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Iranian Research Organization for Science and Technology

Sustainable Technologies for Natural Resources in Iran
Opportunities and Challenges

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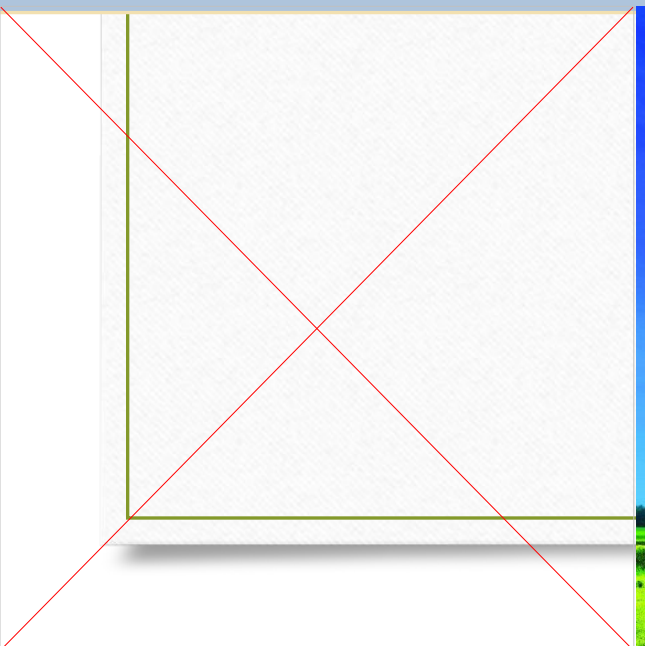


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CONTENTS

01 Iran's Energy Capacity

02 Opportunities for Natural Resources Use

03 Challenges to Natural Resources Use

04 Strategies for Renewable Energy Development

05 International Cooperation for Natural Resources Use

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01 | Iran's Energy Capacity

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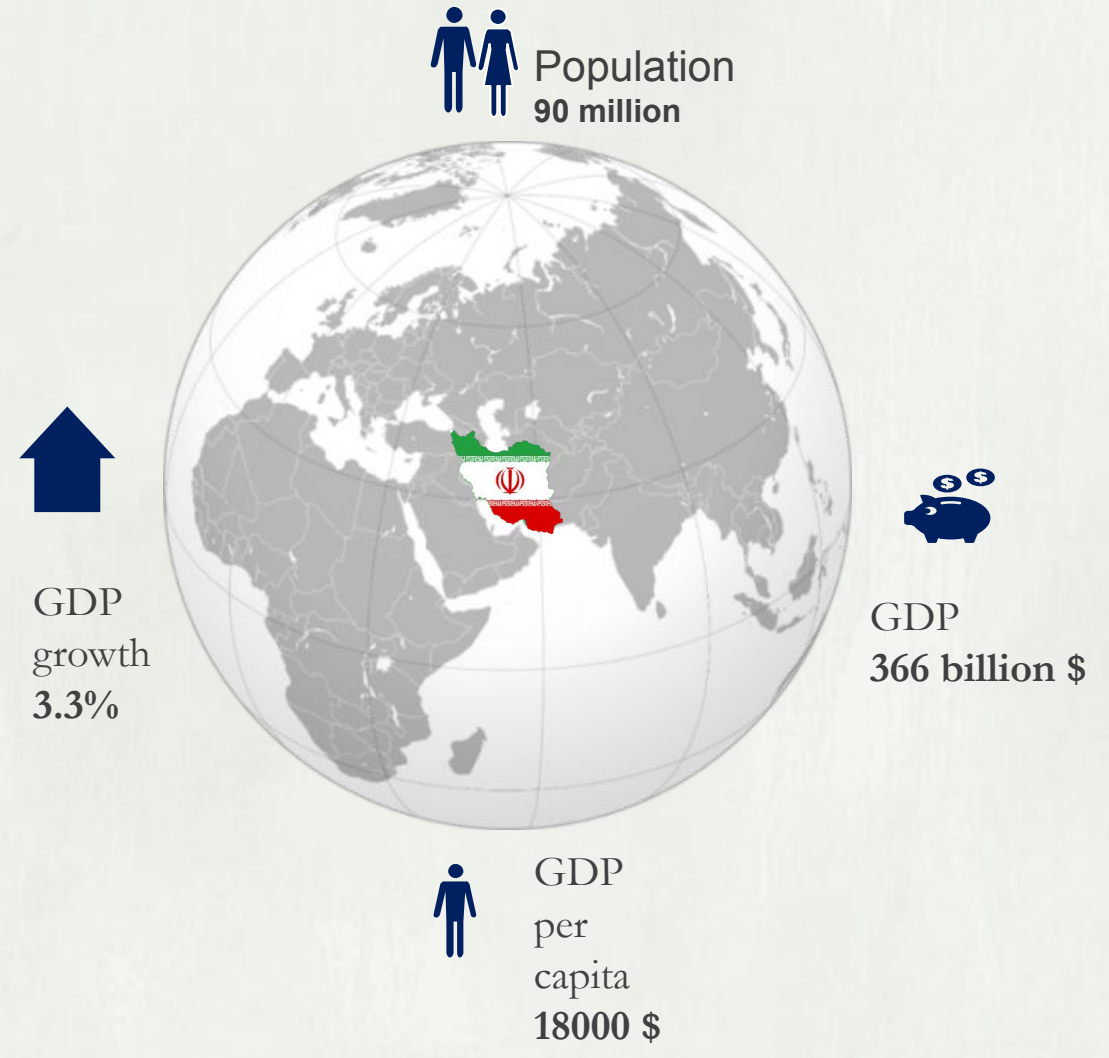
Iran's Natural Resource Wealth: A Foundation For Growth

