimes.com/2023/06/aif-president-tokayev-proposes-to-hold-regional-climate-summit-in-kazakhstan-in-2026/
[27] https://igtipc.org/en/2025/08/01/9246/
[28] https://igtipc.org/en/2025/09/03/9384/
[29] https://qazinform.com/news/oecd-kazakhstan-is-a-key-partner-in-regional-reform-and-green-growth-9eb832

Working with regional development banks

Kazakhstan can also leverage regional development banks more systematically to support green industrialisation. By deepening its engagement with institutions such as the Islamic Development Bank and the Asian Infrastructure Investment Bank, Kazakhstan can access concessional and blended financing for renewable energy, green industrial clusters, grid modernisation and just transition programmes. These banks can co-finance large-scale cross-border projects along the Middle Corridor and within Central Asia, helping to de-risk private investment and align regional infrastructure with low-carbon development objectives.

Kazakhstan has established a solid track record of cooperation with the Islamic Development Bank (IsDB) the Asian Infrastructure Investment Bank (AIIB) and the European Bank for Reconstruction and Development (EBRD) which can be scaled up for green industrialisation.

Islamic Development Bank (IsDB)

In November 2024, at COP29 in Baku, Kazakhstan signed a landmark USD 1.15 billion agreement with IsDB[30]—the bank's largest ever project—for a "Climate-Resilient Water Resources Development" programme, managed by the Ministry of Water Resources and Irrigation. This includes USD 3.5 million in grants for R&D, marking IsDB's strategic focus on Kazakhstan's climate adaptation and sustainable infrastructure.

Asian Infrastructure Investment Bank (AIIB)

AIIB has been a key partner in Kazakhstan's renewable energy expansion. It financed the USD 100 million Zhanatas Wind Farm (100 MW, operational since 2021, abating ~250,000 tons CO_2/year) and the USD 36 million Shokpar Wind Power Plant (100 MW, Zhambyl region, co-financed with EBRD, Green Climate Fund and Clean Technology Fund)[31]. In January 2025, AIIB approved a 220 MW CPIH Kazakhstan Wind Portfolio (five wind farms), bringing its total approved investment in the country to over USD 836 million[32]. AIIB's focus on renewables, grid integration and energy transition aligns with Kazakhstan's carbon neutrality goals.

European bank for Reconstruction and Development (EBRD)

Kazakhstan works closely with the EBRD to expand green energy through large-scale renewables, blended finance and efficiency programmes. The Bank has financed major wind and solar plants such as the 100 MW Shokpar wind farm[33] and projects under its Kazakhstan renewables framework[34], helping add several hundred megawatts of low-carbon capacity and avoid substantial CO_2 emissions. Through KazREFF and the Green Economy Financing Facility, it channels concessional and commercial funds via

[30] https://theislamiceconomist.org/sustainability-climate-change/islamic-development-bank-invests-1-15-billion-in-kazakhstan-water-sector/
[31] https://www.aiib.org/en/news-events/media-center/blog/2024/AIIB-Role-in-Driving-Kazakhstan-Energy-Transition.html
[32] https://www.aiib.org/en/projects/details/2025/approved/Kazakhstan-CPIH-Kazakhstan-220MW-Wind-Portfolio.html
[33] https://www.ebrd.com/home/news-and-events/news/2023/ebrd-helps-kazakhstan-add-100-mw-of-renewable-energy-capacity.html
[34] https://www.greenclimate.fund/project/fp047

local banks[35] to support energy-efficient technologies and small renewables for firms and households. The EBRD also backs coal-to-gas conversions, cleaner district heating and hybrid wind–solar projects[36], linking green power expansion to broader goals like modernising infrastructure and developing the Middle Corridor[37].

Lead Institutions and Next Steps

The Ministry of National Economy and Kazakh Invest should coordinate these initiatives under the "Middle Corridor" green industrialisation pillar, working with Samruk-Kazyna[38] (for SOE-led projects) and IGTIPC (regional cleantech diplomacy). Kazakhstan should propose a regional agreement to harmonise standards and undertake joint procurement, and a regional investment fund capitalised for example by national development banks, regional MDBs and China's Silk Road Fund.

Through this targeted regional and bilateral cooperation, Kazakhstan can use its transit infrastructure advantage to support green industrial development, creating high-value jobs, reducing import dependence, and positioning itself as a regional leader in sustainable value chains.

These recommendations provide a comprehensive roadmap for transforming Kazakhstan's power sector, fostering sustainability, and achieving decarbonization goals through innovative technologies, regulatory reforms, and targeted investments. A balanced approach that integrates renewables, nuclear power, and energy efficiency measures will position Kazakhstan as a leader in sustainable energy within Central Asia.

