United Nations ECE/ENERGY/GE.5/2022/5

Economic and Social Council

Distr.: General
6 September 2022

English only

Economic Commission for Europe

Committee on Sustainable Energy

Group of Experts on Cleaner Electricity Systems

Eighteenth session
Geneva, 19-20 September 2022
Item 6 of the provisional agenda
Round table on financing clean energy technologies

Financing clean energy infrastructure

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I. Introduction and context

1. The rising urgency for limiting global warming to 1.5ºC is providing impetus to accelerate actions to avoid catastrophic effects of the climate crisis. As highlighted by the latest landmark report from Intergovernmental Panel on Climate Change (IPCC),[1] the scale of human impact on the climate is more severe than previously admitted. However, the existing climate model describes a gap between the present implementations of climate change mitigation policies and the stated Nationally Determined Contributions (NDC) at the national level. The individual NDCs further fall short of meeting the collective global target of limiting global warming to less than 1.5ºC.

2. Concurrently, ensuring the reliable supply of affordable energy is imperative for maintaining quality of life which underpins the attainment of the 2030 Agenda for Sustainable Development (2030 Agenda). The transitioning of the energy landscape driven by environmental concerns in meeting ambitious climate targets whilst attaining energy security and quality of life defines sustainable energy.[2] Achieving sustainable energy is a complex interplay of social, political, economic and technological challenges at all scales. However, as highlighted by the United Nations of Economic Commission for Europe (ECE) project on "Pathways on Sustainable Energy", the current energy framework within the region is of out of balance: sustainable energy cannot be achieved without significant trade-offs between energy security, quality of life, and environmental sustainability.

3. Approximately 80% of the primary energy mix in the ECE region is fossil fuel based.[3] There is vast number of people whose livelihoods depend on the fossil fuel energy including coal, oil and natural gas. Therefore, in many countries across the region, fossil fuel energy will remain vital to their energy security and economic well-being in the foreseeable future. This is recognized by the international community and in response, the concepts of carbon neutrality or net-zero carbon have been developed as a more achievable and thus effective regional objective.

4. Carbon neutrality refers to achieving net zero carbon emissions by carefully balancing carbon emissions with carbon removal through engineered carbon removal technology, natural sinks, or simply by eliminating carbon emissions altogether.[4] Achieving carbon neutrality will require the deployment of a diverse portfolio of cleaner energy technologies. This includes from the supply side innovative ways to produce low- and zero-carbon energy, i.e., renewable energy technologies, hydrogen, nuclear power, fossil fuels retrofitted with carbon capture, utilisation, and storage (CCUS) technology, as well as compensating technologies and measures, such as increasing the absorptive capacity of forest. From the demand side, deep decarbonization can be facilitated through system efficiency, electrification of the energy system, and digitalization.

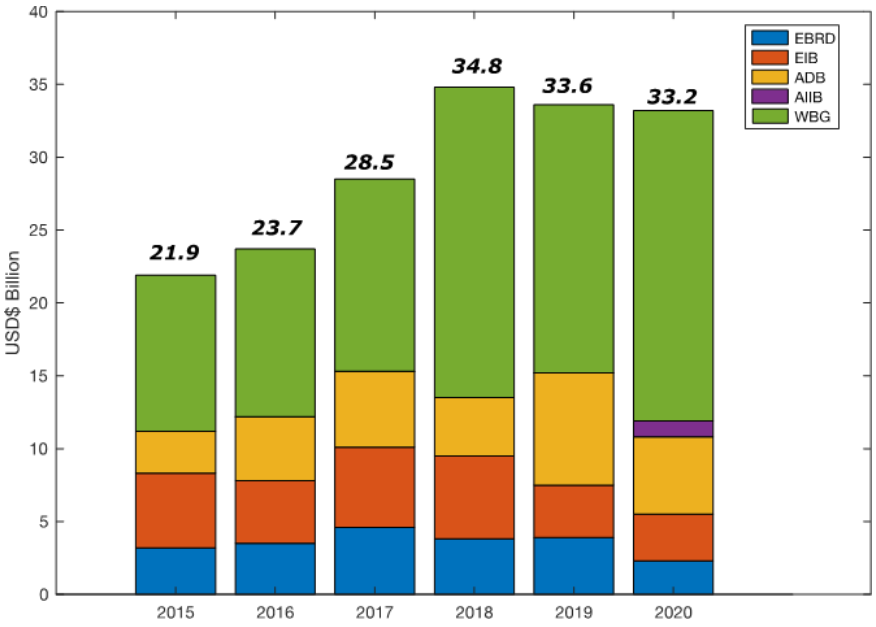
5. The findings from the ECE project on Carbon Neutrality and the report on "Technology Interplay under the Carbon Neutrality Concept" provide clear, achievable pathways for policymakers to implement a carbon-neutral energy system through technology interplay by combining existing and new technologies within an integrated framework. The report urges: 1) accelerated phase-out of unabated fossil fuels, 2) electrification of all sectors through renewable energy and nuclear power, and 3) widespread deployment of low- and zero-carbon technologies (incl. CCUS for the continued use of fossil fuel and hard-to-abate sectors, hydrogen, and next generation of nuclear power). Importantly, the results from the modelling activity show that there is not a single technological solution that can address the problem, but all technologies are required in various proportions to contribute towards the attainment of a carbon neutral energy system.

