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COMPARATIVE ADVANTAGES OF LOCAL NATURAL AND ECONOMIC POTENTIAL AND THEIR EFFECTIVE USE UNDER CLIMATE CHANGE CONDITIONS

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Abstract. The article examined the relative advantages of local natural and economic potential and the opportunities for their effective use under climate change from theoretical and practical perspectives. The researcher, drawing on comparative advantage and factor-endowment theories, systematically assessed the resource-based advantages of the regional economy. Based on open data from international institutions, the article identifies the role of solar energy, irrigated agriculture, and water resources potential in Uzbekistan under changing climatic conditions. The author showed that climate-smart agrotechnologies and renewable energy potential served to reinforce regional advantages. The obtained findings confirmed that sustainable development could be achieved through the consistent management of local potential. The conclusions were enriched with practical recommendations.

Keywords: relative advantage, natural and economic potential, climate change, comparative advantage, renewable energy, climate-smart agriculture, regional development.

Аннотация. В статье рассмотрены относительные преимущества местного природно-экономического потенциала и возможности их эффективного использования в условиях изменения климата с теоретической и практической точек зрения. Исследователь, опираясь на теории сравнительного преимущества и обеспеченности факторами, системно оценил преимущества региональной экономики, основанные на природных ресурсах. На основе открытых данных международных институтов в исследовании определена роль потенциала солнечной энергии, орошаемого земледелия и водных ресурсов на примере Узбекистана в меняющихся климатических условиях. Показано, что климатически адаптированные агротехнологии и потенциал возобновляемой энергии способствуют укреплению региональных преимуществ. Полученные результаты подтвердили возможность достижения устойчивого развития через последовательное управление местным потенциалом. Выводы дополнены практическими рекомендациями.

Ключевые слова: относительное преимущество, природно-экономический потенциал, изменение климата, сравнительное преимущество, возобновляемая энергия, климатически адаптированное земледелие, региональное развитие.

INTRODUCTION

The competitiveness of a regional economy has historically been determined by the specific combination of natural and economic potential available in that territory, including land, water, climate, energy, and labor resources. Each region differs in terms of the quantity and quality of these resources, and these differences create opportunities to produce certain goods or services at relatively lower cost. A clear assessment of the comparative advantages of local potential and their rational use form a solid foundation for regional development.

The agricultural sector occupies a special place in Uzbekistan's economy. According to open sources, agriculture accounts for a significant share of gross domestic product, nearly ninety percent of surface water is directed to irrigation, and a large part of the food consumed by the population is supplied through domestic agricultural production [1]. This structure clearly demonstrates the decisive role of local natural resources in the country's economic life.

Global climate change is reshaping the traditional advantages of regions by altering temperature patterns, precipitation dynamics, and the water balance. At the same time, this process also creates new opportunities: the introduction of modern climate-adaptive technologies can significantly improve the efficiency of resource use. According to World Bank estimates, the use of integrated landscape management and climate-smart technologies in agriculture could increase crop production by USD 4.6 billion over a ten-year period and save

more than 1.8 billion cubic meters of water annually [2].

New dimensions of local potential are also emerging in the energy sector. Uzbekistan has high solar radiation, and according to estimates by the International Energy Agency, the country's technical potential for solar energy use is almost four times higher than its current primary energy consumption [3]. In the context of low-carbon development, this potential is becoming a strategic resource that strengthens the region's comparative advantage.

The purpose of this article is to provide a theoretical justification for the comparative advantages of local natural and economic potential and, using Uzbekistan as an example, to identify practical directions for their effective use under conditions of climate change, based on verified sources. The analysis is conducted within the framework of the theories of comparative advantage and factor endowment.

LITERATURE REVIEW

The theoretical foundations of regional specialization originate from the classical concept of comparative advantage. The Heckscher–Ohlin theory of factor endowments further develops this idea by explaining that the comparative advantage of a country or region is determined by the relative availability of production factors such as land, labor, and capital. Accordingly, regions tend to gain an advantage in the production of goods that intensively require the factors they possess in relatively greater abundance [4].

The role of natural resources in regional development is of particular importance. Gunton evaluates resource-based development through the paradigm of comparative advantage and demonstrates that the rational management of natural wealth can serve as a sustainable source of regional economic growth [5].