Success will depend on strong collaboration between the government, industry, and financial institutions to create a favorable environment for investment and innovation in decarbonization technologies, while supporting vulnerable populations and fostering inclusive growth.

Section 5: Financing decarbonization and green transformation

5.1 Public institutions and climate finance

In Kazakhstan, **climate change considerations are not systematically integrated into the public financial management system**. Although a significant portion of public funds are spent directly or indirectly on climate-related initiatives, there is no requirement to tag or track climate-related expenditures during budget formulation or medium-term financial planning. The system is in its early stages of developing the necessary foundations for effective climate expenditure tracking.

[35] https://ebrdgeff.com/kazakhstan/kk/ebrd-geff-backed-green-investments-in-kazakhstan-reaches-important-landmark/
[36] https://www.ebrd.com/home/work-with-us/projects/psd/55785.html
[37] https://astanatimes.com/2026/01/ebrd-supports-expansion-of-renewable-energy-and-logistics-infrastructure-in-kazakhstan/
[38] https://sk.kz/ar2024/

Key components, such as sectoral strategies for climate adaptation and decarbonization, a structured budget program, a process for reviewing the climate impacts of expenditures, and an institution responsible for regular reporting on climate-related spending, **are still being established**. Furthermore, **public sector accounting rules** lack mechanisms for tracking and measuring financial and non-financial transactions related to climate change, nor do they mandate the disclosure of such information in annual financial statements. As a result, there is no transparent or systematic approach to managing climate finance at the national level, making it difficult to monitor and evaluate the effectiveness of funds allocated to climate initiatives and hindering evidence-based policy decisions.

Climate-related risks are included in the government's fiscal risk reporting, but there is no legal obligation to consider them. The Kazakh government submits a report on budget risks and the long-term sustainability of public finances alongside the draft state budget law. The 2022 report, *Analytical Report on Fiscal Risks and Long-Term Sustainability of Public Finances to 2050*, examines a carbon neutrality scenario, projecting **slower economic growth until 2032 due to the transition to low-carbon pathways, followed by recovery** driven by private investments and increased foreign green investment. However, this scenario also anticipates a **widening budget deficit due to higher decarbonization expenditures**.

While the *Concept of Public Finance Management until 2030* emphasizes the importance of identifying and analyzing budget risks for long-term fiscal sustainability, it does not explicitly address climate-related risks. Additionally, there is no publicly available information on whether banks and insurance companies are conducting disaster risk assessments, which could help manage cluster risks for the public sector. Significant **fiscal risks also arise from the large state-owned enterprise sector, particularly in the energy industry, where transition risks remain unmanaged.**

Although the budget includes **contingency reserves for natural disasters**, there are no clear guidelines for emergency budget operations. The Civil Protection Law establishes contingency reserves at both national and local levels, including a national reserve fund for post-disaster livelihood support and reserves managed by the Committee of Emergency Situations for disaster response and recovery. Local government reserves are capped at 2% of relevant budget revenues. However, these funds are often insufficient, leading to mid-year budget reallocations. Moreover, emergency-related expenditures lack transparency and cannot be effectively tracked, further complicating disaster response efforts.

Kazakh legislation does not require climate change considerations in the public investment cycle. **There is no mechanism to assess the climate impact of public investments or prioritize projects based on their contribution to climate goals**. This gap is particularly concerning given the need for increased green public investment in clean energy, infrastructure, and end-use sectors to achieve net-zero emissions. While critical infrastructure has been identified in the context of information security, there is an urgent need to expand this focus to include climate resilience. Developing a comprehensive approach to climate-resilient infrastructure planning and prioritization is essential to ensure the long-term sustainability and security of key assets.

The new ***Public Procurement Law*, signed on July 1, 2024,** and effective from January 1, 2025, marks the first steps toward **sustainable public procurement**. The law emphasizes the acquisition of goods, works, and services that optimize budget funds

throughout their life cycle while addressing social, economic, and environmental objectives. However, to effectively mitigate climate change impacts through public procurement, a detailed taxonomy is needed to clearly define which works, services, and goods qualify as green.

Green financial instruments in Kazakhstan's public sector are still in their early stages, though progress has been made in the private sector. Legal frameworks for green financing, a taxonomy for green projects, and rules for issuing non-government bonds have been established. **As of March 2024, cumulative green finance since 2020 amounted to KZT 277.8 billion (USD 580 billion), including green bonds (50.2%), social bonds (33.5%), and green loans (16.3%).** The Damu Entrepreneurship Development Fund has supported 102 green projects, providing subsidies totaling KZT 223 billion and guarantees worth KZT 1.4 billion for renewable energy and hydroelectric power projects. Established in 1997, the Damu Fund plays a key role in financing micro, small, and medium enterprises for sustainable development.