6. To deliver the envisioned integrated energy system with a diverse technology portfolio, the financial sector has a key role to play in providing the upfront investment required for immediate deployment of all currently available low- and zero-carbon energy technologies for consistent energy supply whilst attaining carbon neutrality within the ECE region. Crucially, a carbon-neutral compliant energy transition is affordable under the existing global finance capacity. However, 75% of the current global energy expenditure (USD 4.5 trillion) is persistently allocated to unabated fossil fuels.[5] In light of this, significant mobilization of capital needs to be redirected into clean-energy projects with the most potential to reduce emissions whilst maintaining the quality of life of the people.

7. Since 2009, the world's leading international financial institutions (IFIs) have agreed upon a comprehensive agreement to combat climate change through the coordination of their own mandates, knowledge, experience, and resources to facilitate cooperation between authorities with the private sector. These institutions include but not limited to, the Asian Development Bank (ADB), Asian Infrastructure Investment Bank (AIIB), European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB), World Bank Group, Green Climate Fund (GCF), and Climate Investment Fund (CIF). Collectively, they are committed to aid developing nations in the adaptation and mitigation of impacts of climate change and facilitate the transition towards a carbon-neutral technological framework. In 2020, the climate finance for low- and middle-income economies committed by major multilateral development banks (MDBs) is at $38 billion.[6] However, the UN conference on Trade and Development suggests that by 2050, $300 billions of climate finance for adaptation alone might be required for low- and middle-income economies.[7] Thereby, a significant scale up to close the gap in climate finance is evident. The trend in climate finance by major institutions is provided in Figure I.

Figure I

Summary of climate finance from major multilateral development banks between 2015-2020 for lower- and middle-income countries.



II. Review of existing IFI sustainable financial strategies

A. European Bank for Reconstruction and Development

8. The corporate strategy known as the "Green Economy Transition Approach" was published by EBRD in 2015[8] to scale up impactful financing activity to build resilient, low-carbon economies that are in line with the UN SDG goals and the Paris Agreement targets. Subsequently, EBRD announced the full adoption of coal plant exclusion policies, eliminating all investments into thermal coal mining, coal-fired electricity generation and upstream oil exploration and development projects.[9] However, the gas sector is considered both secure, affordable and aligns with a low-carbon transition thus continued to be supported by the Bank. Short-term goals include to align all endeavours with the targets of the Paris Agreement by 2023, and to reach the proportion of its green investments to >50% of the Annual Bank Investment by 2025.

B. European Investment Bank

9. EIB was the first IFI to end financing for coal and lignite power generation in 2013. Subsequently, in its newly launched new climate strategy and energy lending policy, EIB announced its divestment from unabated fossil fuel energy projects including gas from the end of 2021.[10] This goal has been realised as of 2021, EIB no longer support projects inconsistent with Paris goal such as airport construction and new conventional energy-intensive industrial plants.[11] The Paris Alignment for Counterparties (PATH) Framework was established to consider the wider activities of borrowers beyond the climate impact of EIB funded projects. This is to work to ensure that the counterparty is also taking steps towards the decarbonization of their business activity.[12] Its current climate mitigation finance has been mostly directed to mature technologies i.e., sustainable transport, including metro, tramways and high-speed rail and mature renewable power generation (onshore wind, hydro and concentrated solar power). By 2020, EIB has become the EU climate bank to support the delivery of the European Green Deal and enhance investment in Paris-aligned projects.