- Iran, with a population representing approximately 0.1% of the world's total, holds a vast wealth of natural resources. The country possesses about 7% of the world's natural reserves, including roughly 9% of global proven crude oil reserves and 17% of the world's natural gas resources.
- A look at Iran's economic performance underlines the fact that this economy has not realized its potential, and will be growing fast.
- Iran has embarked on a new era of economic development, based on knowledge-based companies and export-led growth – there is a much greater emphasis on local capacity building and creation of Joint Ventures.



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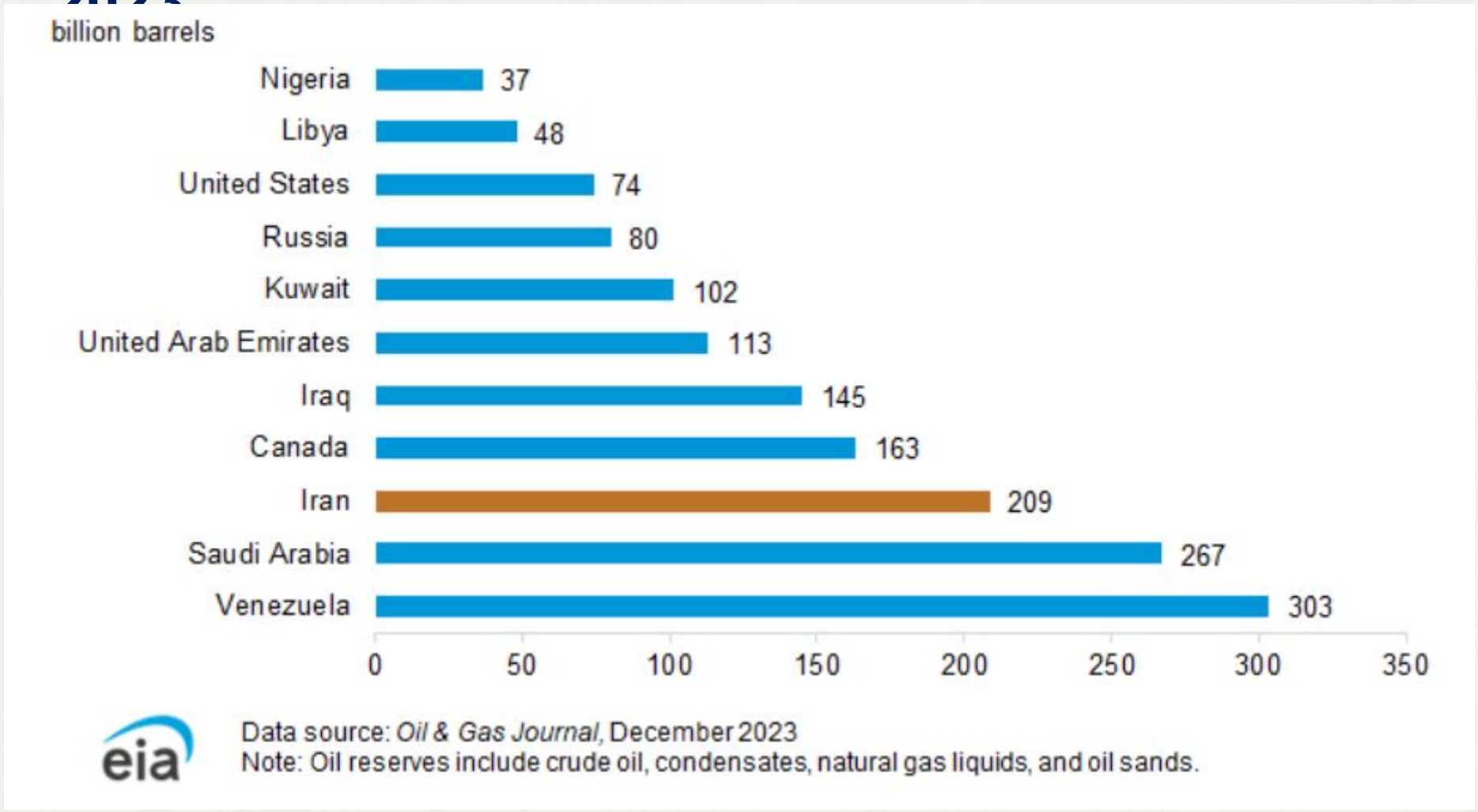
Largest Proved Reserve Holders of Total Oil, 2023



