



3rd Almaty
Energy Forum

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Conclusions and proposed next steps

This year's Almaty Energy Forum gathered over 400 policymakers and representatives from the energy industry, finance sector, science and academia, to discuss how to accelerate energy transition in Central Asia.

The Forum, a joint effort of three UN organizations – Economic Commission for Europe (UNECE), Economic and Social Commission for Asia and the Pacific (UNESCAP) and the United Nations Development Programme (UNDP), and hosted by Kazakh British Technical University – brought together policymakers, energy experts, innovators, and leaders from across the energy spectrum to share knowledge, forge partnerships, and chart a course towards more resilient and more clean energy systems in the region.

Over three days, critical discussions focused on energy connectivity, water-energy nexus, de-risking financing for renewable energy and energy efficiency, critical raw materials, methane management and just transition.



Energy connectivity in Central Asia: unlocking opportunities

Central Asia is a region with vast fossil and renewable energy resources. These resources are, however, distributed unevenly across the region. If developed strategically and shared across the region, they can significantly contribute to emission reduction targets of Central Asian countries, and to an affordable energy transition in the region.

Enhancing regional energy connectivity and energy trade through cooperation is a critical factor to achieve resiliency of the energy system and energy security in Central Asia. An integrated and interconnected energy system, that encompasses electricity and gas grids, and is also compatible for transport and trade of low-carbon and zero-carbon hydrogen, can help create a more reliable, affordable and sustainable energy supply and allow deep decarbonization as well as a more effective integration of scaled renewable energy power generation capacity into the energy system. To create such a system, greater funding will have to be directed towards energy infrastructure projects across the region, including efficient transmission and distribution.

There is a need to effectively scale and integrate additional renewable energy power generation into the current energy systems to improve the overall resiliency of the region's energy systems and ensure alignment with sustainable development. The specific recommendations are:

Invest in and promote integrated planning: Estimated total investment needs for energy projects in Central Asia by 2030 is \$52.8 billion; 86% of the total for power generation projects, and 14.0% for the expansion of electricity networks. Integrated planning optimizes the use of resources, decreases overall project costs and promotes long-term sustainability of the energy system.

Promote renewable energy growth: Kazakhstan aims to increase renewable energy production to 15% of total output by 2030. Uzbekistan plans to raise the share of electricity production from renewable sources to 25% by 2030. Tajikistan and Kyrgyzstan are expected to scale up large hydropower projects and unlock their still untapped hydropower potential. Turkmenistan will need to catch up with

the rest of the region to unlock its renewable energy potential and diversify its energy mix that is now based on natural gas.

Address interconnection challenges: Strengthening grid connections across the region is of critical importance. For example, increased interconnection between Uzbekistan and Tajikistan is necessary to enhance the reliability of electricity supply. Interconnections with Turkmenistan and Iran may be required to ensure stable cross-regional operation. Concrete actions are needed across the region to allow cross-border electricity flows and trade, in particular to enable the integration of increasing shares of renewable energy resources. The region should embrace the strategies of ESCAP's Regional Roadmap on Power System Connectivity, which has been endorsed by all Central Asian member States, and which contains recommendations for improving cooperation on power system planning and financing for cross-border grid infrastructure.

Ensure alignment between connectivity efforts and sustainable development: Connectivity is a tool that, if properly utilized, can enable achieving many of the Sustainable Development Goals, including SDG 7 on access to modern energy resources, SDG 13 on climate action, SDG 8 on decent work and economic growth, and SDG 10 on reduced inequalities, to name just a few. ESCAP's Green Power Corridor Framework offers a set of guiding principles and metrics to help countries ensure that connectivity initiatives are consistent with and enablers of sustainable development.

Improve grid stability and storage: Scaling up renewable energy capacity across the region will require strengthening the regional electricity grid (and supporting storage technologies) that can absorb and distribute this additional vast renewable energy capacity. The extensive planned construction of renewable energy capacity requires additional analysis of power generation capacities, renewable energy resource potential, existing grid capabilities, and characteristics of energy storage.