Kazakhstan has not leveraged taxes extensively to influence GHG emissions or promote environmental outcomes. While the climate agenda is outlined in the *Concept for Green Economy (2013)*, the *National Development Plan 2025*, and the NDCs within the Environmental Code, the tax regime includes numerous exemptions. For example, coal is excluded from the tax base, and certain fuel types are effectively exempt. Other environment-related taxes, such as road taxes, are not assessed for their contribution to environmental objectives. Additionally, revenues from environmental fees are absorbed into the general budget rather than being used in a targeted manner to address environmental challenges.

Kazakhstan lacks a comprehensive **Disaster Risk Financing and Insurance (DRFI) framework**. Given the increasing risk of extreme climate-related events, establishing a robust DRFI mechanism with a suitable mix of instruments would be highly beneficial. For instance, the SFRARR Central Asia disaster risk assessment indicates that fluvial floods alone could erase nearly 2% of the country's GDP, placing a significant burden on the government. A well-designed DRFI framework would help mitigate these risks and enhance resilience to climate-related disasters.

5.2 Green finance scenario

The cost of achieving Kazakhstan's NDC target of reducing greenhouse gas emissions to 15% below 1990 levels by 2030[39]

The decarbonization scenario illustrates Kazakhstan's long-term development within the framework of global and national climate policies, analyzing economic, environmental, and technological parameters. These include real GDP growth, employment, investments, household income, the deployment of new capacities in the energy and industrial sectors, energy and material consumption levels, greenhouse gas emissions, and more.

[39] https://unfccc.int/sites/default/files/2025-11/NDC_Kazakhstan%203.0%20eng.pdf

The calculations were performed using a comprehensive suite of modeling tools, including the CGE-KAZ macroeconomic model, the TIMES-KAZ energy system model, and several sectoral models developed through system dynamics approaches. These tools encompass Kazakhstan's entire economy and enable the assessment of the effects of new policies and measures.

The modeling results reveal the dynamics of the average cost of emissions reduction over five-year intervals from 2026 to 2060.

Table 8. The average cost of emissions reduction, 2026-2060

Period	**2026-2030**	**2031-2035**	**2036-2040**	**2041-2045**	**2046-2050**	**2051-2055**	**2056-2060**	**Average cost of reduction**
Cost (USD/tCO_2e)	27.2	39.1	51.0	74.6	85.4	81.0	79.4	69.5

The cost dynamics are influenced by several factors. In the initial stages of decarbonization (2026–2030), costs are relatively low due to the availability of economically efficient measures such as energy efficiency improvements, the adoption of renewable energy sources, and the modernization of existing industries. These measures require comparatively smaller investments and yield rapid results.

In subsequent periods (2031–2045), costs rise as the most accessible options are exhausted, necessitating the deployment of more complex and capital-intensive technologies. Examples include carbon capture, utilization, and storage (CCUS) systems, hydrogen technologies, and extensive modernization of industrial sectors. These technologies demand substantial initial investments and adjustments to infrastructure, driving up the average cost of reduction.

The peak cost, $85.4 per ton of CO_2, occurs during the 2046–2050 period. This reflects the need to address structural challenges, such as transitioning the entire energy system to carbon-neutral sources and fully replacing industrial capacities. These efforts often involve significant economic costs at the macroeconomic level, including the need to address social aspects such as retraining workers and supporting regions reliant on carbon-intensive industries.

Post-2050, the cost of reduction decreases slightly, driven by accumulated experience in deploying carbon-neutral technologies, reductions in their costs due to scaling, and the benefits of prior investments in infrastructure and innovation. However, costs remain high ($81.0 per ton in 2051–2055 and $79.4 per ton in 2056–2060), as efforts focus on achieving residual emissions reductions, particularly from hard-to-abate sources such as agriculture and certain industrial sectors.

The theoretical foundation for this cost trajectory is based on the concept of marginal abatement costs, which posits that initial measures can be implemented at low costs, while subsequent reductions require significantly more resources. Additionally, the technological learning curve demonstrates that new technologies are initially expensive to implement but become more cost-effective as they scale and expertise grows. Similarly, investments in R&D and infrastructure create favorable conditions for more cost-efficient emissions reductions in the long term.

These estimates underscore the need for precise planning of investment efforts to achieve climate targets. The calculated cost of emissions reduction, derived from decarbonization scenarios, provides a realistic view of the required resources and serves

as a guideline for strategic planning. At the same time, it is important to consider that actual costs may vary depending on factors such as the availability of technologies, their degree of localization, changes in global carbon markets, and mechanisms for international support.