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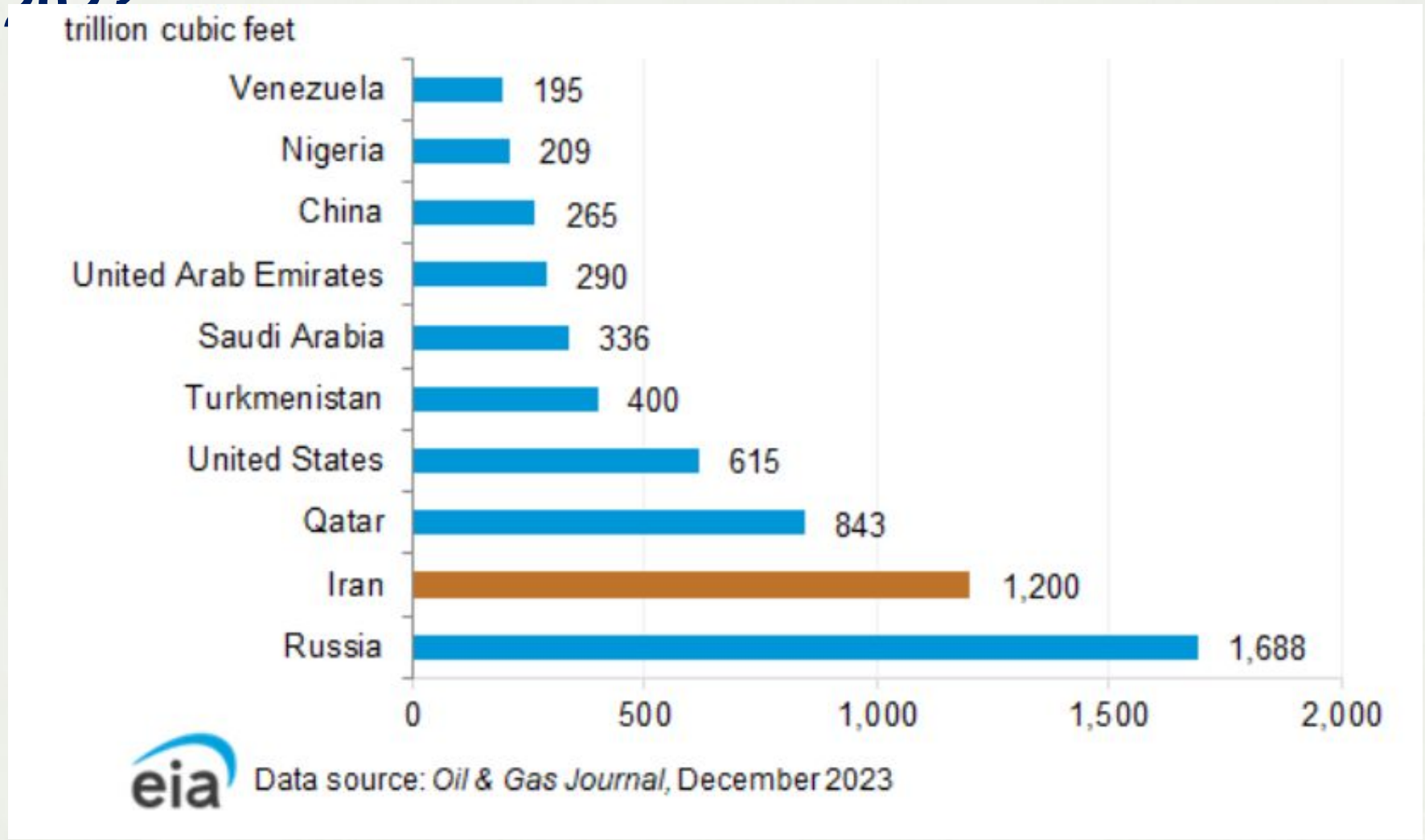
Largest Proved Reserve Holders of Natural Gas, 2023



