

Sustainable Hydrogen Production in Eastern Europe, the Caucasus and Central Asia



ENERGY



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A multi-stakeholder platform that promotes economic integration, cooperation among member States, sustainable development and economic prosperity based on:

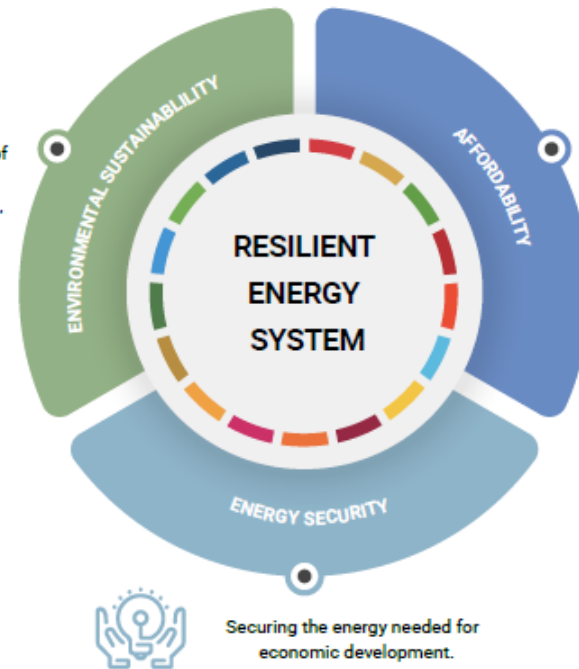
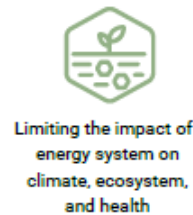
- *public policy dialogue*
- *discussion of international legal instruments*
- *development of regulations and standards*
- *exchange and application of best practices and knowledge*
- *technical cooperation for countries with economies in transition*

Building Resilient Energy Systems

Technical Considerations and Actions for Achieving Energy Security, Affordability, and Sustainability Net-Zero for Europe, North American and Central Asia

What is a resilient energy system?

- A **resilient energy system** ensures that energy makes an optimal contribution to a country's **social, economic, and environmental** development.
- **Energy security** strengthens energy independence through interconnectivity and trade.
- **Affordability** reduces costs of electricity, heating, cooling, and transport.
- **Environmental sustainability** lowers the carbon footprint and enhances efficiency across the energy supply chain.