Balance power flows: With an increasing share of renewable energy in the regional energy mix and rising demand for electricity, as a result of long-term deep electrification of buildings and transport, in Kazakhstan, Uzbekistan, Kyrgyzstan, and Tajikistan, power imbalances at the borders between national power systems will grow. Centralized and harmonized frequency and power flow control systems will be crucial for the stability of the regional electricity network, as well as mechanisms to enable flexible multilateral power trading.



Role of regulators for enhanced regional energy connectivity

During the Soviet era, the Central Asian countries of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan were interconnected into a single Central Asian Power System (CAPS). This vast network of power plants, transmission lines and subsystems allowed for optimal use of the region's energy and water resources. After the collapse of Soviet Union, the CAPS faced numerous challenges that ultimately led to its fragmentation, and a lack of investment in infrastructure and maintenance resulted in power outages in many parts of the region.

Central Asia's legacy of integration gives it an infrastructure and institutional base upon which it can build a more secure, affordable, and sustainable energy system. From an institutional perspective, regulators have a significant role to play in the energy transition at the national level as well as the development of regional power system connectivity. For example, regulators are key to ensuring that variable renewable energy resources and connectivity initiatives are developed in an integrated fashion and in the interest of the consumers.



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Enabling energy transition at a regional scale in Central Asia therefore requires regulatory collaboration. Areas for collaboration include engaging in regional dialogue in order to share experiences, harmonizing regulations, and enabling the development of new or the improvement of existing institutions to support connectivity which in turn will support the clean energy systems of the future. Furthermore, energy connectivity brings multiple benefits, including the expansion of sustainable energy solutions and the creation of mutual socio-economic advantages. Importantly, connectivity projects can be undertaken without necessitating political or economic integration.

Effective regulations are required to incentivize the development and deployment of renewable energy and supportive technologies such as storage and grids. Regulators also play a crucial role in accelerating connectivity efforts, including harmonizing or otherwise aligning regional and national regulations. This involves aligning regional and national regulations, thus ensuring a seamless and harmonious energy landscape.

Regulators play a crucial role in ensuring energy connectivity is sustainable by establishing and enforcing policies, standards, and regulations that promote environmentally responsible and efficient energy practices. The specific recommendations include:

Set standards and requirements: Regulators across the region to establish technical and performance standards for energy infrastructure, including transmission lines and generation facilities. Energy regulators contribute to the diversification of energy sources, improved energy security, and increased energy market stability and system resilience, which is required for grid planning, development and maintenance.

Incentivize development of renewable energy: Regulators can incentivize the integration of renewable energy sources into the grid by implementing various policies. These measures encourage the development and deployment of clean energy technologies. Regulators establish standards for the interconnection of renewable energy systems, such as solar panels and wind turbines, to the grid. These standards ensure safe and reliable integration of distributed energy resources.

Support energy connectivity: Energy regulators can actively promote energy connectivity by facilitating and overseeing the development of cross-border and regional energy infrastructure. They play a crucial role in harmonizing technical and regulatory standards across neighbouring regions, enabling the seamless exchange of electricity.

Promote common market development: Regulators can encourage cross-border electricity trading by harmonizing technical and market rules, fostering standardization, and ensuring fair competition. Additionally, they can support the integration of renewable energy sources by implementing policies that incentivize green investments and grid modernization as well as better balancing of energy systems.

Facilitate fair competition framework: Regulators can create market structures that encourage sustainable practices. Regulators can also oversee transparent pricing mechanisms, which promote fair market conditions. Moreover, they encourage market transparency and information sharing, enabling consumers and businesses to make informed choices.

Engage relevant stakeholders across the region: There is a need for inclusive dialogue with various regional stakeholders, including utilities, industry experts and development organizations to gather input and feedback on energy policies and regulations. This inclusive approach helps ensure that

decisions align with broader sustainability goals and the projects from development agencies complement one another.

Create investment friendly environments: Regulatory certainty and stability are essential for attracting long-term investments. This involves setting clear and consistent rules, ensuring transparency in decision-making processes, and minimizing regulatory risks. By fostering an environment that encourages innovation and competition energy regulators can drive much-needed capital into the power sector, contributing to its sustainable development.

Exchange of best practices and experience: Energy regulators should collaborate with their counterparts in other countries to share experiences and increase collaboration to learn from other experience, with a focus on strategies to accelerate sustainable power system development. There are some existing successful examples of cooperation between energy regulators and international organizations can facilitate this dialogue.