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Iran's Energy System : Subsidies , Pricing and Access

- Subsidies of energy systems: near to 100 b$ annually – 1st in the world
- Powerplants: 33% , households: 24% , industries: 21% , transportation: 15%)
- Price of household's electricity: near to 0.35 $cent / kwh
- Price of household's gas: near to 0.7 $cent / m3
- Availability to electricity: 100% of urban population and near to 99.7% of rural population
- Availability to Gas: near to 97% of total population

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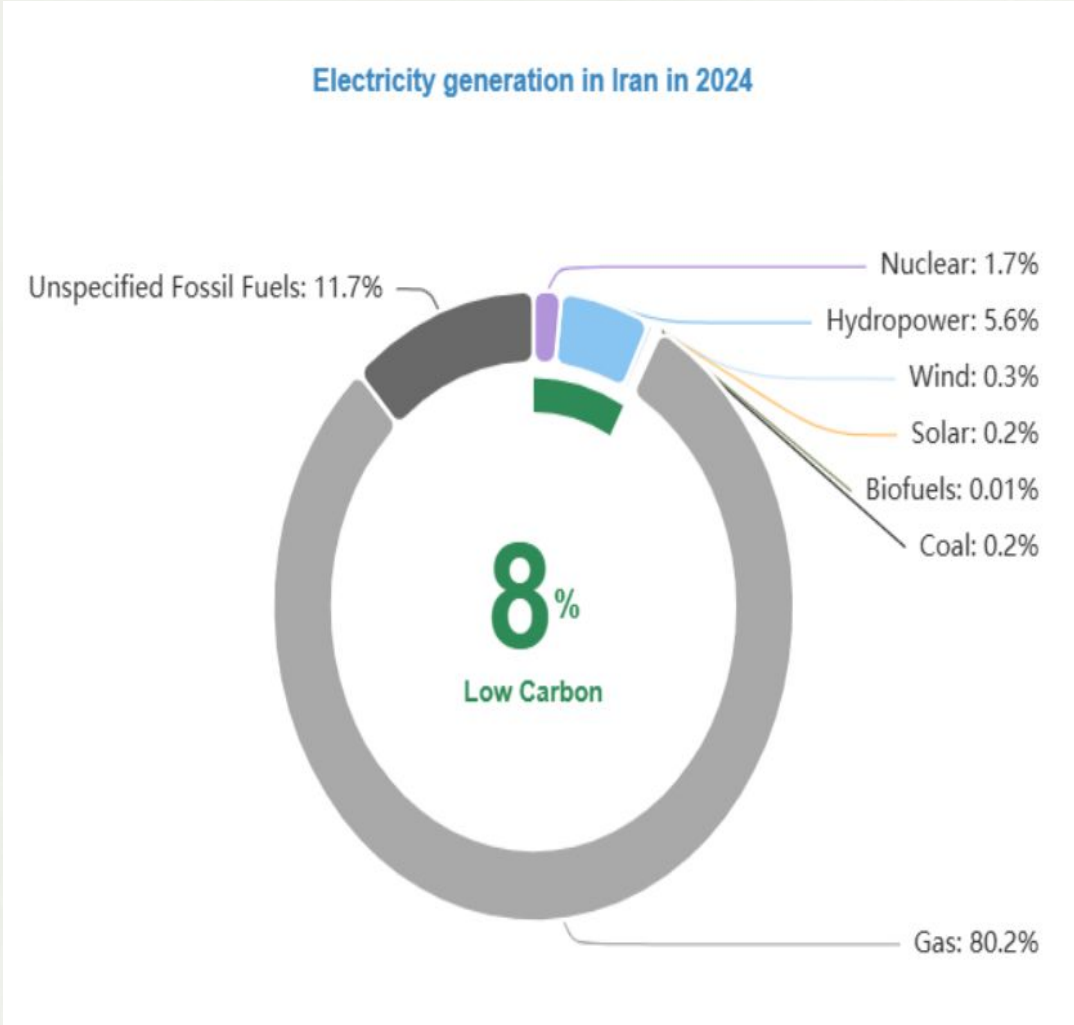
Iran's Electricity Generation Capacity by Fuel

- Fossil Fuel Dominance (2024–2025): Nearly 95% of Iran's electricity from fossil fuel.
- Low-Carbon Energy: Only ~5%, entirely from hydropower
- Natural Gas Share: ~80% of total electricity generation
- Iran plans to expand solar and wind capacity from under 2.5 GW in 2025 to 30 GW by 2030.

