

# Program on Central Asia

Workshop Report

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## From Targets to Implementation:

### Strengthening Kazakhstan's Green Transition Framework



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Cover image: A renewable energy facility combining wind turbines and solar panels in Kazakhstan's steppe. Photo by Sergey Dudikov via Shutterstock

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# Foreword

In May 2025, the Program on Central Asia at Harvard University's Davis Center for Russian and Eurasian Studies hosted the Supporting Kazakhstan's Green Transition Workshop, supported by a seed grant from the university's Salata Institute for Climate and Sustainability. It brought together experts in climate change and energy transition from Harvard alongside key stakeholders and policy experts from Kazakhstan to discuss global and Kazakhstan-specific trends, emerging issues, and cross-cutting challenges in decarbonization. The workshop focused on four key areas: carbon pricing, finance, the politics of transition, and coal and methane. This report presents the main findings and insights from each of these thematic sessions.

We would like to give special thanks to Dani Podgoretskaya and Harvey Salgo, who greatly contributed to the development of the project, the organization of the workshop, and the drafting of this report.

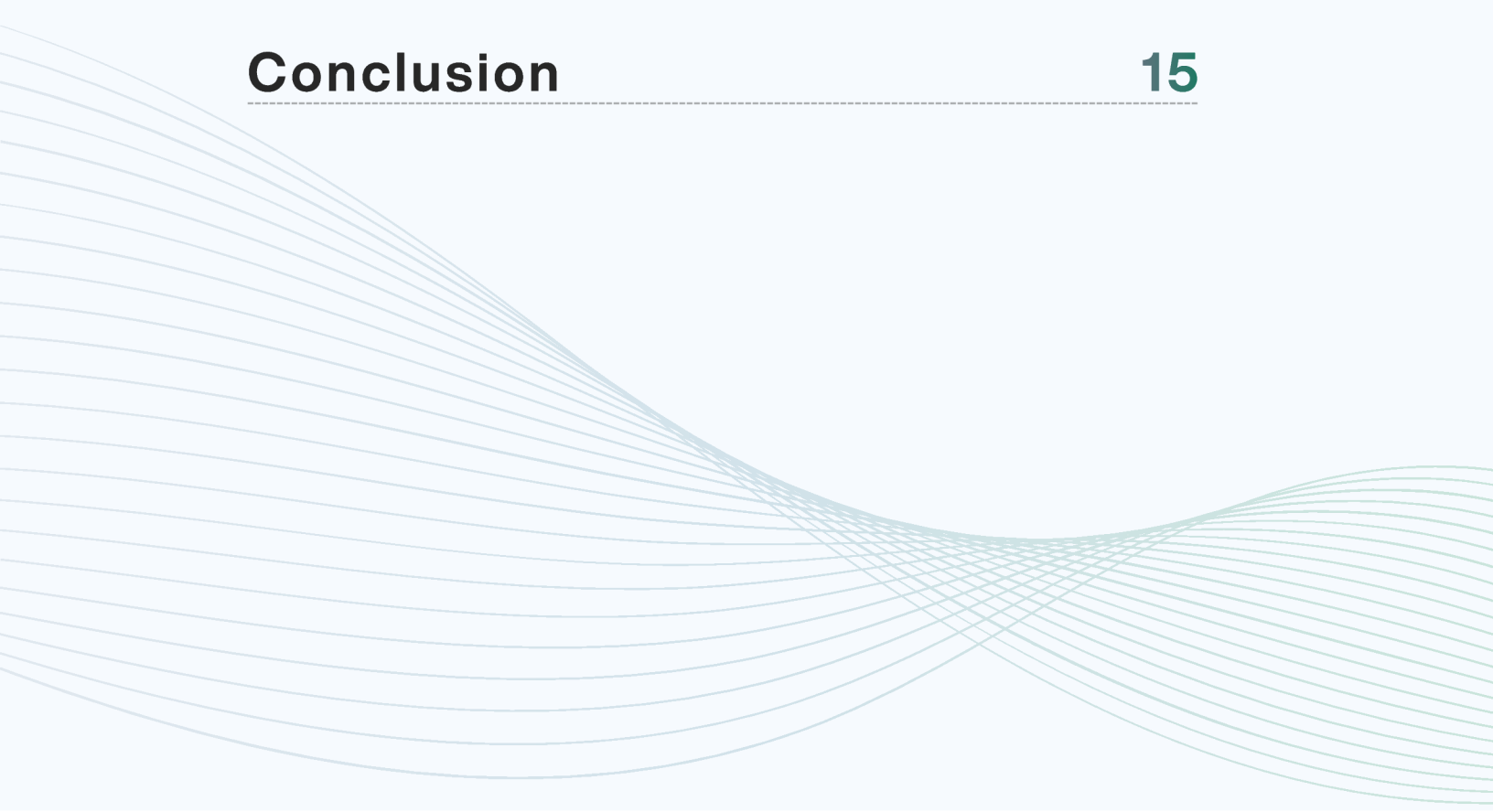
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# Table of Contents



|                                  |           |
|----------------------------------|-----------|
| <b>Key Findings</b>              | <b>1</b>  |
| <b>Recommendations</b>           | <b>2</b>  |
| <b>Context</b>                   | <b>3</b>  |
| <b>Workshop Details by Topic</b> | <b>9</b>  |
| <b>Conclusion</b>                | <b>15</b> |