Addressing Water and Energy Nexus challenges in Central Asia

Central Asian countries represent a classic example for exploring the interlinked and often competing inter-sectoral and cross-border claims to common resources. Such claims often create sources of real or potential tensions, while at the same time highlighting opportunities for optimizing the shared use of water, energy and food resources in the basin and – in a wider context – the whole Central Asia.

Over the past 30 years, the countries of Central Asia have made continuous achievements in inter-sectoral and upstream-downstream coordination, while they also face remaining and emerging challenges such as increasing demands for natural resources and impacts of climate change. This indicates that significant benefits can be gained from a strengthened cooperation on the nexus between water and energy to ensure the enhanced resilience of the Central Asian countries. Efforts to enhance inter-sectoral and upstream-downstream coordination span a wide range of administrative, financial, legal and technical issues.

Enhanced energy connectivity can play a significant role in helping countries diversify energy production at scale and pursue more coherent and efficient water and energy resource management across a region. There are several recommendations for enhancing water and nexus:

Coordinated Water and Energy Management: Enhanced connectivity facilitates the coordinated management of energy and water resources, ensuring that water demand is taken into account for both energy production and irrigation. It is important to continue working on the existing basis of the water-energy cooperation, agree on key principles of water-energy cooperation among the countries, develop multi-year protocols for water allocation, combine administrative and market instruments (e.g. PPP, risk insurance). There is a need for regional water-energy consortium, which would guarantee proper implementation of the water-energy cooperation. The countries should consider setting up a regional non-state technical operator which will be coordinating issues of energy production and irrigation. International partners to support the water and energy cooperation in the region.

Develop based on the existing basis and transform smoothly: Climate change and geopolitical challenges add to the existing issues in the region. Further regional economic integration in Central Asia will lead to more effective institutions, information and data sharing, and resource mobilization to address the cross-boundary water-energy related issues in a more systematic and efficient way.

People should be the focus of the energy network development. The water sector faces a growing gap in human capital, and while water and energy are issues of national and regional security, development of human capital should be seriously considered.

Use existing and develop new practical tools: The region and countries need models (e.g. hydrological, economic costs and benefits of cooperation), scenarios, guidelines and practical tools for intersectoral cooperation, and should invest in data to enable informed decisions. UNECE and ESCAP offer various tools and guidelines (e.g. on nexus, carbon neutrality) that aim to help countries identify appropriate policy and technology options. More work is being done on low-carbon hydrogen production and energy connectivity in the region. Lessons learned and tools from this work will allow countries to tap into the strengths of different available resources and balance their energy production according to seasonal variations.

Facilitating Renewable Energy Integration: Improved energy connectivity enables the integration of diverse renewable energy sources, such as solar, wind, hydropower, and potentially biomass, across a larger geographical area. This allows countries to tap into the strengths of different resources and balance energy production according to seasonal variations. Besides, by encouraging development of renewable energy, the natural advantages of the countries may be reinforced and used more efficiently to achieve benefits beyond energy sector, for example, adding solar PV generation to the existing hydropower capacities may help save scarce water, otherwise used for power generation.

Facilitating Energy Storage and grid resilience: Enhanced connectivity can support the development of energy storage solutions, including large-scale batteries and pumped hydro storage. These technologies allow for the capture and storage of excess energy during periods of high production, which can be released when demand is higher. A connected grid can improve resilience against localized disruptions or extreme weather events. By sharing resources and balancing energy loads across regions, countries can better withstand challenges that might otherwise lead to widespread blackouts.



De-risking financing of renewable energy and energy efficiency projects

Derisking green investments may be provided in 3 forms: removing the risk (e.g. regulatory changes), re-allocating the risk (e.g. loan guarantees) and compensating for the risk (e.g. concessional lending). Removing the risk may take shape of reducing uncertainty, which may and should be encouraged and supported. Investing in pilot projects and pioneering innovative financial schemes may play a fundamental role towards uncertainty reduction.