Climate and geographical location play a central role in the formation of comparative advantage. The quantity and quality of natural resources are recognized as one of the key factors explaining differences in advantages across regions [6].

Climate change is becoming a significant factor reshaping the structure of comparative advantage. Since its impacts vary across territories, it leads to a redistribution of trade and production patterns. Rising temperatures and increasing concentrations of carbon dioxide in the atmosphere affect crop yields differently depending on crop type and geographical location [7].

The water factor is one of the essential conditions determining agricultural specialization. The scientific literature shows that thermal and hydrological conditions, as well as groundwater reserves, have a direct impact on the capacity to export agricultural products, while the shortage of renewable water resources may limit agricultural specialization [8].

The process of energy transition is creating new sources of comparative advantage. Regions rich in renewable energy resources are gaining a favorable position in the global energy market and are acquiring advantages in clean energy production [9].

The concept of ecological comparative advantage enriches this approach. Regions with favorable climate conditions and fertile soils have a natural advantage in specialized crops and high-quality agricultural products, while regions with substantial solar and wind resources have an inherent advantage in renewable energy production [10].

At the practical level, the concept of climate-smart agriculture has gained wide recognition. According to the definition of the Food and Agriculture Organization of the United Nations, this approach covers three interrelated objectives: sustainably increasing productivity and income, strengthening adaptation and resilience to climate change, and reducing greenhouse gas emissions where possible [11].

RESEARCH METHODOLOGY

The study is based on a theoretical and analytical approach. The theories of comparative advantage and factor endowment are adopted as the conceptual framework for assessing local potential. The logic of the analysis is built on a four-stage sequence: identifying local potential, determining the basis of its comparative advantage, assessing its sensitivity to climate change, and developing directions for effective use and adaptation.

Open and verified data from international institutions were used as the empirical basis of the study. Publications of the World Bank, the International Energy Agency, the International Renewable Energy Agency, the United Nations Development Programme, and the Food and Agriculture Organization served as the main sources.

All quantitative indicators were obtained only from reliable sources with available references; estimated or unverified figures were not used. The combination of qualitative analysis and quantitative evidence made it possible to objectively assess the role of local potential under changing climate conditions.

ANALYSIS AND RESULTS

The comparative advantages of local natural and economic potential are reshaped through the lens of climate change and transformed into practical directions for effective use. This logical sequence is presented conceptually in Figure 1: local potential generates comparative advantage, climate conditions change its significance, and rational management directs it toward sustainable regional development.

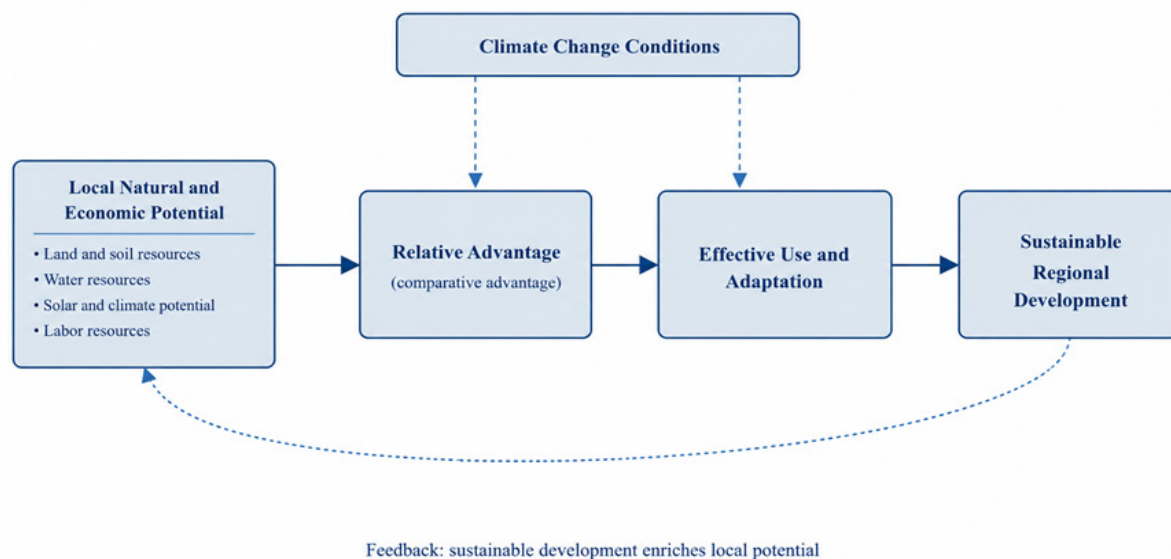


Figure 1. Conceptual model for the effective use of local potential under climate change conditions¹.