Data source: EIA, Ember, Energy Institute and IEA



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02 | Opportunities for Natural Resources Use

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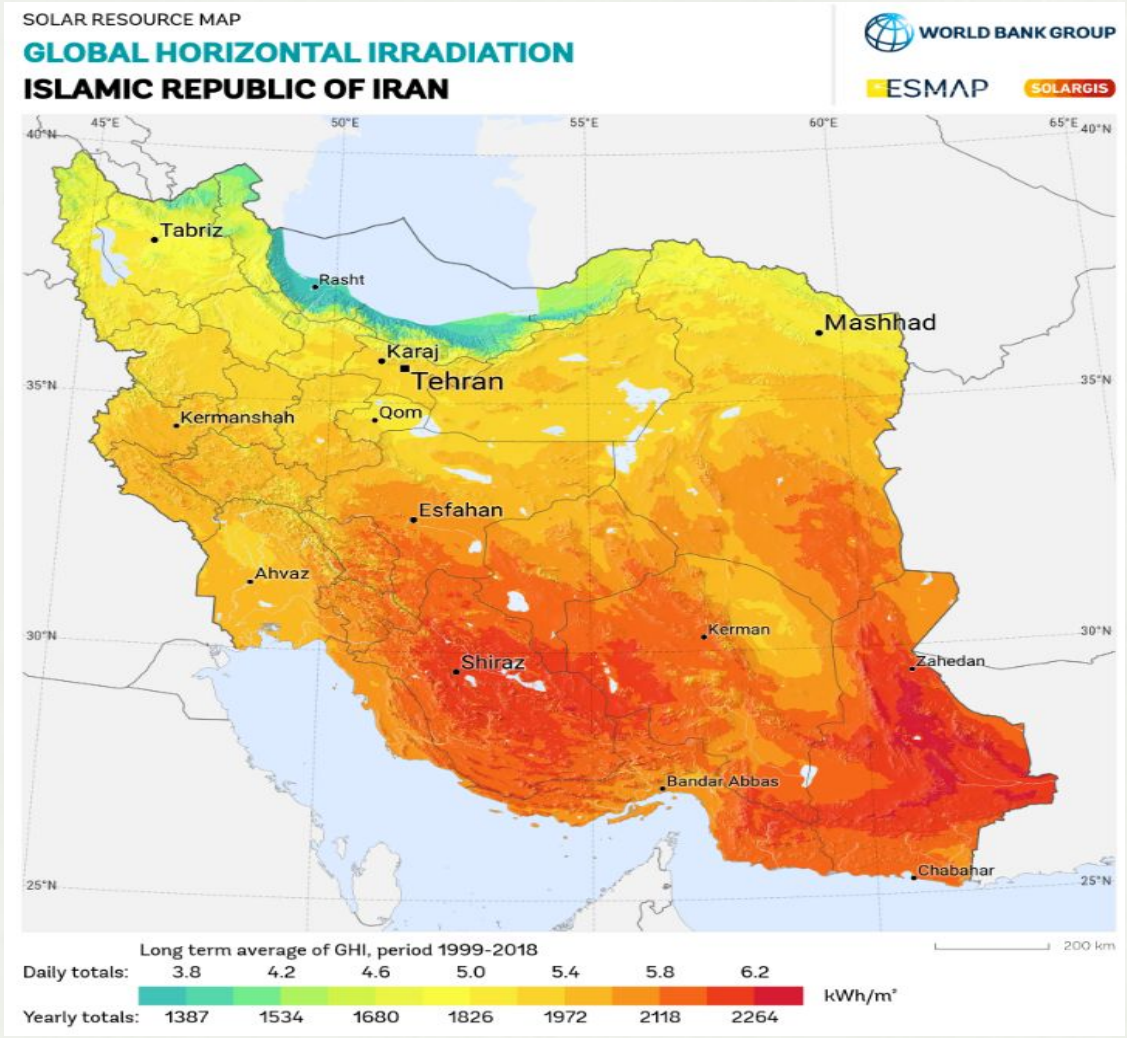
Solar Resources