C. Asian Infrastructure Investment Bank

10. The AIIB has a mission to invest in sustainable energy projects to increase the delivery of clean, safe, and reliable electricity for people in Asia. This is outlined in the Sustainable Energy for Asia Strategy published in 2018.[13] The strategy details the significance of fossil fuel resources to the Asia community to ensure economic growth and improvement of living standards which is underpinned by reliable supply of energy. As of now, the Bank has not yet announced divestment from unabated carbon-intensive fossil fuels including coal in its corporate strategies but expressed this is possible in 2022 by the AIIB president.[14] The strategy was updated in 2021 which stated its ambition to align its operations with the Paris Goals by July 1, 2023, and to reach or surpass a 50% sustainable climate finance share of its total annual bank investment by 2025.[15]

D. Asian Development Bank

11. ADB's climate strategic framework which addresses climate adaption and resilience development is fully mainstreamed into its overarching corporate strategy.[16] Phase 1 of the strategy include scale up in climate finance to meet a $6 billion target by 2020. According to the annual report for 2020, this target was not achieved ($4.3 billion was provided for climate mitigation and adaptation). In 2020, ADB published findings from an independent sector-wide evolution of the ADB energy policy and program, 2009-2019.[17] The report highlights the primary energy mix has been still largely dependent on coal and crude oil which affects the long-term sustainability of the energy system. ADB's energy program facilitated successful renewable energy projects and considered a pioneering investor in many of its developing member states, increasing the availability and reliability of electricity supply. The Energy Policy established in 2009 is considered no longer adequately aligned with the global efforts on climate change. Finally, the evaluation recommends ADB to formally withdraw from financing new coal-fired energy projects.[18] The bank has made commitments to achieve full alignment of its operations by July 1, 2023.

E. World Bank Group

12. To further mainstream climate into the WBG's portfolio, a new Climate Change Action Plan (CCAP) maps out the bank's interventions of 2021-2025 to support green, resilient, and inclusive development for its clients, the government, and the private sector.[19] Since 2010, the WBG ceased direct financing for new utility scale coal-fired power projects. The CCAP addresses the careful management and safety nets to ensure the fossil fuel communities are not left stranded and can be advantaged by the new climate economy. This will operationalise through the WBG helping nationals to establish roadmaps to increase welfare, jobs, and economic growth for affected region. Regulatory frameworks will also be key priority for the WBG to work together with governments to attract private investment into innovative technologies including battery storage, offshore wind, or green hydrogen. Ambitious goals have been outlined to increase the share of climate finance from 26% on average over the period of 2015-2020 to an average of 36% for the next five years of the total financing.

F. Climate Investment Fund

13. The CIF is set up to scale up climate mitigation and adaptation in developing and middle-income countries, working exclusively with MDBs as implementing agencies. Since establishment, it received $10 billion from private donors, MDBs, bilateral organisations, and governments. Leveraging this finance, it has further channelled $61 billion co-financing for climate projects. Their work focuses on empowering transformation through programs of clean technology, energy access, climate resilience, and sustainable forests. A substantial proportion of the Clean Technology Fund (69%) is directed towards renewable energy projects, resulting in a cumulative in 5.7 GW of installed renewable energy generation capacity and a cumulative reduction of 63.7 $MtCO_2$ in GHG emission since 2009.[20]

Subsequently, new areas recognised as next-frontier climate challenges that CIF is pioneering investments is the transition from coal. The Accelerating Coal Transition (ACT) Investment Program worth $2 billion was established in early 2021 offering holistic toolkit to support countries in phasing out coal. The work is implemented through building technical and institutional capacities, developing transformation strategies and alternative economic and social development plans, upskilling, and reskilling the coal community, reclaiming, and repurposing existing infrastructure.