Such investments, if successful, lead to leveraged multipliers of the funds, measured in thousands of dollars per one dollar spent at the piloting phase, and such examples (mainly from Kazakhstan) were discussed by the participants: a pilot site-specific renewable auction scheme cost was less than \$100 k, while it led to repeated investments to create 240 MW of renewable energy capacity in 2019-2022, a pilot issuance of green bonds supported by UNDP-GEF concessional grant of \$200 K led to appearance of SDG bonds market in Kazakhstan worth around \$430 million at present. Those results were achieved by increasing the certainty for the investors by a simple demonstration of a feasible scheme. Other instruments discussed included risk re-allocation tools, such as bank loan guarantees and Government-backed power purchasing agreements (as an outcome of the renewable energy auctions).

Leveraging of support funding is vitally important for a deep and comprehensive decarbonization of the Central Asian region: Kazakhstan alone estimated the investment needed to get carbon-neutral as \$610 billion by 2060, and the lion's share of it must come from the private sector.

Technological innovations such as the massive application of digital technologies also help reduce investment risks dramatically, as is the case with the National Entrepreneurship Support Fund in Kazakhstan, which fully digitalized its process of issuing loan guarantees for small businesses and achieved a low default rate and superior operational efficiency (both low cost and high speed).

Appropriate financial instruments can play a pivotal role in removing barriers and encouraging investments that contribute to the development of renewable energy and the adoption of energy-efficient practices. These investments not only reduce the use of fossil fuels but also enhance the efficient use of energy resources, mitigating the effects of climate change and paving the way for a more sustainable and economically prosperous Central Asia and a wider region. Addressing the barriers to investments and establishing an enabling regulatory environment that encourages private investments is of critical importance.

Design new financial instruments and sharing knowledge: This is a way of demonstrating to the market what works and what does not, and encouraging larger scale investments, in the same way as happened with the green bonds and site-specific renewable energy auctions in Kazakhstan. New instruments may include anything that is expanding the available options away from risk-averse collateralized bank loans and caters for higher risk profiles, encouraging more bold investments and, last but not least, helps the conservative debt financing in many cases:

- mezzanine funding / subordinated loans;
- equity and equity funds;
- factoring for energy service companies;
- Islamic finance instruments;
- impact investment;
- monetizing emission reductions;
- energy performance insurance, etc.

Scale up and enhance existing instruments, adding incremental innovations: Loan guarantees and concessional funding may be improved and scaled up, to reduce market distortion and get better value for money, e.g. interest rate subsidies replacement by more transparent and less distortive investment grants to the SMEs that completed green projects and got verified, developing a stronger and more flexible loan guarantee scheme for green loans, partial replacement of green bond coupons through emission reductions from the funded project, etc.

Improve regulatory environment to reduce investment risks and encourage investments in decarbonization: Protecting the gains of the suppliers in regulated markets, such as power generation, district heating, electricity transmission, water, so that these monopolies are getting full profit from their investments in energy saving for a reasonably long period to be motivated to invest.

Introduce and enhance Environmental, Social, and Governance (ESG) regulations: ESG regulations in the banking sector involve a comprehensive approach that considers both regulatory frameworks and industry practices. There is a need for regulatory bodies to establish clear and comprehensive guidelines for ESG integration in the banking sector as well as to make ESG reporting mandatory for banks, requiring them to disclose their environmental, social, and governance practices.

Develop local emission reductions market and support access to international markets of all types:

While the region's energy efficiency is one of the worst in the world, monetising emissions reductions is an additional source of funding with an apparent additionality. The national Governments and the international development agencies must work hand in hand to unlock this funding source as soon as possible, to the benefit of the local economies and the humanity.



Unlocking critical raw materials potential in Central Asia

The economy relies on critical minerals as resources, but their supply may be disrupted. With the global energy transition and the need to meet the Paris Agreement and the Sustainable Development Goals (SDGs), many of these critical minerals are now essential metals in high-tech sectors. These metals fall under the category of critical raw materials (CRMs) and include rare earth metals (REMs), as well as other metals like lithium, indium, tellurium, gallium, and platinum group elements.