# Key Findings

- Kazakhstan's 2060 Decarbonization Strategy sets ambitious goals for decarbonization, but it lacks a cross-sectoral roadmap and fails to clearly assign responsibility to specific actors, including a designation of how steps toward decarbonization should be coordinated across ministries.
- Without stronger carbon pricing and subsidy reform, Kazakhstan's industries could lose access to premium markets and fall behind emerging global standards.
  - Kazakhstan's Emissions Trading System (ETS) fails to provide meaningful incentives for decarbonization, as is reflected in the carbon price, which hovers around \$1 per ton of CO<sub>2</sub>eq.
  - Fossil fuel subsidies, which averaged 5.8% of GDP between 2010 and 2023, distort market signals, erode the ETS's effectiveness, and inhibit industrial transformation.
  - With the EU's Carbon Border Adjustment Mechanism (CBAM) coming into full effect in 2026, carbon-intensive exports such as iron, steel, aluminum, and cement face mounting competitiveness risks.
- The Astana International Financial Center (AIFC) has positioned Kazakhstan as a regional leader in sustainable finance, yet local markets remain shallow and borrowing costs exceed 18%, deterring investment in renewables. High certification costs, limited investor awareness, and currency volatility further restrict capital inflows.
- Capturing methane, and thus reducing emissions, could offer net economic gains but is not yet feasible at scale due to weak capture infrastructure and limited transport networks.
- Comparative lessons from China underscore both the risks of coal lock-in and the power of coherent regulation and industrial policy in scaling clean technologies.

# Recommendations

- Kazakhstan should revise and strengthen its current decarbonization strategy to provide a clearer, cross-sectoral roadmap that aligns national objectives with concrete implementation steps.
- A revised decarbonization strategy must identify low-hanging fruit in power generation, where around 84% of electricity still comes from carbon sources, while also integrating non-power sectors such as transport and construction.
- Innovative tools like the proposed “Green Swap,” which links climate investors with emission-avoidance credits, could offer a promising mechanism to bridge the green financing gap.<sup>[1]</sup> However, implementation would require robust certification, institutional capacity, sector planning, and coordination with multilateral development banks to ensure credibility.
- Sustained political commitment and engagement of key government stakeholders (including the ministries of National Economy, Finance, Energy, Ecology, Transport, Agriculture, and Water Resources and Irrigation) are essential to move beyond rhetorical targets toward tangible outcomes.

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[1] Akash Deep, Henry Lee, Wasim Tahir, and Joshua Doyle, “The Green Swap: Disentangling Climate and Development Impact to Mobilize Climate Finance” (Belfer Center for Science and International Affairs, 2025), <https://www.belfercenter.org/research-analysis/green-swap-mobilize-climate-finance>.

# Context

Kazakhstan is a dynamic and ambitious upper-middle-income country. It has the largest economy in Central Asia and reached GDP growth of 6.5% in 2025, exceeding the global average of 3.2%.<sup>[2]</sup>

Over half of Kazakhstan's export revenues come from crude oil and oil products. While it wants to continue benefiting from its rich reserves of oil, gas, and coal, it is also eager to decarbonize the economy and contribute to global climate change mitigation.

The country possesses vast renewable energy potential. It is also the world's top producer of uranium, making it well positioned to develop nuclear energy. In 2023, Kazakhstan demonstrated its commitment to tapping this potential by launching an ambitious Decarbonization Strategy aimed at achieving carbon neutrality by 2060.