Moreover, the approach of progressively increasing ambition creates opportunities to develop long-term financial strategies. These strategies should include attracting private investments, leveraging international financial mechanisms, and integrating decarbonization into national budgetary policies. The development of a comprehensive financing framework will not only enable Kazakhstan to achieve its stated goals but also foster economic growth, advance high-tech industries, and create new jobs.

To estimate the investment needed to achieve NDC unconditional goal we must keep in mind that there are several factors likely to contribute to an increase in greenhouse gas emissions in the country. As part of President Kassym-Jomart Tokayev's Address to the Nation of Kazakhstan, titled "The Economic Course of a Fair Kazakhstan," the government has been tasked with doubling the GDP by 2029, reaching $450 billion. This objective necessitates an annual economic growth rate of 6%. It is estimated that, in the context of Kazakhstan, a 1% increase in GDP leads to a 0.5% increase in electricity demand. Thus, **the annual growth in electricity production must be at least 3%. Moreover, the government plans to construct three new thermal power plants within the next 5-7 years.** Considering these and other factors, it can be anticipated that greenhouse gas emissions will rise, necessitating more proactive measures to achieve the unconditional NDC target.

To achieve the NDC target of reducing greenhouse gas emissions by 15% by 2030 compared to 1990 levels, it is estimated that a cumulative reduction of 756.4 million tons of CO2 emissions will be required between 2026 and 2030. Based on the previously provided cost of **$27.2** per ton of CO2 equivalent for emission reductions, *the total investment needed is estimated at* ***$20.7 billion USD***. This reflects the financial resources required to meet the emission reduction goals outlined in the NDC.

5.3 Sources of financing

State Budget Funding

Even though climate change issues are highly relevant to the country, and a number of measures are being implemented in this area, there is no single methodology for the creation of a climate budget and climate-related expenditure monitoring is not carried out.

To overcome this difficulty, a climate labeling procedure has been used to estimate the climate share of state budget spending. Climate labeling entails identifying both direct costs, directly aimed at the implementation of environmental issues, as well as indirect costs, aimed at the implementation of directions other than climate, but having an environmental impact in the future.

Total climate linked spending is defined as expenditures across all budget programs that have both direct and indirect positive impact on climate change and the environment. Within this category, strict climate spending represents expenditures associated with budget programs that make a direct contribution to climate change response based on

the information available. Strict climate spending therefore represents the costs directly related to responding to climate change and can be considered to represent a minimum level of climate spending.

In addition to strict climate spending, the state budget includes activities that may be expected to have an indirect impact on climate change and simultaneously perform additional functions. For example, infrastructure development, food security, etc.

To understand the climate relevance of different kinds of state budget expenditure, a weighting exercise has been applied across 12 areas of government budget spending:

- Public services of a general nature.
- Defense.
- Public order, security, legal, judicial, penitentiary activities.
- Education.
- Healthcare.
- Social assistance and welfare.
- Department of Housing and Utilities.
- Culture, sports, tourism and information space.
- Fuel and energy complex and subsoil use.
- Agriculture, water, forestry, fisheries, specially protected natural areas, protection of the environment and wildlife, land relations.
- Industry, architectural, urban planning and construction activities.
- Transport and communications.
- Other.

As indicated in the table below, four weighting filters – high relevance, medium relevance, low relevance, and marginal relevance – have been applied to climate-linked state expenditure data to produce a total state budget climate spending estimation. Each relevance level corresponds to a weight on the scale of 0-100%, indicating the proportion of the expenditure to be counted as climate according to the judgment of the author based on stakeholder consultations.

Table 9. Climate Relevance Weighting

Level	Weights	Rationale
High relevance	Weighting more than 70%	Clear primary objective of delivering specific outcomes that improve climate resilience or contribute to mitigation
Medium relevance	Weighting between 50% to 70%	Either (i) secondary objectives related to building climate resilience or contributing to mitigation, or (ii) mixed programs with a range of activities that are not easily separated but include at least some that promote climate resilience or mitigation
Low relevance	Weighting between 20% - 50%	Activities that display attributes where indirect adaptation and mitigation benefits may arise
Marginal relevance	Weighting less than 20%	Activities that have only very indirect and theoretical links to climate resilience

These weightings are defined as follows:

High relevance climate-linked expenditure. This category represents from 15% to 30% of the total climate-linked expenditures. It includes expenses that are considered highly relevant to addressing climate change. These expenditures likely involve substantial investments in initiatives, projects, or policies directly aimed at mitigating greenhouse gas emissions, adapting to climate impacts, promoting renewable energy, or implementing sustainable practices.

Medium relevance climate-linked expenditure. This category accounts for 20-30% of the total climate-linked expenditures. It encompasses expenses that have a moderate level of relevance to climate-related efforts. These expenditures may involve investments in activities such as research and development of climate solutions, capacity-building initiatives, policy formulation, or supporting climate education and awareness programs.

