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ENERGY GEOGRAPHY: REGIONAL POTENTIALS OF RENEWABLE ENERGY SOURCES

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Abstract: This article analyzes the use potential of renewable energy sources (RES) based on their geographical distribution. Resources such as solar, wind, geothermal, biomass, and hydropower vary depending on natural-climatic conditions and regional capabilities. The paper evaluates the RES potential in different regions and highlights their economic and environmental advantages.
Keywords: renewable energy, geographic potential, energy mapping, resource capacity, regional development.

Introduction

Energy geography is one of the essential directions in modern geo-economic research. With population growth, industrial expansion, and the depletion of traditional energy resources, the demand for renewable energy sources (RES) is steadily increasing. Their location, potential, and economic efficiency are closely related to the natural resources, climate, and topography of the region. Therefore, studying RES from a spatial perspective is a highly relevant issue.

Methods

The study was conducted using the following methods:
• **Cartographic analysis:** Geographic potential was assessed using thematic maps depicting RES capacity.
• **Statistical analysis:** International and national energy production indicators were examined.
• **Comparative regional analysis:** The advantages of different RES were compared based on the natural and climatic conditions of various regions.
• **Literature review:** Scientific articles and reports were studied based on data from IEA, IRENA, and the World Bank.
Study regions included Uzbekistan, Central Asia, Europe, and North America.

Results

The analysis revealed the following key findings:

1. **Solar Energy:**
   - Highest potential observed in Uzbekistan, the Arabian Peninsula, North Africa, and the southern United States.
   - In Uzbekistan, Bukhara, Navoi, and Kashkadarya regions stand out with more than 300 sunny days per year.

2. **Wind Energy:**
   - High potential regions include northern Kazakhstan, western coasts of Europe, Denmark, Canada, and central U.S. states.
   - In Uzbekistan, promising areas are Karakalpakstan and Jizzakh regions.
3. **Hydropower:**
   - Hydropower potential is concentrated in mountainous and river-rich areas (Norway, Nepal, Kyrgyzstan).
   - In Uzbekistan, the Syrdarya and Zarafshan river basins have relatively higher potential but are limited in scale.
4. **Biomass and Waste-to-Energy:**
   - High potential in agricultural regions such as Southeast Asia and Brazil.
   - In Uzbekistan, energy production can be established based on livestock and agricultural waste.
5. **Geothermal Energy:**
   - Widely used in tectonically active regions such as Iceland, Indonesia, Italy, and New Zealand.
   - In Uzbekistan, geothermal potential is limited, but local research is ongoing.

Discussion

The study shows that effective development of renewable energy sources depends heavily on their spatial distribution and resource potential. Regional development of RES:
- ensures energy security,
- contributes to ecological sustainability,
- helps reduce regional economic disparities.

In the context of Uzbekistan, the development of **solar and wind energy** is particularly prioritized. However, this requires attracting investments, supporting local manufacturers, and modernizing the energy infrastructure.

Conclusion

In-depth study of the regional potential of renewable energy sources plays a crucial role in shaping energy policy. Each region requires a customized strategic approach based on its natural and economic conditions. A geographic approach enhances the efficiency of energy projects, minimizes environmental risks, and supports sustainable development.

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