

## **Report on the Workshop on Hydrogen-Water Nexus in Central Asia**

12 June 2024, Astana, Kazakhstan and online

The event was organized by UNECE as part of the Regional Stakeholder Consultations on Energy Connectivity and Sustainable Energy on 12-13 June 2024 in Astana, Kazakhstan. It was held in a hybrid format in the Radisson Hotel and with the possibility to connect online.

The event was attended by the representatives of the ministries of energy, international financing institutions, development agencies, industry, academia, NGOs and other experts from Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan (UNECE member States and RPTC programme countries), the United States (UNECE member States), Iran and Pakistan (UN Member States).

The session discussed the utilization of hydrogen-water nexus approach in Central Asia to identify critical bottlenecks in low carbon hydrogen production potential in relation to the water use, and exchange expert opinions on opportunities for applying multi-sectoral decision-making approach in the energy and water sectors for improved coordination.

Central Asia region has big potential for development of hydrogen economy. In Kazakhstan, the potential of solar and wind can be used for low carbon hydrogen production, and the estimated future hydrogen production potential by 2040 is up to 2.624 Mt per year. Kyrgyzstan has great potential for renewable energy, especially large hydropower and solar energy, and in the long-term, to develop low carbon hydrogen. Tajikistan also has the potential to generate low-carbon hydrogen using hydropower. Turkmenistan has potential in using the desalinated water from Caspian Sea for hydrogen production. Uzbekistan has an estimated potential of 2.09 Mt of hydrogen and emerges as one of the key frontrunners in the development of the regional hydrogen economy.

At the same time, the Central Asian challenges such as population growth, increasing demand for energy and water coupled with decarbonization (while continuing economic development) require inter-sectoral approach and coordinated policies in governing of hydrogen production and water resources in the region.

Central Asia's water resources are primarily sourced from the Amu Darya and Syr Darya rivers and crucial for agriculture, ecosystems, and local communities. Optimizing water usage while facilitating the growth of hydrogen production is needed to address the challenges and present new opportunities.

The utilization of nexus approach can have potential to unlock additional opportunities and choices by comprehending the connections between different elements and implementing effective systems for improved coordination. The hydrogen-water nexus in Central Asia can represent a critical and evolving intersection of energy and environmental dynamics.

During the event, Mr. Yuri Melnikov, Expert, UNECE Hydrogen Task Force, made presentation with overview on hydrogen policies, the role and potential of Central Asian region in the low-carbon hydrogen production. In particular, to achieve the 1.5C pathway, hydrogen and e-fuels must account for 14 per cent of total final energy consumption by 2050 and will require a 100-fold increase in hydrogen production and delivery infrastructure. At the same time, considerations for hydrogen production in Central Asia and the Caspian are not included in

the models by many stakeholders. Mr. Melnikov indicated that water consumption for hydrogen depends on the production technology and varies significantly between coal gasification (31 kg), natural gas-SRM (17.5 kg), natural gas-SRM-CCUS (32.2 kg) and electrolysis-PEM (17.5 kg) showing that green hydrogen is less water-intensive. He pointed out that Central Asia is a region of water stress. In case of Kazakhstan, for example, water resources used for hydrogen production (hydrogen via PEM and Alkaline) are relatively small, but it needs to be assessed on a case-by-case basis as water resources are highly dependent on local availability. Overall, hydrogen is not the foremost water management risk in the region, but it should be carefully evaluated in strategies, projects and policies within an interdisciplinary approach.

Ms. Botakoz Suleimenova, Researcher, Hydrogen Technologies Research Laboratory, KMG Engineering, made presentation with overview of hydrogen deployment in Kazakhstan, barriers for hydrogen industry development in the country and particularities of hydrogen-water nexus. She indicated that water management in Kazakhstan is made on basin approach. The total amount of water resources is around 100 km<sup>3</sup> of which 57 km<sup>3</sup> are formed on the territory of Kazakhstan and the rest of the volume comes from riparian countries. While the agriculture sector is the main consumer of water (around 65%), industry consumes around 25% and the rest goes for public utilities and household needs. Ms. Suleimenova indicated that industrial and household wastewater, flood and precipitation water as well as available surface water can be used for hydrogen production purposes. She pointed out on the current work by KMG Engineering for assessment of (i) water resources through remote sensing (such as surface water, contract territories of ground water, precipitation); (ii) potential of renewable energy (including solar and wind); (iii) the cost of hydrogen production. She concluded that analysis of hydrogen opportunities in Kazakhstan is an ongoing process and will require looking at the hydrogen production and storage as well as formation of hydrogen energy market.

The session was followed by the moderated discussion. Ms. Nadejda Khamrakulova, Economic Affairs Officer, UNECE, was moderating the panel discussion. The panellists included Mr. Shukhrat Isaev, Head of Department, Agency for Innovative Development of Uzbekistan; Mr. Furugzod Usmonov, Energy Expert, Tajikistan, Vice Chair, Group of Experts on Cleaner Electricity Systems; Mr. Paul Bertheau, Project Manager, HyRECA project; Mr. Nurbek Yessetov, Energy Advisor, H2 Diplomacy Office, Kazakhstan; Ms. Peline Atamer, Senior Policy Analyst, SIPA-Central Asia, OECD (online); and Ms. Dina Azhgaliyeva, Senior Research Fellow, ADB Institute (online).

The participants focused discussion on (i) potential for the development of hydrogen economy in Central Asia; (ii) looking at how nexus approach can help in optimizing water usage while facilitating the growth of hydrogen production in Central Asia; (iii) the role of renewable energy sources and desalinated water in effective utilization for low carbon hydrogen production in Central Asia; (iv) key challenges and barriers to developing a hydrogen-water nexus in Central Asia, and how they can be addressed; (v) importance of inter-sectoral cooperation and coordinated policies in governing hydrogen production and water resources in the region; (vi) the role of international partnerships playing in the development of the hydrogen-water nexus in Central Asia.

Key takeaways from the discussion include:

- Central Asian region has big potential for low-carbon hydrogen production, leveraging its rich renewable energy sources, including solar, wind, and hydropower.
- Efficient use of water resources is crucial for hydrogen production. Central Asia relies heavily on the Amu Darya and Syr Darya rivers, and optimizing water use while expanding hydrogen production is essential to address both energy and agricultural needs.
- Employing a hydrogen-water nexus approach can enhance understanding of the interdependencies between water security and hydrogen production. By integrating water and energy policies, the region can better manage resources and improve sector coordination.
- Renewable energy sources and use of desalinated water from the Caspian Sea are crucial for producing low-carbon hydrogen. These resources must be effectively integrated into hydrogen production strategies.
- Collaboration with international organizations and partnerships is important for the success of the hydrogen-water nexus. These can bring in necessary expertise, funding, and technology to support regional initiatives.
- Continuous analysis is needed to realize hydrogen opportunities in the Central Asian region.

The event materials are available on the UNECE [webpage](#).