

Article

Scientific and Theoretical Views on Sustainable Regional Development with Consideration of Environmental Factors

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Abstract: The article examines the scientific and theoretical views of foreign, Russian, and domestic scholars, researchers, and experts on the problem of sustainable regional development considering environmental factors. The article is prepared based on modern trends in sustainable regional development with consideration of environmental factors.

Keywords: sustainable development, region, environmental factors, environmental sustainability, regional development, performance.

1. Introduction

In recent years, environmental conservation issues have become increasingly important globally, leading to the emergence of modern and widely used terms such as "sustainable development," "green economy," "low-carbon economy," and "circular economy." Generally speaking, these terms reflect the need to protect the environment, prevent environmental disasters, combat the unsustainable use of natural resources, and ensure the transfer of sufficient natural resources to future generations. Based on this, this article examines issues of sustainable regional development, taking environmental factors into account.

Scholars from the UK, France, Italy, and China—Mirza Muhammad Nasir, Ahmed Imran Khunjra, Alessia Palma, and Tanvir Bagh—emphasize that high-quality governance is a fundamental condition for sustainable regional development. In frontier, emerging, and developed economies, governance quality consistently demonstrates a positive and statistically significant impact on both environmental performance (EP) and progress toward achieving the Sustainable Development Goals (SDGs). Effective governance enhances transparency, accountability, the rule of law, and the effectiveness of public policy implementation, enabling regions to develop and implement environmental regulations and sustainability-oriented development strategies [1].

Based on this, international researchers have drawn the following conclusions:

Environmental performance and sustainable development outcomes vary systematically depending on the level of economic development. The study shows that environmental and sustainable development indicators vary across regions depending on the degree of economic development. Developed economies demonstrate higher average values for the Environmental Performance Index (EPI) and SDG indicators, while frontier and emerging economies demonstrate higher average values for the SDGs. are lagging behind. This highlights the need for differentiated regional development strategies, in which environmental policies are adapted to institutional capacity, economic structure, and the composition of the energy mix [2].

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The adoption of renewable energy sources is a key environmental factor in sustainable regional development. Scholars provide compelling evidence that increased use of renewable energy has a positive impact on environmental performance and sustainable development, particularly in countries with early-stage and emerging economies. Renewable energy helps reduce environmental degradation, supports the achievement of climate goals, and improves energy security, making it a critical component of environmentally sustainable regional development trajectories.

Dependence on non-renewable energy sources limits environmental sustainability at the regional level. Consumption of non-renewable (primary) energy generally has a negative impact on environmental performance, particularly in countries with early-stage and emerging economies. This confirms that continued dependence on fossil fuels leads to environmental pollution and the formation of Negative environmental externalities that undermine sustainable regional development. Although non-renewable energy can support economic activity in the short term, it creates significant environmental risks for regions in the long term [3].

Furthermore, international scholars have drawn a number of additional conclusions. Specifically, economic growth can contribute to sustainable regional development given the appropriate environmental and institutional conditions; investment models play an important role in ensuring environmental sustainability at the regional level; environmental sustainability outcomes are nonlinear and vary across regions; environmental performance indicators and the Sustainable Development Goals form a comprehensive framework for assessing regional sustainability; and sustainable regional development requires integrated energy, environmental, and public administration policies.

2. Methodology

Based on the findings of the aforementioned international scholars, it can be concluded that developed regions should accelerate investment in renewable energy and reduce dependence on fossil fuels; emerging market regions should prioritize good governance, renewable energy development, and environmentally responsible economic growth; and regions with emerging economies should focus on strengthening the institutional environment, implementing clean energy sources, and rationally managing energy-intensive investments.

The importance of international cooperation should also be emphasized, as developed regions can support less developed regions through technology transfer and financial assistance to promote environmentally sustainable regional development[4].

3. Result and Discussion

Brazilian scholar Jandir Ferreira de Lima argues that sustainable regional development represents the integration of regional and sustainable development, emphasizing that regional progress must be achieved without compromising environmental integrity and the well-being of future generations. It is viewed not simply as economic growth, but as a transformational process constrained by environmental limits.

Furthermore, the Brazilian scientist also formulated a number of conclusions regarding sustainable regional development, taking into account environmental factors, which are presented in Figure 1.

According to the Brazilian scientist's findings, sustainable regional development must go beyond theoretical discussions and become a practical reality. To achieve this, environmental sustainability must be perceived as a shared value by society and regional decision-making bodies at all levels of government[5].