G. Green Climate Fund

14. The GCF operates as the financial mechanism for the UNFCCC to deliver the reduction of emissions and to aid vulnerable societies that face the challenges imposed by climate change by providing financial instruments for mitigation projects and programmes. As of July 2022, $10.8 billion GCF funding has been approved with a further $29.4 billion co-financing. This is commensurate with 200 approved projects of which 128 are in developing nations. By the start of 2020, for every $1 billion invested in mitigation, 460 MtCO2 of carbon dioxide-equivalent has been reduced.[21]

III. Case study: Kazakhstan

A. Overview of Kazakhstan's energy sector

15. The Republic of Kazakhstan is the largest energy producer in the Central Asia region and a major energy exporter given its abundant availability of natural resources. Kazakhstan's energy-intensive heavy industries and high reliance on coal leads to the CO_2 intensity of Kazakhstan's GDP to be 70% higher than the world average. Its National Inventory report indicates that in 2020, energy-related emission accounted for 80% of its total GHG emission where fuel combustion alone accounted for 90% of energy related emission. In 2021, President Kassym-Jomart Tokayev has pledged to achieve carbon neutrality by 2060, this commitment has boosted the development of climate policies and the drafting of long-term decarbonisation roadmaps. Therefore, given the status of its climate target, the current energy portfolio and the 2060 vision, Kazakhstan provides a concrete example to analyse the gap in the existing climate financing directed into the country and its 2060 climate target. This analysis could be further extended to showcase similar gaps in other developing nations in the overall ECE region.

16. In 2019, Kazakhstan produced nearly 7000 TJ of energy which covers more than twice its national energy demand. The majority of Kazakhstan's energy mix is dependent on fossil fuel (99% of total energy mix in 2019) of which coal represent 47%, followed by natural gas (28%) and oil (24%). The dominant use of coal is to produce electricity and heat which accounts for 70% of electricity generation in Kazakhstan presently.[22]

17. Owning to its vast fossil fuel resources, the oil and gas industries and related sectors accounts for 17% of the annual GDP in 2020 and thereby serving as the main source of government revenue. Kazakhstan's coal reserves are some of the largest and cheapest to mine in the world. However, many coal-fired plants are highly polluting, and inefficient.

18. Kazakhstan's nuclear and renewable energy sources are substantial. Kazakhstan has 11% of the world's uranium and has been the largest producer since 2009. In 2019, Kazakhstan produced 43% of the world's uranium. According to various estimates, the capacity of all hydro resource is approximately 170 billion kWh per year, the potential of solar energy is estimated to be 2.5 billion kWh annually, the most significant wind resource is at the Dzungarian Gate with the ability to produce 17,000 kWh/m^2, and lastly, Kazakhstan has significant biomass where up to 35 billion kWh of electricity can be produced annually from the processing of agricultural waste.[23]

19. Geological assessments have also identified that the sedimentary basins of Kazakhstan have significant potential to safely store 539 Gt of CO_2[24]. This provides opportunity for the deployment of carbon capture and storage (CCS) technology to reduce

GHG emission as well as to facilitate enhanced oil recovery that is clean and aligns with the Paris agreement.

B. Gap analysis method

20. For identifying external investment flows into Kazakhstan, we used publicly available database that compiles climate-related development finance statistics at the sectoral activity level between 2000-2019 from the Organisation for Economic Co-operation and Development (OECD).[25] They are an intergovernmental body comprised of 38 member nations that aims to shape policies to encourage world trade and economic progress. The OECD climate finance database provides information on the annual climate financing in units of US$ billions to recipient countries and more specially differentiated to each sector and subsector of development. The providers are bilateral, multilateral, and private philanthropic sources.

21. To further investigate external investment flows from private donors into Kazakhstan's energy sector, we used the annual report of a joint-stock company - Kazakhstan electricity and power market operator (KOREM). The Kazakhstani government has setup an auction mechanism to select most efficient renewable projects. In KOREM's annual report,[26] a list of auction winners (project names) and capacity generation in MW are provided. We further identified a list of foreign direct investments from China to Kazakhstan,[27] this information provides the amount of investment in US$ millions, project, and technology.

22. We perform data cleaning and mining to complete datasets where possible and extract relevant data from various databases, i.e., identifying the amount of investment and its source into the energy sector of Kazakhstan only, thereby eliminating irrelevant data. We categorise the funding amount by the subsector/technology, i.e., wind energy, solar energy, hydro-electric power plants, energy policy, etc.