Central Asia is a region that holds a vast amount of resources that could be valuable for the energy transition. The Central Asia Orogenic Belt has an abundance of porphyry copper, gold and polymetallic deposits. Additionally, Central Asia possesses significant reserves of various minerals such as 38.6% of global manganese ore, 30% of chromium, 20% of lead, 12.6% of zinc, 8.7% of titanium, 5.8% of aluminium, 5.3% of copper, 5.3% of cobalt, and 5.2% of molybdenum.

The demand for CRMs, which are essential for global development, has increased in recent years due to the widespread use of high-tech devices such as wind turbines, solar panels, smartphones, and tablets. In addition, the development of future high technology also depends on the 'magical' properties of REMs, which are crucial for superconductivity, cryogenics, non-silicon electronics, and more.

UNECE and ESCAP can help countries in Central Asia develop a strategic roadmap promoting the adoption and leveraging the United Nations Framework Classification on Resources (UNFC) and the United Nations Resource Management System (UNRMS), initiating an ICE-SRM Central Asia to build the capacity of Central Asian institutions and establish a collaborative network.

By leveraging UNFC and UNRMS frameworks, several areas can be supported, including assessment and monitoring, investment and financing, circular economy and sustainability, regional cooperation and integration, and global goals and transition. Additionally, Central Asia has the potential to become a major supplier of critical raw materials and meet global demand by 2030. This could result in a significant market value and create numerous job opportunities. The specific recommendations are:

Enhance understanding and application: The countries in the region need to deepen their comprehension of Central Asia's critical raw materials landscape, learning from global best practices and applying frameworks like UNFC and UNRMS to regional challenges.

Develop strategic roadmap: The region is in a need of a strategic document that outlines a clear roadmap for leveraging UNFC and UNRMS to navigate the complexities of critical raw material governance in Central Asia.

Building capacity to develop resources sustainably: The establishment of the International Centre of Excellence in Sustainable Resource Management will equip relevant Central Asian institutions with the necessary skills to implement UNFC and UNRMS effectively.

Facilitate collaborative regional network: There is a need for a facilitated dialogue on how to develop the critical raw materials sustainably. A new network for fostering collaboration among Central Asian stakeholders in critical raw materials, enhancing regional integration, and sharing valuable insights.

Support in policy advancements: Concrete policy recommendations and advocacy efforts will be formulated, promoting the adoption of UNFC and UNRMS within national and regional critical raw materials strategies to support sustainable development goals.



Methane Management, Policies and International Cooperation

Central Asia is a region with vast methane resources in both fossil and biogas sectors. When emitted into the atmosphere, methane is wasted as a commodity and has a potent effect on climate. Methane emissions contribute to a quarter of today's global warming. It is over 80 times more potent than CO₂ during the first 20 years, but has a shorter lifespan in the atmosphere. Because methane is one of the few greenhouse gases that has economic value, methane mitigation can take place through market forces, provided policymakers can address market failures and distortions. To enable capture and use of methane through mitigation projects, national governments must set up favourable conditions for the private sector to identify opportunities and invest in emission reduction projects.

This topic was explored through a workshop for policymakers on methane management and through a panel session that focused on methane mitigation in the context of international cooperation. Participants discussed lack of financing for fossil-based mitigation projects. Whereas funding countries are interested in “easily-to-endorse” projects related to renewable and biogas, this interest does not meet the needs of developing countries who are dependent on fossils and do not have the financing for transition. There is a need to make sure that energy transition mechanisms exist for developing countries, while also ensuring that funding countries are comfortable and confident in achieving emission reductions and that achieved reductions are credible and ambitious.

Many resources are available for countries to develop policies that help mitigate methane emissions. Specific recommendations included:

Join the Global Methane Pledge: Countries in Central Asia could join and request technical assistance under the Global Methane Pledge, which aims to reduce methane emissions by 30% globally between 2020 and 2030 as well as commit to using the highest tier IPCC inventory methodologies (Tier 3).

Improve measurements to measure methane missions: Methane emissions from underground coal mines could be estimated by using measurements of methane concentration and flow, which are taken for safety purposes. Policymakers can develop a tier 3 approaches for monitoring, reporting and verification (MRV) systems, if they use safety measurements for MRV.