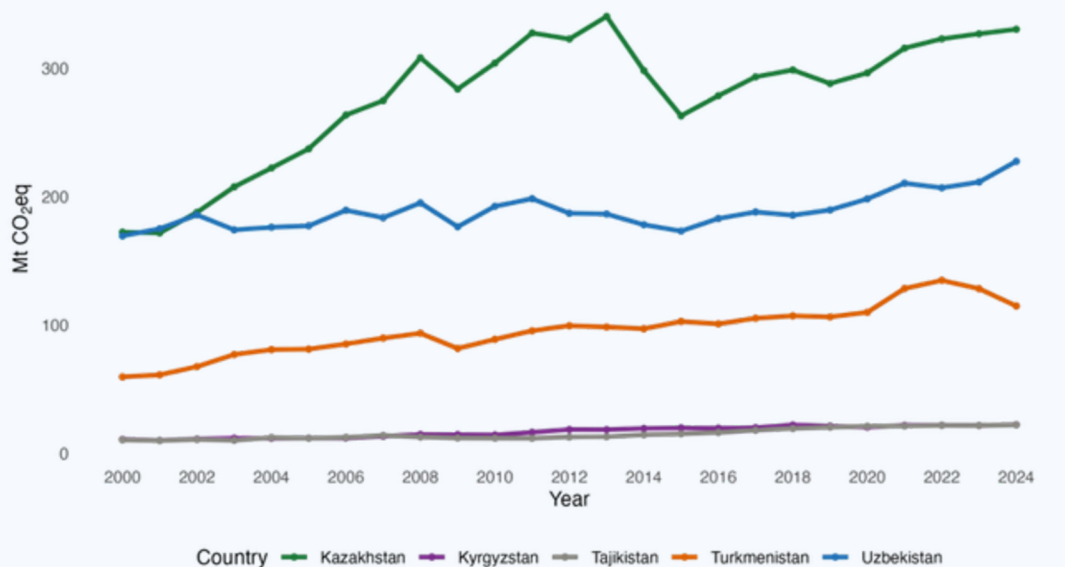
Currently, Kazakhstan is the largest greenhouse gas (GHG) emitter in Central Asia (Figure 1) and ranks second only to Russia among the former Soviet republics, according to EU EDGAR data.<sup>[3]</sup> Kazakhstan's GHG emissions rose sharply from a low of 165.69 MtCO<sub>2</sub>eq in 1999 to 340.36 MtCO<sub>2</sub>eq in 2013 (Figure 2).

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[2] Dana Omirgazy, "Kazakhstan's GDP Grows 6.5% in 2025, Led by Industry, Transport, and Construction," The Astana Times, Jan. 13, 2026, <https://astanatimes.com/2026/01/kazakhstans-gdp-grows-6-5-in-2025-led-by-industry-transport-and-construction/>.

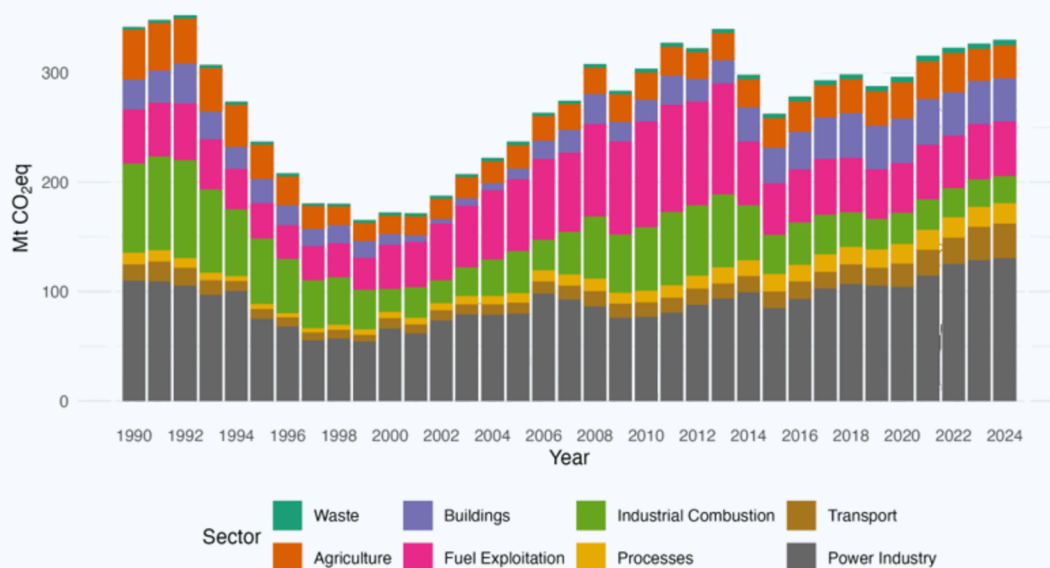
[3] Monica Crippa et al., "GHG Emissions of All World Countries: 2025 Report" (Luxembourg: Publications Office of the European Union, 2025), <https://doi.org/10.2760/9816914>.