- Solar Availability Across Iran: Over 300 sunny days per year in most regions
- High Solar Radiation: Average 4.5–5.5 kWh/m²·day in more than two-thirds of the country
- Annual Solar Energy Potential: Around 1,640–1,970 kWh/m²/year on 80% of the land
- Global Horizontal Radiation: Up to 2,200 kWh/m²/year in the sunniest regions
- Year-Round Solar Power Feasibility: Favorable conditions for continuous solar generation
- Large-Scale Solar Deployment Potential: Significant land area suitable for photovoltaic installations



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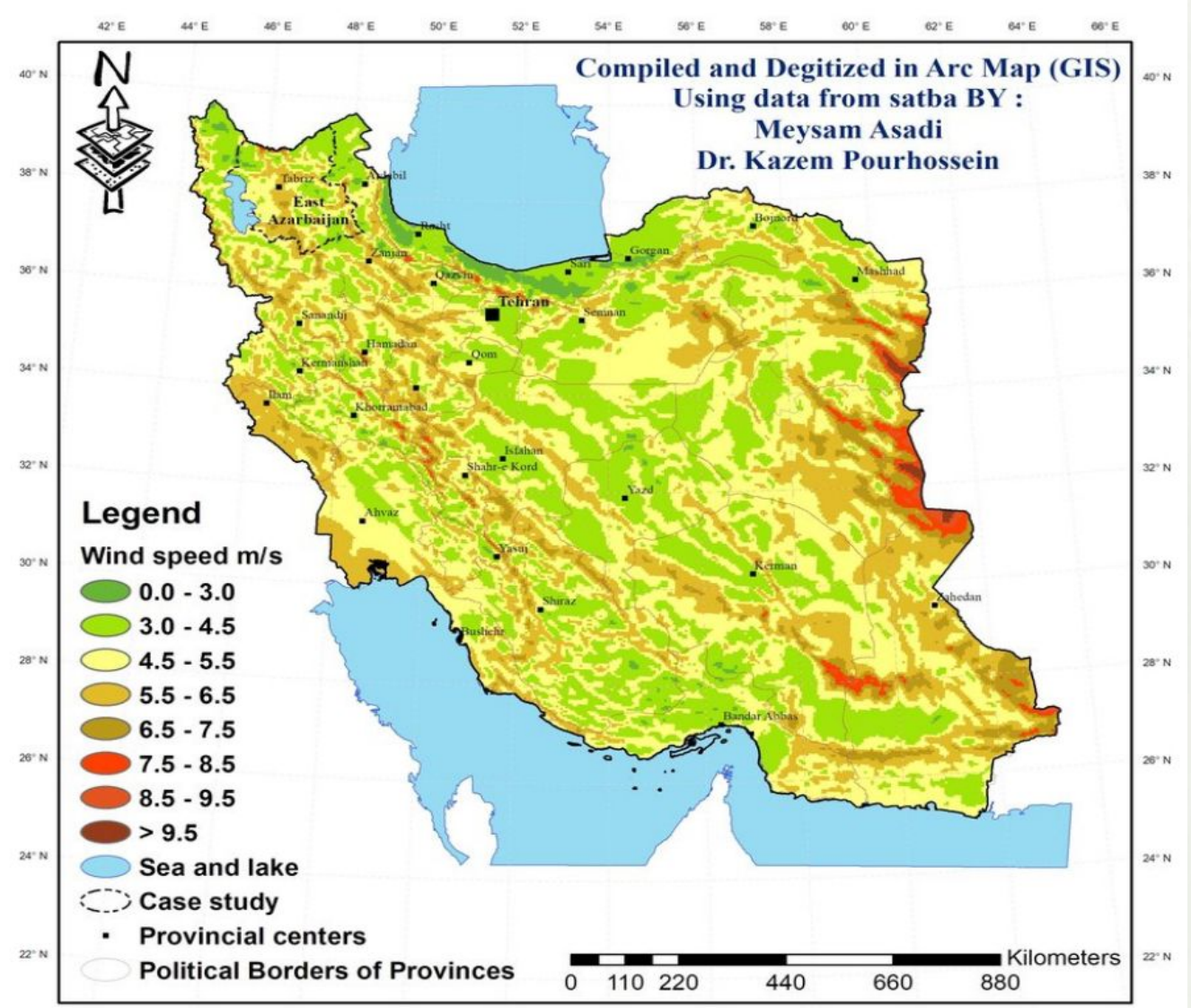
Wind Energy