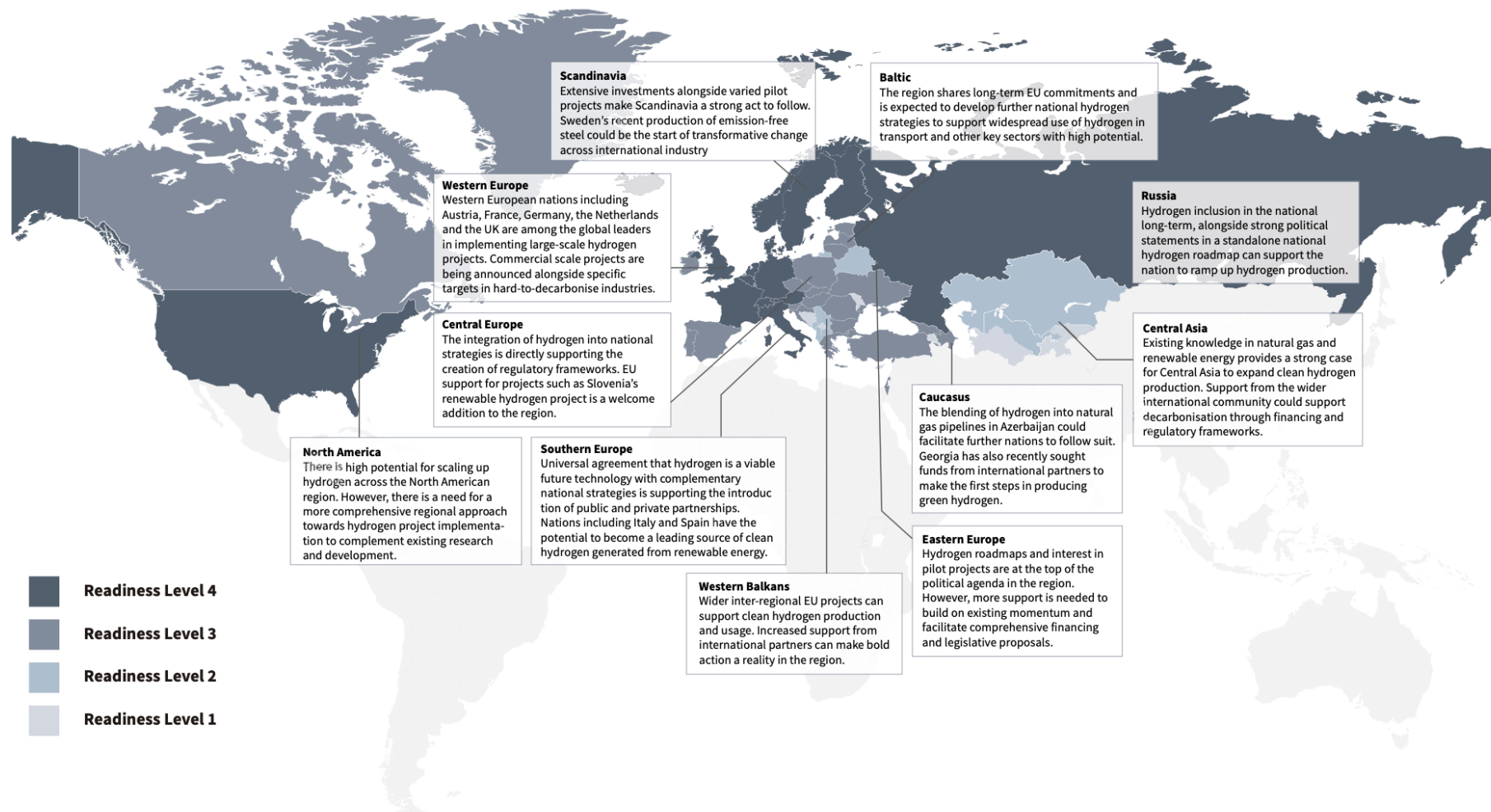


Priority Activities for Sustainable Energy in 2023

- **Access to critical raw materials** and United Nations Framework Classification for Resources (UNFC) → adoption of UNRMS, necessity for scaling renewable energy and energy transition
- Work on **hydrogen production and decarbonization** in Central Asia (project on low-carbon hydrogen production in the CIS countries and its role in the development of the hydrogen ecosystem and export potential)
- Work on **energy connectivity** – project on enhancing regional energy connectivity for more resilient and carbon neutral energy systems in Central Asia
- **Almaty Energy Forum** – a platform for continuous inclusive multistakeholder dialogue to facilitate regional cooperation, provide technical capacity support and build cross-regional technical and institutional capacity in Central Asia

Assessment of Readiness Level across UNECE Region

Levels of actions taken towards the integration of hydrogen into energy systems



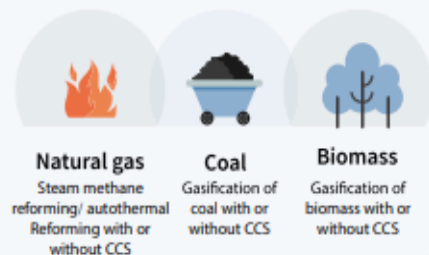
HYDROGEN VALUE CHAIN

Hydrogen, an innovative solution for achieving carbon neutrality

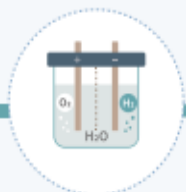
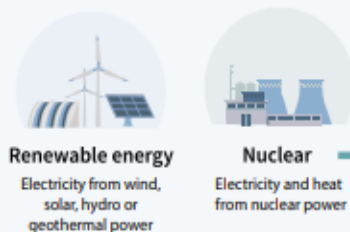