Figure 1. Total GHG Emissions in Central Asia (2000–2024)



Source: Emissions Database for Global Atmospheric Research

Figure 2. Kazakhstan GHG Emissions by Sector (1990–2024)



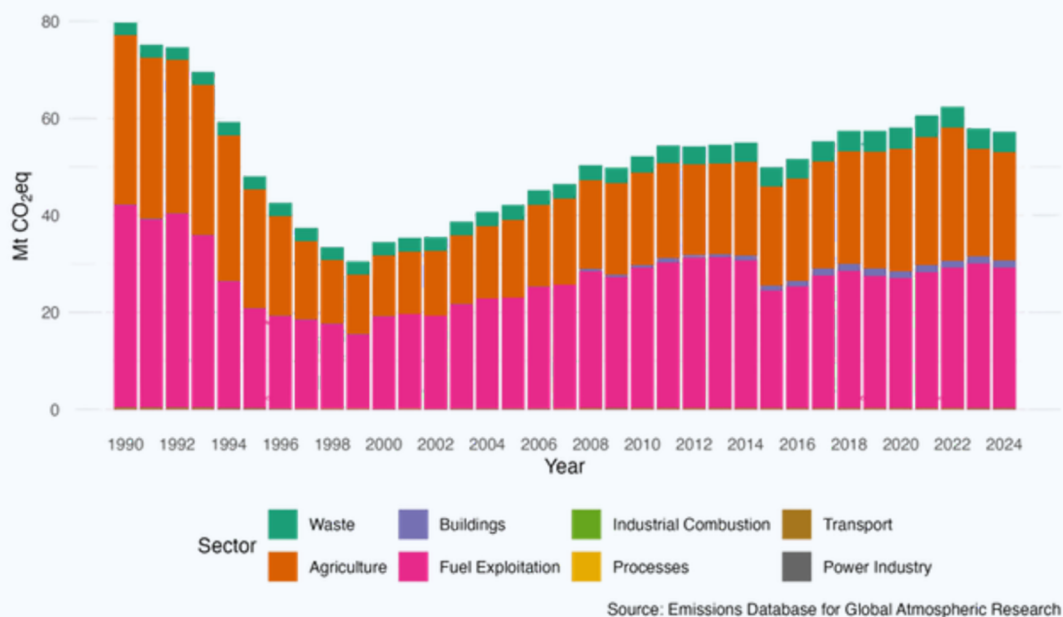
Source: Emissions Database for Global Atmospheric Research

Since 2020, emissions have been rising steadily, climbing from 296 MtCO<sub>2</sub>eq to 330 MtCO<sub>2</sub>eq in 2024. In October 2025, Kazakhstan committed to a 17% unconditional emissions reduction from 1990 levels by 2035, and up to a 25% reduction with international support.<sup>[4]</sup>

However, based on the EDGAR data, current GHG levels are only about 3.5% below the 1990 level. Additionally, projections currently show emissions creeping upward to around 368 MtCO<sub>2</sub>eq by 2030.<sup>[5]</sup>

If this trend, which started in 2021, persists, Kazakhstan will miss its Nationally Determined Contribution (NDC) target. Methane emissions have slightly decreased in the past two years (Figure 3).<sup>[6]</sup> Agriculture and fuel exploitation account for most of Kazakhstan's methane emissions.

Figure 2. Kazakhstan Methane Emissions by Sector (1990-2024)



[4] United Nations Development Program, "Kazakhstan," accessed April 13, 2026, <https://climatepromise.undp.org/what-we-do/where-we-work/kazakhstan>.

[5] Climate Action Tracker, "Kazakhstan: Policies & Action," accessed April 13, 2026, <https://climateactiontracker.org/countries/kazakhstan/policies-action/>.

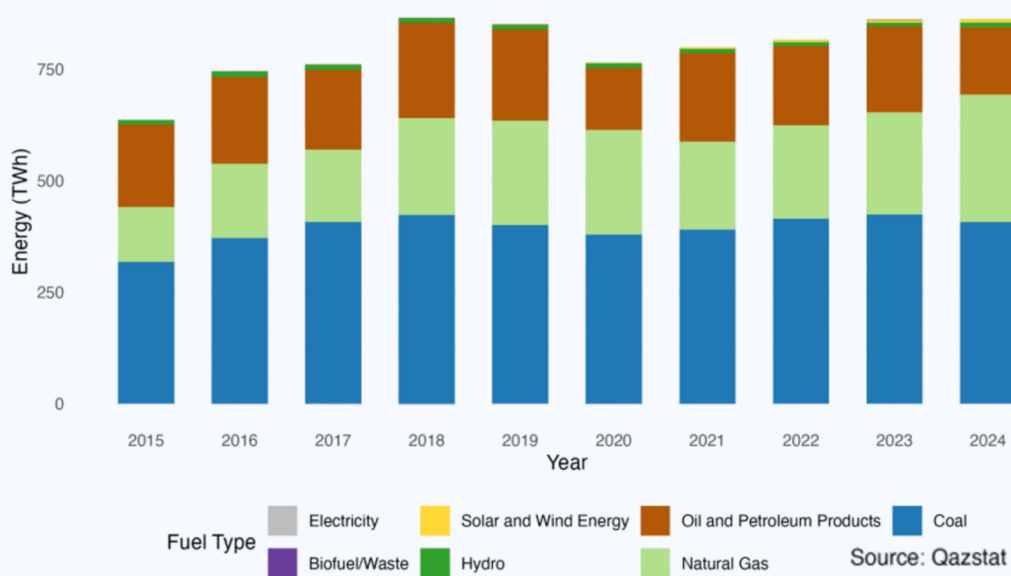
[6] Crippa et al., "GHG Emissions of All World Countries: 2025 Report," <https://doi.org/10/2760/9816914>.