Low relevance climate-linked expenditure. This category comprises 12-16% of the total climate-linked expenditures. It includes expenses that are considered to have a lower level of relevance in the context of climate change. These expenditures may involve funding for activities that have some connection to climate, but their direct impact or contribution to climate mitigation or adaptation efforts may be relatively minor.

Marginal relevance climate-linked expenditure. This category makes up the largest portion, representing 30-45% of total climate-linked expenditures. It includes expenses that are considered to have minimal relevance to climate-related initiatives. These expenditures may involve peripheral or tangential costs that are indirectly related to climate change, such as administrative expenses, general overheads, or costs associated with activities that have limited direct impact on addressing climate challenges.

The analysis indicates that **between 2019-2023 4.1 – 4.9% of state budget funds are directly or indirectly related to climate finance relevant activities ($1.6-$2.4b).** However, as mentioned previously, the country's budget system, as well as spending planning, is not fully focused on climate change. Budget programs are based on the needs of a particular sector, often without considering relevant expected climate change and its consequences. So, for example, while the infrastructure category forms a large part of Total Climate Linked Spending, it is difficult to argue that the construction of facilities such as schools, kindergartens, and hospitals necessarily incorporate climate related components, building insulation standards, energy efficiency of heating / cooling and flood resistance. As such, a conservative estimate (marginal or low relevance weight) of how much of this infrastructure spending incorporates climate elements is applied.

The analysis indicates that despite the rapid growth of climate-related spending, the share of the net climate budget, which represents high-relevance spending aimed at enhancing climate resilience or mitigating climate change, has remained relatively stable. Over the same period, **the net climate budget increased from $1b (2.8% of all budget expenditures) to $1.6b (3.2%) in 2023.**

Since the net climate budget relates to the primary objective of implementing specific actions that enhance climate resilience or actively aid in mitigating climate change, this analysis is directed towards scrutinizing this sector of government budget allocations.

In contrast, the net climate change budget reflects identifiable costs associated with climate change and a high relevance weight is applied to this expenditure. The net

budget category mostly includes financial resources allocated during that year to combat climate change, support sustainable initiatives, and invest in projects aimed at reducing greenhouse gas emissions, adapting to the impacts of climate change, and promoting renewable energy sources.

Currently, the law on the republican budget for 2023-2025 is in force, within the framework of which the following budget expenditures have been approved:
2024: $44.9 billion.
2025: $47.0 billion.
2026: $54.1 billion

Considering that over the last four years, the average climate-linked spending as a percentage of total budget commitment was 4.58%, with net climate budget accounting for 2.9%, we can estimate the expected net climate spending for the upcoming years as follows:
2024: approximately $1.30 billion.
2025: approximately $1.36 billion.
2026: approximately $1.57 billion

The expected volume of climate expenditures from the budget by 2030 therefore amounts to approximately $9.8 billion by 2030. As not all climate expenditures are tied to the execution of the NDC (averaging 14.2% of climate expenditures for the period 2019-2023), **it is anticipated that only $1.4 billion will be specifically earmarked for NDC implementation by 2030**.

Private Sector Funding

Domestic Private Investment

In addition to state budget data, Kazakhstan maintains statistical records relating to various climate related expenditure indicators. These indicators show the allocation of private sector funding associated with environmental preservation, encompassing efforts directed at climate change mitigation and adaptation. Two categories of environmental spending are measured – current environmental costs, which relate to operational expenses, and investment in fixed assets.

The current environmental costs category represents expenses incurred by enterprises and organizations in carrying out environmental related activities linked to the operation of technological processes and industries, as well as for the maintenance and operation of machinery and equipment that are designed and operate in order to prevent, reduce, clean (recycle) and / or eliminate pollutants (products).

During 2022 these environmental-linked expenditure amounted to $540.5 million reflecting an increase in spending of 12% denominated in national currency from 2019 to 2022 but a fall of 6.6% when measured in US dollars.

Two thirds of these funds were directed to the traditionally industrial regions of: Atyrau region (19.8%), Aktobe region (14.3%), Karaganda region (11.6%), Pavlodar region (10.6%), East Kazakhstan region (10.2%).

In terms of economic activity, 95.6% of these current environmental protection costs linked to industrial sectors –

The main source of financing for undertaking these environmental protection expenses were firms' own funds (92.1% at the end of 2022), with 'other funds' accounting for 6.7% of funding and state budget funding support only representing 1.2% of total spending.

The second category of environmental spending, investments in fixed assets, represents spending in the acquisition of fixed assets aimed at preserving and restoring the environment. Spending in this area decreased significantly over the period 2019 to 2022, amounting to $346.8 million during 2022.