23. To compile the internal investment flows into Kazakhstan's energy sector, we used information available from the Development Bank of Kazakhstan's website. We categorise the data according to year, project description, subsector/technology, lending amount in US$ millions and capacity generation in MW.

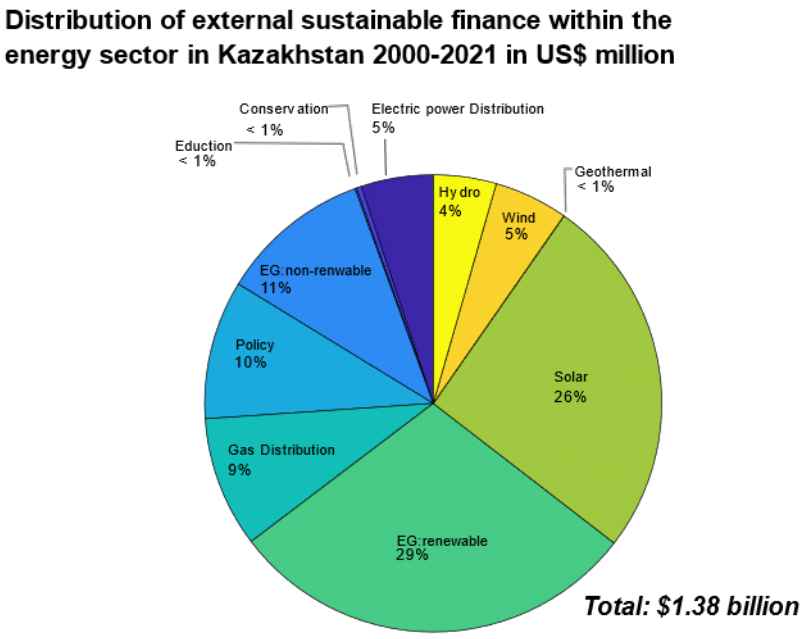
24. We visualise the data using pie chart to illustrate the distribution of climate finance and energy investment in Kazakhstan across technology or subsector of the energy system.

C. External investment – OECD dataset

25. We show the distribution of investment flows in US$ millions across various subsectors and technologies into Kazakhstan's energy sector in Figure II. Notably, around $1 billion is flowing into renewable energy projects between 2000 and 2021 with a generation capacity identified where possible reaching nearly 900 MW. This is commensurate with abating 1 million ton of CO_2 annually. The largest donor is EBRD.

26. Of the renewable energy generation, solar photovoltaics comprises of nearly 70% of climate-related finance. It is evident that there is a redistribution of the financing towards renewable energy from traditional fossil fuel resources from bilateral and multilateral financial institutions. Importantly, there is concurrent financing into appropriate energy policy for renewable that is establishing the necessary framework to attract investment into the renewable sector. The most prominent is the Kazakhstan renewable finance facility. However, based on the data compiled here, there is an observable gap for clean fossil fuel (fossil fuel with CCS), hydrogen, biomass with CCS, and nuclear power generation capacity as well as the necessary funding to establish associated policy framework to facilitate future successful investment into these sectors from the private industry.

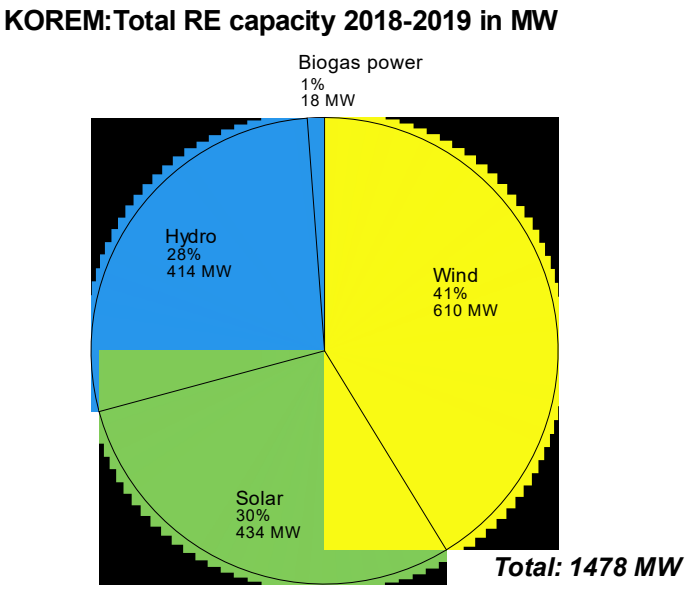
Figure II
the distribution of external sustainable finance within the energy sector in Kazakhstan between 2000-2021 in US$ million.