Kazakhstan's primary energy mix (Figure 4) is dominated by fossil fuels, which account for nearly 98% of energy supplied to the domestic energy system, according to data from Qazstat, the national statistics agency.<sup>[7]</sup> In 2024, coal accounted for 47.2% of the total primary energy mix, followed by natural gas at 33.1%, and oil and petroleum products at 17.4%.

In 2024, there was a significant increase in the share of energy coming from natural gas. Year over year, Kazakhstan noted a 2-percentage-point decrease in coal, a 5-percentage-point decrease in oil and petroleum products, and about a 6.5-percentage-point increase in gas consumption. In 2024, renewable energy sources (including hydro, solar, wind, and biofuels) accounted for 2.1% in the primary energy mix.

Figure 4. Kazakhstan Total Primary Energy Consumption by Fuel Type (2015–2024)



In the power sector (Figure 5), renewable energy use has been steadily rising, while coal use has been decreasing, according to data compiled by Ember Energy Research.<sup>[8]</sup>

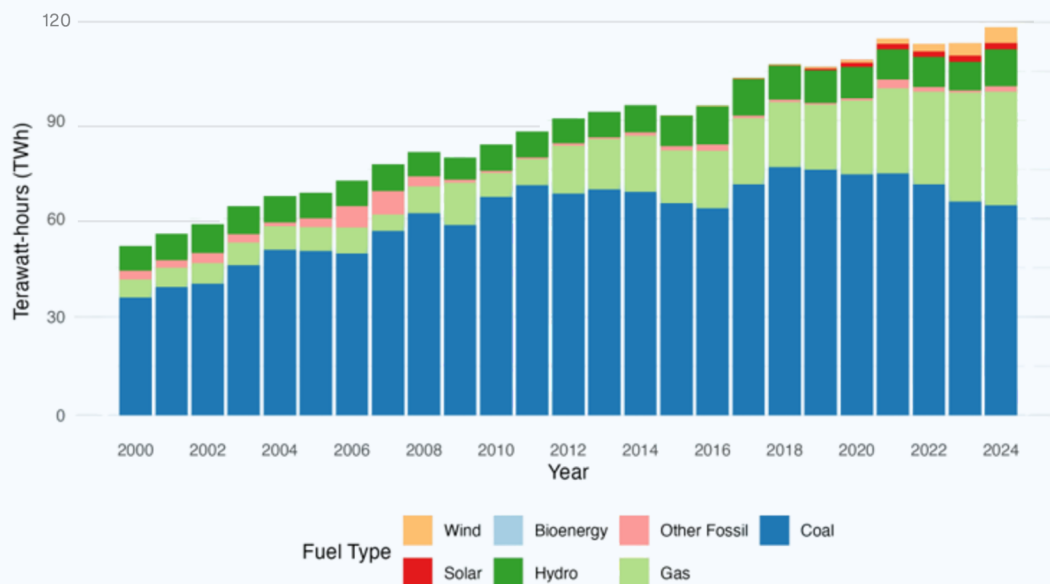
[7] Bureau of National Statistics of Kazakhstan, "Fuel and Energy Balance of the Republic of Kazakhstan (2024)" (Astana, 2025), <https://stat.gov.kz/en/industries/business-statistics/stat-energy/publications/411630/>.

[8] Ember Energy Research, "Yearly Electricity Data" dataset, accessed June 20, 2025, <https://ember-energy.org/data/yearly-electricity-data/>.

The share of electricity generated by burning coal has fallen from a peak of 81.10% in 2011 to 54.03% in 2024. In that same period, the share of electricity generated by renewable energy (solar, wind, and hydro) rose from 9.10% to 15.21%, driven primarily by a significant increase in solar and wind.

Therefore, while the trend for renewable energy is positive, coal still dominates electricity production. Notably, Kazakhstan’s government has also been focusing on the adoption of “clean coal” technologies.

Figure 5. Electricity Generation by Source in Kazakhstan (2000-2024)



Source: Ember (data compiled from EI, EIA, IEA, Samruk, GEM, IRENA)

The progress toward building out renewable energy infrastructure, however, is modest, given the decarbonization goals set by the government and the country's energy transition potential. Kazakhstan is facing many big challenges. For the workshop, we selected a set of issues that would be best addressed by careful consideration of both global and national trends, policies, and circumstances. They included:

[8] Ember Energy Research, “Yearly Electricity Data” dataset, accessed June 20, 2025, <https://ember-energy.org/data/yearly-electricity-data/>.