Using the example of Uzbekistan, the main areas of local potential, their bases of comparative advantage, climate sensitivity, and opportunities for effective use are summarized in Table 1.

Table 1

Comparative advantages of Uzbekistan's local natural and economic potential and adaptation directions under climate change conditions²

Area of potential	Basis of comparative advantage	Climate sensitivity	Direction for effective use	Source
Solar energy	High solar radiation; technical potential nearly four times higher than current primary energy consumption.	Positive — its importance is increasing in the transition to a low-carbon economy.	Gradual expansion of solar photovoltaic capacity.	[3]
Renewable energy capacity	2,275 MW by the end of 2024.	Climate policy is attracting investment.	Development of transmission and storage infrastructure.	[13]
Irrigated farming	Significant share in GDP; a large part of food supply is covered by domestic production.	Sensitive to water scarcity and temperature changes.	Water-saving irrigation and integrated management.	[1]
Climate-adaptive agrotechnology	Potential to increase crop productivity by USD 4.6 billion over a ten-year period.	Reduces risks through adaptation.	Introduction of climate-smart practices	[2]

¹ Source: Developed by the author.

² Source: Developed by the author.

Water resources management	Thermal and hydrological conditions influence agricultural specialization.	High sensitivity	Planning that takes into account the dynamics of specialization.	[8]
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Practical achievements in the field of solar energy show that local potential is being transformed into a real economic advantage. According to the International Renewable Energy Agency, the country's solar capacity increased from 475 megawatts in 2023 to 2,275 megawatts by the end of 2024 [13]. This growth rate reflects the results of a consistent policy aimed at strengthening energy infrastructure.

The medium-term outlook is also positive. According to the International Energy Agency, Uzbekistan aims to increase its solar energy capacity to 5 gigawatts by 2030 [14]. This direction further deepens the country's comparative advantage in low-carbon development and enhances the stability of energy supply.

In the agricultural sector, climate-adaptive practices are becoming a key tool for improving the efficiency of potential use. According to the World Bank approach, climate-smart agriculture combines the objectives of increasing productivity, strengthening resilience to climate risks, and reducing emissions [15]. Water-saving irrigation and integrated resource management make it possible to preserve local agricultural advantages under changing climate conditions.

The results obtained confirm that climate change redistributes existing advantages [7]. Although limited water resources create constraints for traditional agricultural specialization on traditional agricultural specialization [8], renewable energy and climate-adaptive technologies create new sources of advantage [9]. Balanced management of different areas of local potential increases the resilience of the regional economy and creates a reliable foundation for sustainable growth.

CONCLUSION AND SUGGESTIONS

The comparative advantages of local natural and economic potential remain a decisive factor in regional development. Climate change does not eliminate these advantages; rather, it transforms their structure and opens up new opportunities through rational management. The case of Uzbekistan clearly demonstrates how the potential of solar energy and climate-adaptive agriculture is being transformed into a real economic advantage.

Based on the analysis, the following practical recommendations were developed:

Strengthen integrated water resources management and widely introduce water-saving irrigation technologies.

Gradually expand climate-adaptive agrotechnologies and resilient crop varieties.

Increase solar energy capacity while ensuring the balanced development of transmission and storage infrastructure.

Establish a digital monitoring system for the continuous assessment of local potential and use it in management decision-making.

Align regional development programs with climate adaptation objectives and strengthen institutional coordination.

The systematic and consistent use of local potential will increase the economic resilience of Uzbekistan's regions and create a reliable foundation for sustainable development. A scientifically grounded assessment of comparative advantages and their adaptation to changing climate conditions should serve as a priority direction for future development.

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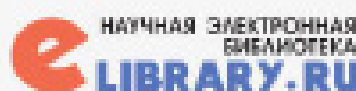
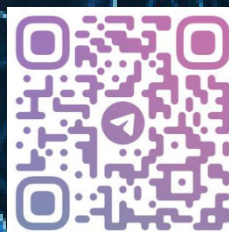
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