At the end of 2022, one half of these fixed asset investments were directed towards environmental activities related to the "green economy" – 27.2% for wastewater treatment, and 23.9% for air protection and climate change issues. The remaining investment related to activities such as the protection and rehabilitation of soil, groundwater and surface water (7.1%), waste management (5.5%), and conservation of biodiversity and habitat (1.2%), etc.

In a regional context, Atyrau region became the leader in terms of investments in fixed assets aimed at environmental protection (27.8%), followed by Zhambyl region (12.3%), Akmola region (9.1%), Shymkent (8.7%), Karaganda region (8.2%) and Astana city (6.8%).

Most of the investment went into industry: 85.4% in total. 62.7% was in electricity, gas, steam, hot water and air conditioning, 19.3% in mining and quarrying, 1.9% in manufacturing, and 1.5% in water supply, waste and clean-up services. A further 10.0% went to public administration, defense and social security, and 3.2% to construction.

In similar fashion to environmental protection costs, the main source of financing for investments in fixed assets was own funds (51.1%), followed by other funds (38.9%) and budget funds (10.0%).

In general, the share of investment targeted at protecting the environment across the total volume of investments in fixed capital fluctuates around 1.0%. Separately, it should be noted the costs aimed at eliminating natural emergencies and their consequences increased by 44.5% over the period 2019-2022, from $12 million to $17.4 million.

The main recipient regions of those funds were Almaty city (58.7%), Akmola region (8.5%), Almaty region (8.1%), Karaganda region (6.2%).

Additionally, according to Damu, from 2010 to 2022 green support has been provided to businesses in the form of subsidies, loan guarantees, and credit guarantees for 141 projects, totaling 150.4 billion tenge or $326.6 million. However, detailed data on specific years and projects are not available.

It is very difficult to determine the expected volume of private investment resources, since the sources of these resources are more than 2 million business entities. Therefore, we assume that future dynamics of private sector climate investment will follow a similar trajectory to historic levels.

Foreign Direct Investment

Kazakhstan continues to be the top investment hotspot in Central Asia, attracting about 70% of the region's total FDI. The surge in FDI in Kazakhstan primarily stems from

increased investment in sectors such as mining, transportation, finance, telecommunications, and energy.

According to the National Bank of Kazakhstan, in 2023, the gross inflow of FDI amounted to USD 23.4 billion, which is 16.9% or USD 4.8 billion less than the figure for 2022 (USD 28.2 billion). This decrease is largely due to a reduction in investments in the mining industry, which decreased by 30.3% or USD 3.7 billion. A significant decline occurred in the oil and gas extraction sector, where investments fell by 41.5% or USD 3.9 billion Despite this, the mining and quarrying sector still holds the largest share of the gross FDI inflow - 36% or USD 8.4 billion. Of this amount, USD 5.6 billion was directed towards the extraction of crude oil and natural gas.

The decline in FDI in the metallurgical industry continues, with investment volumes decreasing from USD 4.2 billion to USD 2.8 billion. Moreover, compared to 2022, there was a significant drop in investments in the professional, scientific, and technical activities sector - by 69.8%, amounting to USD 875.1 million, as well as in the electricity and gas sector, where the decrease was 37% or USD 235.7 million.

Among the top sectors by investment volume are also the manufacturing industry (USD 5.4 billion or 23%).

The least attractive sectors for foreign investors are the water supply sector (USD 10.3 million or 0.04% of the total FDI volume) and agriculture (USD 49.5 million or 0.2%).

The FDI source structure also shifted: the US share dropped from 18% to 4% (from USD 5.1 to 1 billion), and the Netherlands' share from 30% to 25.6% (from USD 8.5 to 6 billion), while inflows from Russia (+USD 1.3 billion) and the UAE (+USD 452.1 million) increased, making Russia the second-largest investor with a 12.3% share. Overall, FDI is highly concentrated, with 68% coming from seven countries (Netherlands, Russia, Switzerland, China, South Korea, the US and Belgium). Regionally, Almaty became the main FDI destination in 2023, overtaking Atyrau after the completion of the peak investment phase in the Tengiz expansion project.

One may reasonably assume that all investment into electricity, gas and steam and plus a proportion of three categories – agriculture, forestry & fishing (10%), water, wastewater & solid waste (50%), and transport (10%) – may be associated with NDC activities. These assumptions enable an approximate estimation to be made of the amount of FDI that may be expected to contribute towards achieving NDC goals as presented in the table below.