## 1. Carbon Pricing and Subsidies

- What lessons can we learn from the implementation of Kazakhstan's Emission Trading System and how can the ETS be improved?
- What are the implications of the potential expansion of the EU Carbon Border Adjustment Mechanism (CBAM) and the adoption of similar initiatives by Kazakhstan's trade partners?

## 2. Finance

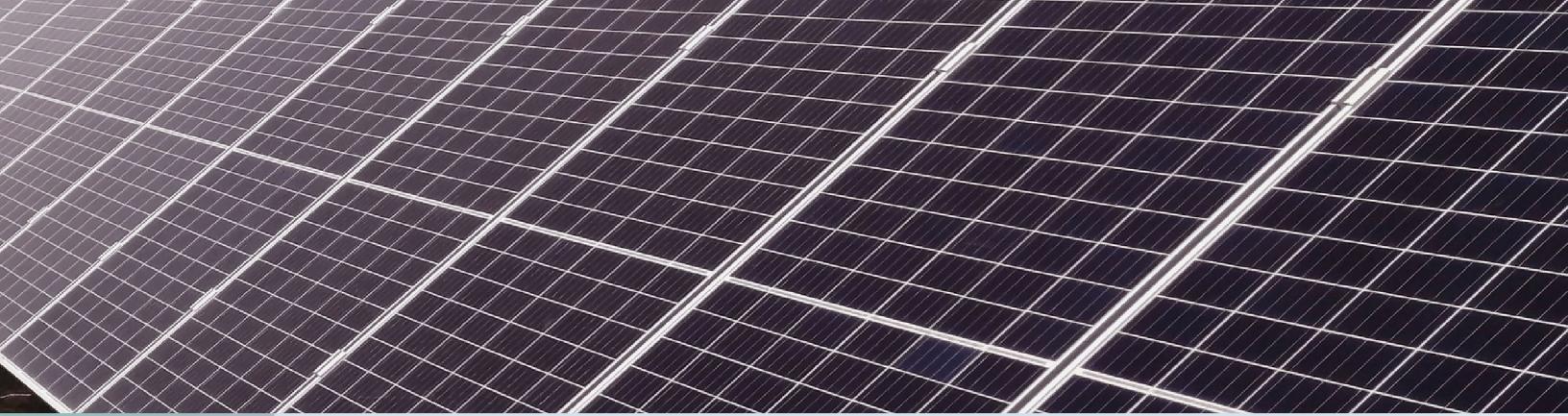
- What are the challenges of the emerging green finance market in Kazakhstan and how can they be addressed?
- What specific mechanisms (green bonds, sustainability-linked loans, climate policy performance instruments) could Kazakhstan leverage to reduce borrowing costs? How can multilateral partnerships be structured to improve credit terms?
- What policy and regulatory frameworks would effectively address FDI-related risks in green infrastructure?

## 3. Politics of Transition

- What institutional reforms could ensure meaningful progress toward decarbonization goals?
- What is the impact of the second Trump administration's policies on the global energy transition landscape?

## 4. Coal and Methane (the primary component of natural gas)

- How should Kazakhstan approach the management of its legacy coal infrastructure and what models can it draw from?
- What are politically and economically feasible strategies for methane mitigation in Kazakhstan, especially given the wide variety of sources of methane leakage?



# Workshop Details by Topic

## Carbon Pricing and Subsidies

Kazakhstan's ETS covers 47% of emissions, higher than in the EU, where only about 38% of emissions are covered.<sup>[9]</sup> However, the trading system crucially suffers from low carbon prices: ~\$1/tCO<sub>2</sub>eq in comparison to the EU's ~\$90/tCO<sub>2</sub>eq. Extensive fuel subsidies and the free allocation of permits have contributed to very weak decarbonization incentives. The effects of CBAM on Kazakhstan will depend on the strategic actions taken by the country, such as successfully reorienting products to different markets in the short term or potentially strengthening its ETS in the long run.

The proliferation of policies similar to CBAM in other crucial markets like China could severely limit the effectiveness of Kazakhstan's re-exporting strategy. CBAM entered into its transition phase in October 2023 and its definitive phase in January 2026. For Kazakhstan, the CBAM-covered products of interest are iron and steel, aluminum, cement, electricity, fertilizers, and hydrogen.

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[9] AIFC Authority, "How Can Kazakhstan Improve Its Carbon Regulation System? AIFC Report," Astana International Financial Center (AIFC), Feb. 17, 2025, accessed June 20, 2025, <https://aifc.kz/news/how-can-kazakhstan-improve-its-carbon-regulation-system/>.



The workshop highlighted a crucial weakness in Kazakhstan's decarbonization strategy: the lack of a coherent, integrated, and cross-sectoral national strategy. While Kazakhstan's current decarbonization strategy provides a vision for decarbonization, it does not translate into concrete industrial or economic planning frameworks.