D. External investment – KOREM dataset

27. The KOREM dataset provides additional insight into the investment flows towards the renewable sector in Kazakhstan from 2018-2019 round of auctions which indicates the capacity generated through private investment. The majority of projects developed is wind and followed by Solar (Figure III). The top investor are Kazakhstan and China.

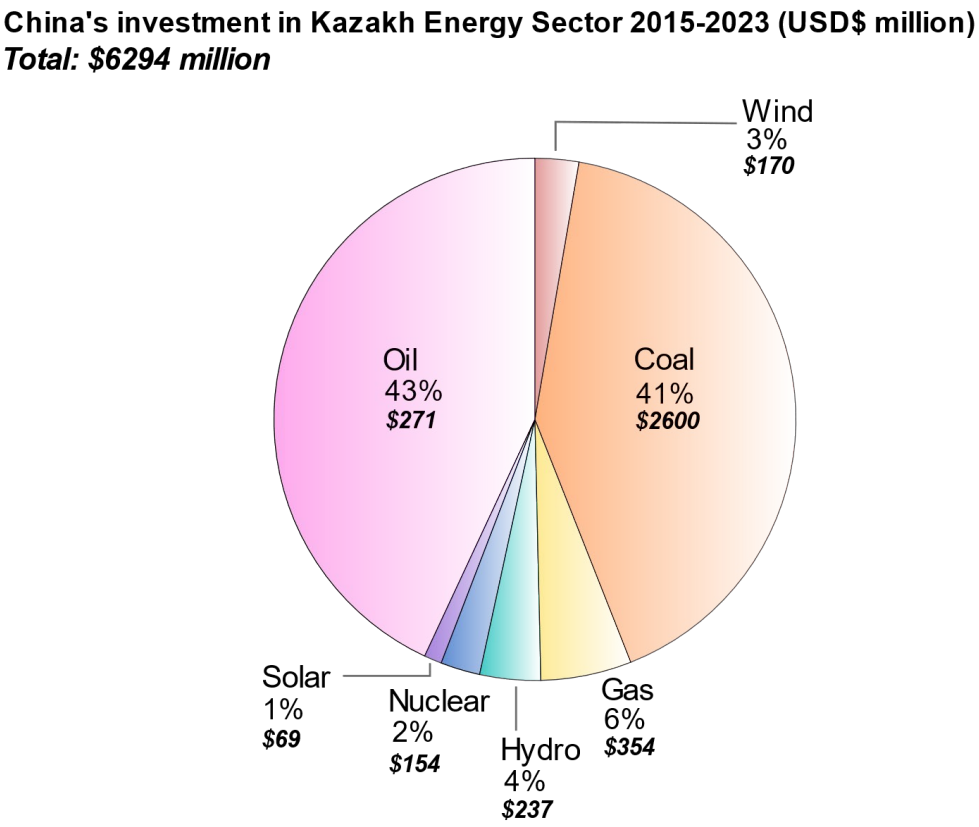
Figure III
distribution of renewable energy capacity sold during the 2018-2019 KOREM renewable energy auctions.



E. External investment – China's foreign direct investment

28. We illustrate the proportion of China's investment in Kazakh energy sector across various primary energy sources between 2015 – 2023 in Figure IV. China's total investment is $6.3 billion. A significant proportion (90%) of China's total investment is directed towards unabated fossil fuel resources of which oil and coal is disproportionally dominant compared to gas investment. Hydropower (4%) dominates investment from China that is directed at renewable energy sources. From our analysis, China is the only investor that invested in Kazakhstan's nuclear resources. China's investment is commensurate with a generation capacity of at least 600 MW (this is a significant underestimation of generation capacity as many projects did not provide this information). Overall, China's investment pattern is more diverse than external investment from multilateral and other bilateral institutions. However, gaps in investment for other clean energy technology needed to reach carbon neutrality other than renewable energy sources is also evident.