Table 10. Climate Related total FDI inflows ($M)

	2019	2020	2021	2022	2023
Agriculture	1.5	0.9	3.6	3.2	4.9
Electricity, gas, steam	249.3	134.6	225.6	635.6	399.9
Water supply	13,5	21,4	5,5	5,8	5,1
Transport	110.5	89.7	101.5	116.5	113.4

Overall	374.8	246.	336.2	761,1	523.3

As can be seen from the summary table above, most FDI is directed at the energy sector (on average 76.4% of all FDI inflows) while the transport sector accounts for 21.7% of climate FDI inflows, and the remainder is targeted at the agriculture and water sectors. The nature of Foreign Direct Investment (FDI) is inherently volatile, and fluctuations are common, making it challenging to accurately forecast FDI dynamics. Additionally, in this context, the share of climate-related investments was determined through expert judgment by assigning weights to sectoral categories of investments. To fully understand the volumes of climate-related FDI, a detailed analysis at the project level is required, which involves non-public data. Therefore, it is reasonable to assume that the average level of climate-related FDI up to 2030 will roughly correspond to the levels observed over the past five years.

5.4 Investment needs to reach NDC objectives

As discussed above, the necessary financial resources to achieve the goals of the NDC has been estimated to amount $20.7 billion by 2030.

Based on the planned volumes of budget expenditures for 2024-2026 and the average value of net climate expenditures for 2019-2024, the potential volume of **climate financial resources from the state budget was calculated to be approximately $9.8 billion by 2030.** However, it is crucial to note that this expenditure, while climate-related, may not necessarily align with the NDC target indicators. When considering state budget allocations within these specific domains, by using the average shares of budget allocations of 2019-2023 to NDC domains, the combined total amounts **to $1.4 billion by 2030.**
If we assume that the future trend of climate expenditure and private sector investments continues as observed in the analyzed period, it can be expected **that the total volume of accumulated domestic private funding will amount to approximately $4.0 billion by 2030.**

If climate-related FDI received by Kazakhstan's economy follows the average trend of the past four years, amounting to $395 million annually, the anticipated total volume of climate-related FDI would sum to $2.8 billion.

According to the announced and planned projects / programs of international organizations, the cumulative volume **of ODA support will amount to approximately $0.9 billion by 2030.**

Thus, the total volume of available financial resources expected by 2030 is estimated at $9.1 billion, while the investment gap required to meet the outlined targets amounts to $11.6 billion. This significant shortfall highlights the need for additional funding mechanisms and strategic investments to bridge the gap and ensure the achievement of climate and sustainability goals by 2030.

5.5 Barriers to the financing decarbonization

Kazakhstan faces significant barriers in addressing climate change, particularly in the areas of financial planning, risk management, and access to international funds.

Limited Institutional Capacity

The institutional framework in Kazakhstan struggles to integrate environmental, social, and climate considerations into financial planning and public debt management. This results in climate risks not being adequately accounted for in economic policies and fiscal strategies. Additionally, there is a lack of trained personnel and technical expertise within governmental agencies to address these issues comprehensively.

Policy Implementation.
Even when climate policies are in place, there is often a gap between policy formulation and implementation due to limited institutional capacity. This includes a lack of monitoring and evaluation systems to track progress and make necessary adjustments.

Challenges in the Local Financial Sector.
The local financial sector, including banks and investment firms, lacks the necessary tools and methodologies to effectively screen and mitigate climate risks. This includes a shortage of risk assessment frameworks that incorporate climate variables, leading to inadequate consideration of climate impacts in lending and investment decisions. There is also a limited availability of green finance products, such as green bonds and loans, which are essential for funding climate projects. This restricts the flow of capital towards sustainable initiatives.

Lack of Mechanisms for Climate Considerations in PPPs.
The mechanisms to integrate climate change considerations into Public-Private Partnerships are underdeveloped. This means that climate risks and opportunities are often overlooked in the planning, design, and implementation of PPP projects, which can result in projects that are not resilient to climate impacts or that fail to contribute to climate mitigation and adaptation goals. The regulatory framework for PPPs does not mandate the inclusion of climate risk assessments or sustainability criteria, leading to a lack of focus on climate resilience and sustainability in these projects.

Constrained Access to International Climate Funds Kazakhstan's ability to tap into international climate funds, such as the Green Climate Fund, is constrained by institutional and procedural challenges. This includes a lack of familiarity with the application processes, insufficient project preparation and proposal development capabilities, and inadequate coordination among national entities involved in climate finance. The institutional capacity to manage and effectively utilize international climate funds is limited. This involves both administrative capabilities to handle the funds and technical skills to design and implement projects that meet the stringent criteria of international climate finance mechanisms.

5.6 Recommendations for Strengthening Climate Finance and Investment Frameworks

Develop Comprehensive Climate Finance Strategies
Establish clear frameworks to integrate climate goals into national investment plans, ensuring alignment with the NDC Roadmap and sectoral priorities. This will enhance transparency, accountability, and the efficient allocation of resources for climate initiatives. Conduct climate analytics to assess current impacts, vulnerabilities, and risks, and integrate these findings into economic and financial analyses to prioritize investments.