The lack of coordination and of a long-term, stable strategy hinders inter-agency cooperation and undermines private sector confidence, already suffering from insufficient guidance. Power generation within the electricity sector—which contributes roughly 40-45% of emissions and where around 84% of power comes from carbon sources—was identified as a readily addressable target for near-term decarbonization, yet no clear roadmap for such decarbonization exists.

The biggest challenge currently is the prioritization of fossil fuel subsidies. According to the International Energy Agency, Kazakhstan's annual direct and indirect subsidies in 2010-2023 averaged 5.8% of GDP and in 2023 alone subsidy spending exceeded \$15 billion.<sup>[10]</sup> However, a crucial point of contention at the workshop was disagreement over how fossil fuel subsidies should be calculated, and the IEA methodology was put into question. These subsidies persist across all sectors, distorting carbon price signals and undermining the effectiveness of the ETS. These subsidies keep consumer prices artificially low; however, they prevent the adverse social effects of raising energy prices.

Without stronger carbon-pricing mechanisms and the reduction of subsidies, Kazakhstan risks falling behind on decarbonization and undermining its global trade competitiveness under CBAM and similar regimes. However, it is crucial to pair ETS reform, particularly tighter emissions caps and higher carbon prices, with international financing, regulatory upgrades, and stakeholder buy-in to enable effective transition.

Social trade-offs from energy price reforms can be mitigated through well-designed compensation mechanisms and transparent governance, as shown by the example of Indonesia. Other key domestic hurdles discussed in the workshop included inefficiencies in power generation, high energy transmission losses, and weak alignment between national and regional plans.

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[10] "Impacts of Fuel Subsidies on Kazakhstan's Energy Pricing," Ec[ON]omyKZ, March 5, 2025, accessed June 20, 2025, <https://economykz.org/?p=14241&lang=en>.

# Finance

Kazakhstan has made early progress in sustainable finance with support from the Astana International Financial Center (AIFC) and the Damu Fund, which have accelerated domestic issuance of sustainable bonds. Today Kazakhstan is the leader in Central Asia for sustainable bond issuance. The green finance market is growing, and green financing has shifted from pilot initiatives to more substantial and diversified financing rounds indicating growing maturity and investor interest. However, multiple challenges remain. Local financial markets remain underdeveloped, with green bonds still treated as part of broader markets rather than a distinct asset class. There is a shortage of high-quality and bankable projects, while verification and certification costs remain high.

There is a shortage of high-quality and bankable projects, while verification and certification costs remain high. Investor awareness and demand for green instruments are limited, and the absence of standardized frameworks adds further uncertainty. Finally, currency fluctuations and policy instability, as has been mentioned before in the case of carbon pricing, continue to heighten financial risk. The main problem noted during the workshop was the availability of bonds for non-state-owned enterprises.

A major problem in Kazakhstan is the availability of international financing. Currently, there is no transition mechanism that would allow internationally available green financing into the Kazakh market. Additionally, many borrowers in Kazakhstan are either prohibited from borrowing in hard currencies or avoid doing so due to local currency depreciation. In the Kazakh market, interest rates remain prohibitively high for green energy investors, as well as other borrowers, at around 18%.

A potential solution to this problem could be offered by the Ministry of Finance, which could issue green bonds or guarantee loans using its sovereign credit. A second option could see the Development Bank of Kazakhstan playing an intermediary role between international capital and the domestic green market. The DBK could also co-finance projects with international partners, sharing risk and ensuring that funds reach viable green projects.



During the workshop, Harvard professor Akash Deep presented an innovative financing solution that has the potential to aid Kazakhstan's financing problems by bridging the cost gap between green and fossil projects. This mechanism known as the "Green Swap," operates by enabling climate investors to cover the additional costs associated with developing renewable energy projects (i.e., providing only the "green CAPEX") rather than fossil-based ones in return for receiving carbon-avoidance credits.<sup>[11]</sup>

While the Green Swap is an innovative mechanism, all the participants of the workshop recognized its potential viability for helping finance renewable energy projects in Kazakhstan. The principal challenges that were identified for this mechanism were additionality and certification. The idea requires not only two separate project proposals, but it is also difficult to establish with certainty whether a given investment, such as a renewable energy project, genuinely displaces emissions that would have arisen from an alternative fossil-based project. Moreover, while certification could be undertaken by multilateral development banks, the process could potentially be time-intensive and demand extensive institutional coordination to ensure credibility and integrity.

## Politics of Transition

In 2023, Kazakhstan adopted its 2060 Decarbonization Strategy. However, the ambitious goals have not yet translated into full-fledged institutionalized political commitments. The government needs to reform its decision-making structures and processes.