PRODUCTION

FUEL-BASED PRODUCTION



ELECTRICITY SYSTEM



CONVERSION, PROCESSING & TRANSPORTATION

PURE H₂



PROCESSING

- Liquification and regasification of H₂
- H₂ gas compressed



CONVERSION

Haber-Bosch process

H₂ & N₂ → ammonia;
standard shipping modes



Methanization

H₂ + CO₂ → CH₄ + H₂O
or H₂ + CO → CH₃OH (methanol)
(synthetic or substitute natural gas)



H₂

STORAGE



Liquefied H₂ in storage tanks



Geological storage in underground salt caverns

USE

TRANSPORT



- Hydrogen into **fuel cells** for trucks, passenger vehicles
- Synthetic fuels** for shipping and aviation

INDUSTRY



- Hydrogen as **feedstock** in refining, steel production, chemicals production
- Hydrogen for **heat generation** for industrial processes

BUILDINGS



- Hydrogen for **heating**
- Hydrogen for onsite **power** through fuel cells

POWER



- Fuel cell **electricity**, H₂ turbines and H₂ CHP
- Energy storage** and system buffer



Awareness

Recognise hydrogen as a viable climate mitigation option



Acceptance

Develop and integrate policies to jumpstart hydrogen economy



Finance

Direct public and private investment into clean hydrogen projects

Project on Sustainable Hydrogen Production Pathways

Analysis of national potentials to contribute to development of a hydrogen ecosystem and global energy transitions, including the supply of energy to energy-deficient regions of the world

Analysis of priority areas for the development of national hydrogen potential

Analysis of hydrogen production potential across CIS countries

Analysis of the opportunities for hydrogen export and possible applications in the domestic market

Peer-to-peer dialogue on best practices and lessons learned in developing national hydrogen strategies

Subregional assessment of cost and technical performance of hydrogen production from fossil fuels, low-carbon energy, and renewable energy across beneficiary countries

Refining of existing data and assumptions related to sustainable hydrogen production for the energy model.

Directions for the implementation of pilot projects for the supply of sustainable hydrogen for export

Recommendations for pilot projects in international cooperation in sustainable hydrogen technologies

Policy dialogue to identify and overcome existing barriers to development of a hydrogen ecosystem

Final seminar for representatives of governments, industry, and academia to present and discuss recommendations and discuss how they can be incorporated into draft National Action Plans to meet SDG 7

Towards the Hydrogen Economy Development

Armenia, Belarus and Moldova are united by dependence on energy imports and an orientation towards natural gas. In all three countries, renewables have so far received limited development, but in Armenia and Belarus, nuclear power plays a significant role. With relatively unambitious greenhouse gas emission reduction targets, there is practically no potential local demand for low-carbon hydrogen over the next 10 years. However, Belarus and Moldova's proximity to the EU market could open additional opportunities in the future, especially in connection with renewable hydrogen