Build capacity for informed policymaking: Policymakers can explore two resources to assist in developing policies for methane mitigation: *Policymaker's Framework for Addressing Methane Emissions from the Global Methane Initiative* and *Methane Abatement for Oil and Gas: Handbook for Policymakers*. These resources have practical case studies, tools, and resources for methane

mitigation and help put policies into context and ensure policymakers have the right information for decision-making.

Improve cost-effectiveness of methane mitigation projects: Countries in Central Asia can improve cost-effectiveness of methane mitigation projects by developing enabling policy conditions, such as those related to price on energy, carbon pricing mechanism, and access to energy markets. Globally, countries have adopted the following policies to improve cost-effectiveness of methane mitigation projects: include methane mitigation projects in feed-in tariffs and obligations; include methane in carbon pricing mechanisms; ensure access to energy markets; provide direct technology subsidies, grants, and financing. Many other policies can determine feasibility of methane mitigation projects, and countries should comprehensively review their policy landscape.

Comply with Article 6 of Paris Agreement: Countries can begin preparing for potential emerging markets under the Article 6 of Paris Agreement, which can help create or improve financial incentives for methane mitigation. Efforts are already under way to develop regulatory and institutional framework, build capacity, and a system for project approval support for eligible countries (with bilateral agreements in place). Similarly, UNDP is supporting development of digital infrastructure, such as platform, national registering and video monitoring of projects.

Develop policies that bring change to the industry: Such change could include not permitting coal mining without realistic and binding maximum allowable emissions and principles-based procedures for emissions curtailment throughout the coal mine life; increasing security bonding; preventing transfer of gassy coal mines to junior mining companies that have weak ESG policies and practices; creating trusts (funding structures) to manage and supply capital administered by non-political bodies to provide new technologies that reduce unaddressed emissions; closing loss producing mines and financing mined land repurposing that promotes vibrant futures for mining communities ensuring just and equitable transitions based on practical and implementable plans. Methane emissions are inextricably related to safety problems — emissions reductions lead to safer coal mines.



Developing human capital for a just energy transition in Central Asia

Achieving the energy transition is imperative for mitigating the adverse impacts of climate change. It also serves as a strategic foundation for realizing a sustainable, net-zero future in accordance with international commitments (such as SDG 7, 8, and 9) and the evolving landscape of energy innovation.

A “just transition” is an integrated approach to sustainable development that brings together social progress, workers’ protection, environmental consciousness, and economic success into a framework of democratic governance and institutional support. Effective “just transition” strategies require local, bottom-up participation of all affected stakeholders and commitment by the governments to guarantee their buy-in and provide planning security.

There is increasing evidence, and recognition, that clean energy transitions require new technologies to serve the energy needs of growing and advancing economies.

Research and innovation from the academic sector are crucial in developing the expertise that Central Asia needs to adapt to climate change and properly prepare for transition. This includes developing scenario building and strategic foresight tools to assess future energy needs, technology trends, and policy implications to ensure that Central Asia’s energy policies are future-ready.



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Building and maintaining resilient and carbon neutral energy systems in Central Asia will require developing new innovative solutions, which will in turn require new skills. Universities will play a key role in that process as it will be to a large extent their task to develop the human capital necessary to meet the requirements of the green economy and to close the skills gap across the region to deliver on green and just energy transition.

The session brought together university representatives and policymakers to explore how to overcome barriers and identify solutions to foster the next generation of energy experts across Central Asia. The specific recommendations coming out from the discussion include:

Strengthen educational and training programs: It is necessary to develop and expand specialized energy education programs across academic institutions in Central Asia to build capacity and foster the next generation of energy experts to deliver on just energy transition across the region. While improving the curriculum of the current programs to deliver on just energy transition, it is necessary to consider a multidisciplinary approach.

Promote industry and academia collaboration: Foster partnerships between academia and private sector actors. Such strategic partnerships could result in fruitful joint research projects and innovation, as well as in internships and mentorship programs for students.

Build a regional platform for collaboration and knowledge exchange: Establishing a regional platform for knowledge exchange, joint research initiatives, and collaborative projects will enable universities across the region to collaborate more strategically and effectively. A first step would be to map their respective activities and strengths, and coordinate their curricula so that they respond to the needs of the upcoming energy transition and thus ensure that students are equipped with skills necessary to prepare the transformation, deliver it, and maintain its results.