Key stakeholders such as the ministries of National Economy, Finance, Energy, Ecology, Transport, Agriculture, and Water Resources and Irrigation should play a more central role. Decarbonization commitments should guide long-term policies designed to keep the country on track and establish credibility with non-governmental stakeholders.

Institutionalization could be carried out by providing a roadmap for decarbonization, which specifies concrete steps. At present, the government is developing such a roadmap, involving representatives of businesses, international organizations, and other experts.

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[11] Deep et al., The Green Swap, <https://www.belfercenter.org/research-analysis/green-swap-mobilize-climate-finance>.

A particular point of concern regarding the decarbonization strategy was a lack of a clear assignment of responsibility to different actors and stakeholders. Participants noted that a roadmap should not only outline the specific steps that need to be taken but also assign responsibility to different government bodies and stakeholders for carrying out those steps.

During the workshop, a preliminary mapping of stakeholders was created; however, a more comprehensive analysis is necessary. A clear mapping of stakeholders should also include the steps necessary to increase cooperation between actors to pursue energy transition. Alignment of incentives and the creation of communication channels for cooperation can boost overall adherence to the decarbonization strategy. The participants also noted that any further refinement or changes to the decarbonization strategy should be carried out by Kazakh stakeholders. Another shortcoming of the current strategy noted at the workshop was the lack of a discussion about the decarbonization of the non-power sector.

A decarbonization strategy should include a comprehensive mapping of decarbonization across various sectors, such as agriculture, transportation, and construction. Additionally, it is important that a revised decarbonization strategy identify readily achievable goals, targeting sectors and specific projects with the fewest barriers. In other words, as the workshop participants noted, it needs to target low-hanging fruit.

## Coal and Methane/Natural Gas

The participants discussed China as a model of a country heavily reliant on coal while also investing heavily into renewables. China's energy policy, however, remains heavily shaped by energy-security concerns. Despite progress on renewables in recent years, experiences of blackouts, hydropower disruptions, and floods have pushed a resurgence in coal plant construction. While China has developed highly efficient coal technology, with plants reaching around 48% efficiency, integrating intermittent renewables has increased grid costs due to coal plants being repeatedly ramped up and down to compensate for gaps in renewable output. This cycling, which operates at varying loads of 90%, 70%, and 40%, damages catalysts and raises operational expenses.



Ybyrai 50MW wind power plant in Kostanay, Kazakhstan; Longru Huang

Moreover, most of China's electricity prices are not market-based, meaning production costs are largely decoupled from consumer prices except in a few southern grid regions. At the same time, China's electric vehicle (EV) success has stemmed not only from subsidies but also from strong regulatory support, including easier registration, unrestricted city access, and mandatory EV quotas. This success demonstrates the impact that policy can have on stimulating cleaner solutions. Yet despite world-class technology, China now faces overcapacity in solar and EV production, with many companies struggling financially.

Kazakhstan has joined the Global Methane Pledge and reducing methane emission is one of the top decarbonization priorities for the country's government. Methane leakage is a particular problem in the oil and gas industry. However, companies are increasingly aware that the cost of methane abatement is negative, as captured methane can be used or sold, generating revenue. It is simply profitable to have less leakage. Advances in technology have also enabled detecting leakages at various scales via satellites. This technology is already being deployed, with one such satellite, developed in collaboration with Harvard, being launched in 2024.<sup>[12]</sup>

This means that it has become easier to punish companies for not meeting regulatory standards or for violating environmental codes. However, while both the public and private sectors are aligned on the issue of reducing methane leakage, Kazakhstan currently lacks capacity to capture this methane and to transport it to markets. Additionally, methane emissions from agriculture are politically sensitive and rarely addressed, even though they are major contributors to climate change.

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[12] Matt Goisman, "Steven Wofsy Chats about Recently Launched MethaneSAT Emissions Satellite," Harvard John A. Paulson School of Engineering and Applied Sciences, March 5, 2024, <https://seas.harvard.edu/news/cutting-edge-methane-monitor>.



# Conclusion

While Kazakhstan has demonstrated a commitment to decarbonization and taken important first steps, it now faces the challenge of moving beyond simple, early measures. To ensure that decarbonization accelerates and decarbonization goals are met by the 2060 target, Kazakhstan will need to create a credible, well-coordinated national decarbonization strategy. Such a strategy will require a clearer, cross-sectoral focus that aligns national objectives with concrete implementation steps.

To ensure its implementation, the strategy should be anchored in transparent governance, predictable regulation, and equitable transition measures. While Kazakhstan faces considerable challenges, including maintaining trade competitiveness and ensuring a just transition, it can draw on lessons from other countries, develop new financial institutions and mechanisms, and cooperate with a wide range of stakeholders in the energy sector to address these challenges. Ultimately, Kazakhstan's decarbonization trajectory will hinge less on technological availability than on governance, pricing reform, and financial innovation.