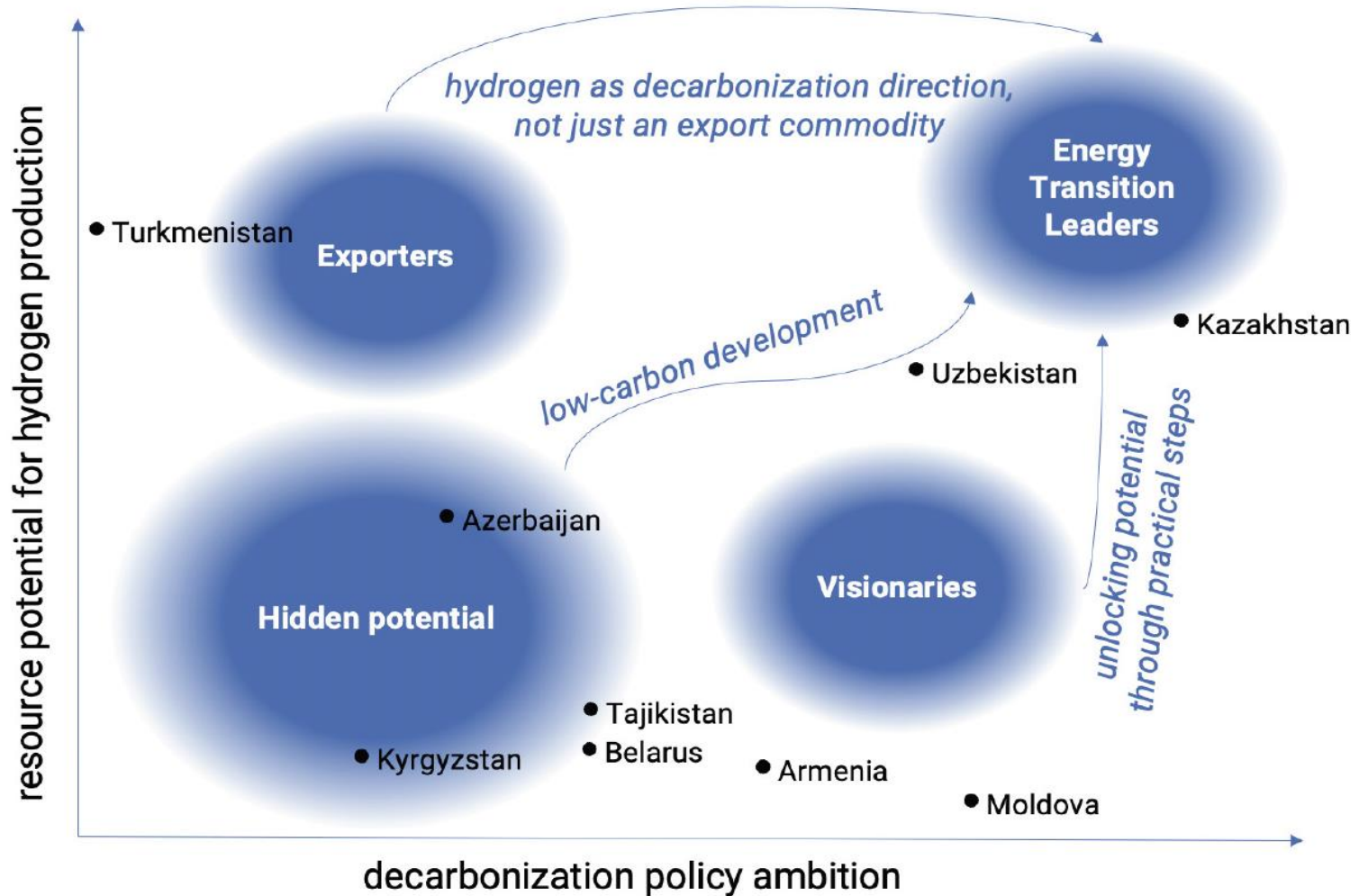
Azerbaijan and Turkmenistan - major energy exporters towards the EU and China. The climate policy in these countries does not yet create significant incentives for decarbonization and low-carbon technologies deployment. The key consumers of gas from Azerbaijan and Turkmenistan - the EU and China - are actively developing the hydrogen economy, which can create additional incentives for the countries

Towards the Hydrogen Economy Development

Kyrgyzstan and Tajikistan are united by energy shortage problem and a significant hydropower plants share in the energy mix, which provide low-carbon, but intermittent energy. Hydropower plants create problems associated with energy deficit during winter and energy surplus during summer. This creates potential for hydrogen production using surplus curtailed electricity from hydropower plants and use of this hydrogen, for example, to replace imported oil products

Kazakhstan and Uzbekistan are showing impressive momentum in launching the low-carbon energy transition— despite being rich in and exporting their own fossil energy resources. Both countries are drafting national hydrogen strategies with the support of international organizations and are actively deploying renewable energy

Possible typical scenario models for hydrogen economy establishment and deployment in the countries covered by the study, depending on their decarbonization policy ambition and resource potential for low-carbon hydrogen production



Way forward



The hydrogen economy deployment pace will be determined by:

- Strategic focus on low-carbon development
- Building an appropriate regulatory framework
- Expanding markets
- Technological development
- International cooperation
- Joint projects implementation
- Common export strategy

Thank you for your attention!



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