- Wind Speeds: Average 4–6 m/s at 30–40 m in many regions
- High Potential: Technical potential >20 GW
- Installed Capacity: Only a few hundred MW currently
- Seasonal Winds: Eastern regions have strong summer winds
- Market Outlook: Valued at USD 0.74 B (2024), projected USD 1.37 B (2031)



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Renewable Energy

Iran's Renewable Energy Potential

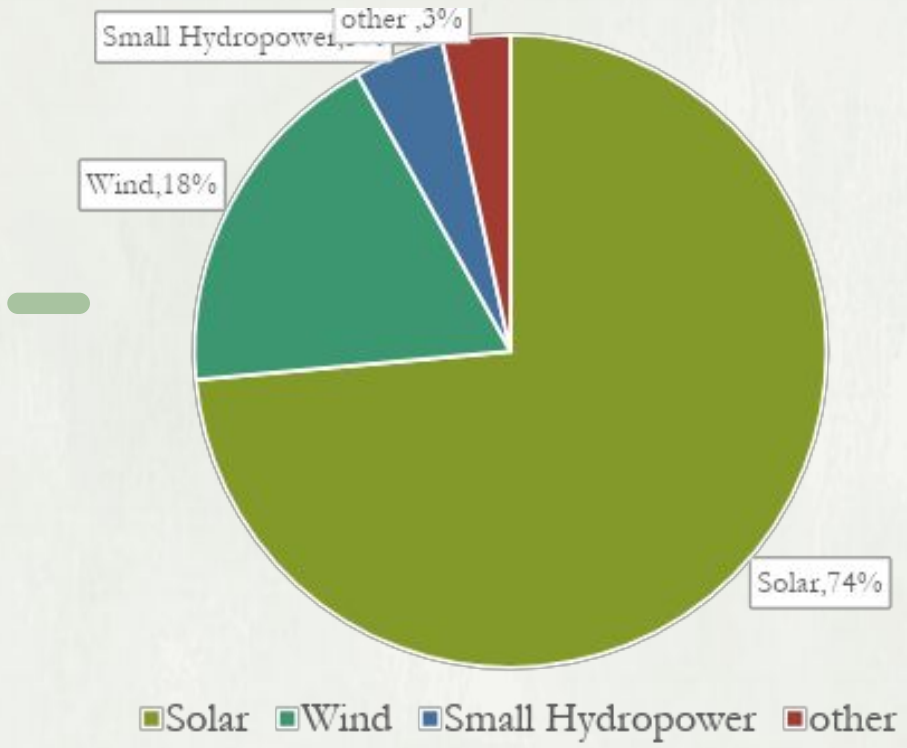
- Over 300 sunny days annually
- Significant wind energy potential in various regions
- Government target: 30,000 MW by 2030

Current Installed Capacity

2,500MW

As of September 2025

Progress towards 2028 target



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03 | Challenges to Natural Resources Use

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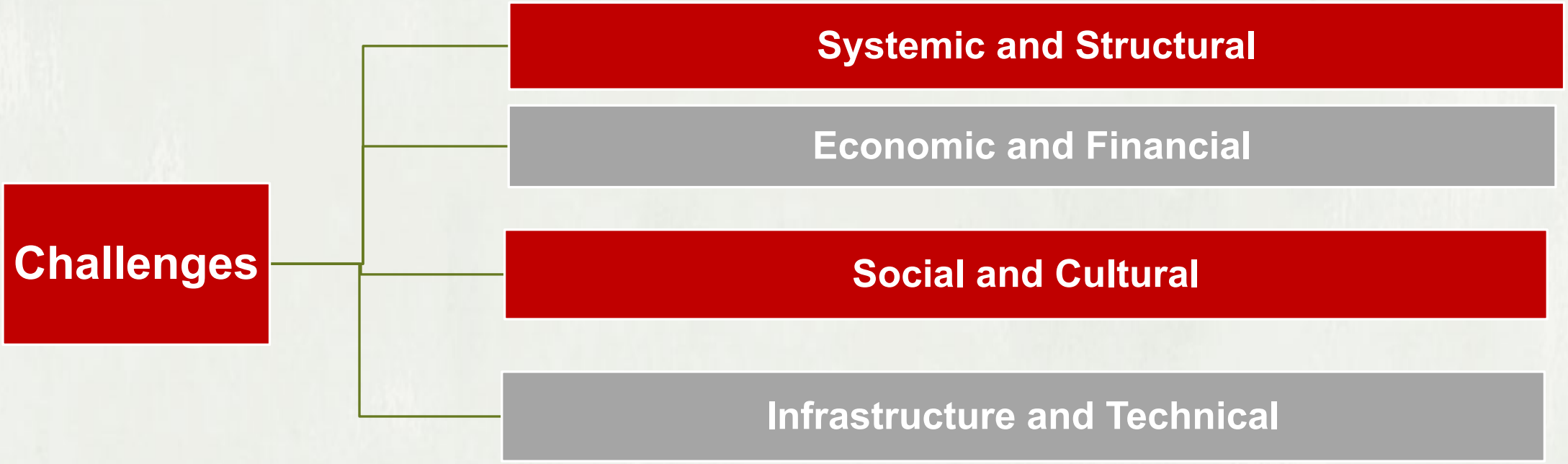
Challenges to Developing Renewable Power Plants