Figure IV
distribution of energy finance investment from China in Kazakhstan's energy sector between 2015-2023 in US$ million.

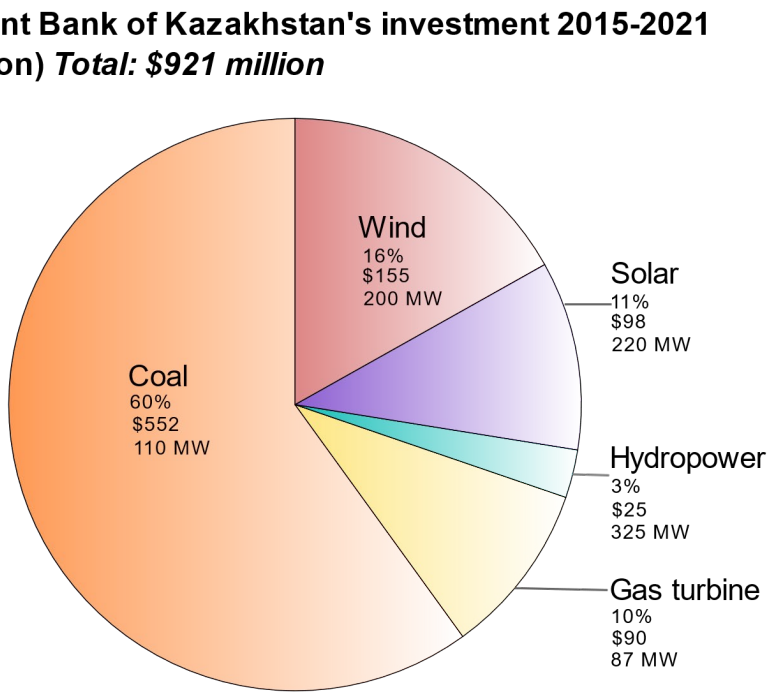


F. Internal investment – Development Bank of Kazakhstan

29. Similar to China's investment pattern into Kazakhstan's energy sector, the internal energy investment from the Development Bank of Kazakhstan is dominantly directed into unabated fossil fuel resources including coal and natural gas (70% of total investment between 2015-2021). These primary energy sources are commensurate with generating 197 MW of power. Contrastingly, the combined generation capacity of invested renewable energy sources including wind, solar and hydropower is much greater with 745 MW (Figure V). The overall internal investment pattern is highly dichotomous. Renewable energy sources are not considered as firm capacities because these cannot produce power on demand at any given time during the year for as long as required. While unabated fossil fuel is a reliable supply, however the carbon intensity of these sources does not align with Kazakhstan's long term climate target. Therefore, alternative energy sources or technologies

that provide firm capacities in addition to renewable energy sources is evidently required. The continued use of fossil fuel will only be aligned with the long-term climate goal if CCUS technology is incorporated.

Figure V
distribution of energy-related investment from the Development Bank of Kazakhstan between 2015-2021 in US$ million



IV. Objectives of the round table on financing clean energy

30. At its eighteenth session on 20 September 2022, the Group of Experts will discuss the financing of cleaner energy technologies with key members of the international financial institutions (IFIs). This is in line with the objectives of the Paris Agreement, Agenda 2030 for Sustainable development, and the UNECE Regional Forum on Climate Initiatives to Finance Climate Action and the SDGs. The objectives of these session include:

(a) To evaluate existing sustainable investment flow strategies of key IFIs influential in the ECE region and to enhance understanding of the current sustainable investment climate and its implementations;

(b) To present a case study gap analysis for Kazakhstan which will demonstrate any discrepancies between presently implemented sustainable financing instruments with the modelled pathways to reach carbon-neutral in the "Technology Interplay under the Carbon Neutrality Concept" report;

(c) To provide foundations to kick start discussions for sustainable financing within the ECE region in line with the objectives of the Paris Agreement and the objectives and targets of the 2030 Agenda within a carbon-neutral framework in the Sustainable Energy Week in 2022;

(d) To inform stakeholders on the diversification in the future energy portfolio needed for carbon neutrality and to highlight the benefits of a diversified energy portfolio for building resilient energy systems.

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