Strengthening Climate Risk Integration in Public Financial Management
Incorporate climate risk assessments into strategic planning and budgeting processes to identify vulnerabilities and prioritize investments in resilient infrastructure and sustainable practices. Implement climate budget tagging to track expenditures and align them with national climate objectives. Develop guidelines for integrating climate risks into infrastructure planning and asset management at all government levels.

Establish Effective Carbon Pricing Mechanisms
Introduce a robust carbon pricing system, including an emissions trading system (ETS) and carbon taxation, to incentivize emission reductions and attract private investment in green technologies. Ensure progressive tightening of benchmarks, paid quota allocation, and alignment with international carbon markets to drive decarbonization. Develop a unified digital ecosystem for carbon regulation and strengthen monitoring, reporting, and verification systems.

Promote Green Public Procurement
Mandate the inclusion of climate criteria in public procurement processes, develop guidelines for sustainable procurement, and provide training for civil servants. Implement monitoring systems to ensure compliance with green standards and promote sustainable solutions. Introduce minimum environmental criteria for public tenders and establish a reporting mechanism to assess the application of green procurement practices.

Enhance Private Sector Engagement in Climate Action
Introduce mandatory ESG reporting and align Kazakhstan's green taxonomy with international standards to improve transparency and attract climate-conscious investors. Develop unified non-financial reporting requirements to ensure consistency and reliability in sustainability disclosures. Extend ESG reporting requirements to companies with foreign participation and provide methodological guidance for identifying and managing ESG risks.

Use Subsidies and Tariffs to Facilitate Renewable Energy Development
Reform subsidies and tariffs to create an investment-friendly environment for renewable energy projects. Simplify procedures for connecting renewable energy facilities to the grid and develop legislative frameworks for energy storage systems and bilateral renewable energy contracts. Implement pilot projects for renewable energy with energy storage systems and establish clear rules for bilateral renewable energy contracts.

Integrate Climate Criteria into Private Investment Projects
Introduce mandatory environmental criteria for large investment projects, focusing on energy efficiency, renewable energy integration, water management, and emission reductions. Provide state guarantees and risk-sharing mechanisms to support green financing and innovation. Develop plans for sustainable transport logistics, resource efficiency, and environmental education to ensure holistic climate integration.

Implement Additional Incentives for Climate Investment
Adopt sectoral and regional emission reduction plans to signal government commitment to climate action. Introduce financial and tax incentives for low-carbon technologies and establish a sandbox for pilot projects to test and scale innovative solutions. Provide targeted support for the adoption of carbon-neutral technologies and the utilization of secondary energy resources.

Section 6: Conclusion

Kazakhstan stands at a critical juncture where its long-standing, resource-based growth model must be reconciled with the imperatives of decarbonisation and green structural transformation. This paper has shown that the country's dependence on oil, gas and coal, combined with institutional constraints and uneven regional development, makes the transition complex. At the same time, the analysis demonstrates that Kazakhstan has already put in place many building blocks for change: an updated NDC, a carbon-neutrality strategy to 2060, emerging carbon market instruments, and a growing portfolio of renewable energy and efficiency initiatives.

Taken together, the political economy assessment, sectoral diagnostics and institutional review underscore that incremental measures will not be sufficient. Decarbonisation in Kazakhstan must be driven by an integrated policy approach that aligns carbon quotas and pricing, long-term planning frameworks, energy system reforms, fiscal policy, technological and industrial upgrading, and just transition measures. The proposed strategies in this paper highlight how carbon regulation can be strengthened, how coal can be phased down while expanding renewables and, where appropriate, nuclear power, and how energy efficiency and digitalisation can moderate demand and improve system resilience.

The discussion of institutions makes clear that effective implementation will depend on stronger mandates, clearer coordination across ministries and levels of government, and enhanced technical and administrative capacity. Without these, even well-designed policies are unlikely to deliver their intended outcomes. Likewise, the financing analysis shows that achieving Kazakhstan's NDC and longer-term neutrality objectives will require very substantial investment, with public resources used strategically to de-risk and crowd in private capital, and with climate finance instruments better aligned to national priorities.

Finally, the paper emphasises that green industrialisation cannot be divorced from social and regional realities. Ensuring a just transition for coal- and carbon-dependent regions, protecting vulnerable households from the distributional impacts of reform, and actively engaging the public will be essential to maintaining political support for the transition. If Kazakhstan can use the integrated policy strategies outlined here to steer its energy and industrial systems onto a new trajectory—supported by regional and multilateral cooperation—it has the potential not only to meet its climate commitments, but also to build a more diversified, resilient and inclusive economy over the coming decades.

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