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Systemic and Structural challenges

- Lock-in Effects of Fossil Fuel Infrastructure:
  Existing energy systems are optimized for oil and gas, making transition costly and complex

- Path Dependency in Technological Development:
  Historical reliance on hydrocarbons limits institutional capacity for innovation in renewables

- Misalignment between Policy Goals and Implementation:
  Lack of coordination among energy, environment, and industry ministries prevents coherent action

- Weak Monitoring and Evaluation Systems:
  Ineffective assessment frameworks lead to poor implementation of renewable policies

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Economic and Financial challenges

- Fossil Fuel Subsidies:
  Heavily subsidized conventional energy sources make renewable energy technologies economically uncompetitive

- Non-Competitive Energy Market:
  State-controlled markets dominated by fossil fuels leave little room for private sector participation

- Limited Access to Financing:
  Weak financial institutions and limited green financing instruments restrict project funding

- Sanctions and Trade Restrictions:
  Imposed Economic sanctions reduce access to foreign direct investment and international financing

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Social and Cultural challenges

- Low Societal Awareness:
  The public often lacks understanding of the environmental and economic benefits of renewable energy

- Cultural Attachment to Fossil Fuels:
  In oil-rich countries, fossil energy is often perceived as a symbol of national prosperity

- Insufficient Technical Skills:
  There is a shortage of trained engineers, technicians, and project managers specialized in renewable energy systems

- Weak Educational and Vocational Programs:
  Universities and technical institutes offer limited specialized curricula on renewable energy technologies

- Resistance to change:
  Both public and institutional inertia impede transitions toward innovative and sustainable technologies

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Infrastructure and Technical challenges

- limited Energy Storage Capacity:
  The weakness of large-scale storage technologies limits the reliability of renewable power supply

- Limited Digitalization and Smart grid Systems:
  Outdated monitoring and control systems reduce operational efficiency

- Insufficient Maintenance and Service Networks:
  The absence of specialized maintenance infrastructure leads to performance degradation

- Lengthy and Bureaucratic Land Acquisition Processes:
  Obtaining land for renewable energy projects is often delayed by complex regulations and administrative inefficiencies, leading to higher costs and project delays

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04 | Strategies for Renewable Energy Development

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Strategies for Renewable Energy Development

Large industries (1+ MW) must procure 1% of their power from renewables energies, reaching 5% in five years.

Tendering System for the Construction of Large-Scale Power Plants

Guaranteed Power Purchase Agreements

Construction of Renewable Power Plants Using Buy Back Model

Electricity Supply for Cryptocurrency Mining Centers

Construction of a Solar Power Plant in Industrial Parks

Development of Specialized Solar Parks

Green Trading Board of the Energy Exchange Market

Export of Renewable Electricity

Development of Rooftop Solar Power Plants

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05 | International Cooperation for Natural Resources Use

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International Cooperation among APCTT Members States

- Join Relevant Climate Resilience and Sustainable Technology Platforms for Peer Learning
- Seek Technical Assistance and Knowledge Exchange
- Co-Financing with Multilateral Development Banks and Regional Partners
- Leverage Collaborative Programs for Capacity Building, Policy Reform and Pilot Financing
- Establish an International Coordination Body to Align Organizations, Institutions Agencies and Missions
- Create a Single International Roadmap for Sustainable Resource Management , Data Sharing and Local Manufacturing
- Define Clear Governance, Decision Rights and Accountability Mechanisms

THANK YOU FOR ATTENTION