Russian scientists E. V. Karanina and K. E. Kartavykh emphasize that environmental factors are key to sustainable regional development, as they directly determine the economic potential of territories, the quality of life of the population, and the capacity of the regional system for long-term development. A region's socioeconomic development

is inextricably linked to environmental sustainability, and increased well-being is accompanied by increased anthropogenic pressure on the natural environment, requiring continuous monitoring and regulation of environmental indicators. According to the Russian scientists:

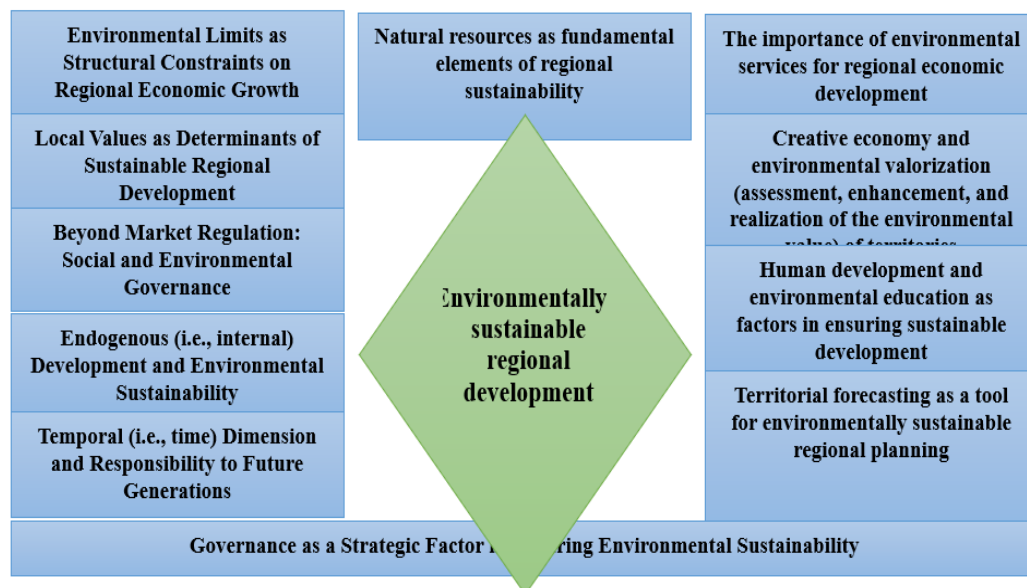


Figure 1. Environmentally sustainable regional development

1. A region's environmental sustainability is influenced by a combination of factors, including the state of the natural environment (atmosphere, water, land, and ecosystems), the level of environmental pollution, population losses due to environmental degradation (morbidity, decreased productivity), social and institutional capacity to address environmental issues, and the unification of societal efforts to address global environmental challenges.
2. The main obstacles to sustainable regional development from an environmental perspective are accumulated water pollution, insufficient attention to environmental issues in certain areas, increasing transport burdens, and limited budgetary funding for environmental protection.
3. The integrated index of environmental sustainability is a tool for assessing the sustainable development of a region, allowing for a quantitative determination of the degree of environmental safety and the identification of risk zones based on environmental indicators. Regional differences in environmental sustainability levels shape environmental risks, which allows for ranking regions by the likelihood of negative environmental consequences and using these assessments in regional development policy.

Overall, based on the opinions of the aforementioned Russian scientists, it can be said that sustainable regional development requires a comprehensive approach, including monitoring environmental indicators, government-business collaboration, improving the effectiveness of environmental protection measures, and incorporating environmental sustainability into strategic regional development planning[6].

Another Russian scientist, N.L. Nikulina, emphasizes that the deteriorating environmental situation, increasing greenhouse gas emissions, and the need for energy conservation and energy efficiency make environmental factors key to sustainable regional development and achieving a decent quality of life for the population. She argues for the triune nature of sustainable development, based on the interconnectedness of environmental, economic, and social components, where environmental conservation and rational use of resources are fundamental to the long-term development of regions.

N.L. Nikulina notes that:

Low-carbon transformation is a key environmental focus for sustainable regional development: reducing the carbon intensity of production and consumption, increasing

energy efficiency, and implementing renewable energy sources (RES) and best available technologies (BAT) are essential conditions for environmentally oriented regional development;

The ESG agenda is viewed as a practical mechanism for integrating environmental factors into regional development: the ESG approach translates sustainable development goals into practice, ensuring the integration of environmental requirements into investment, management, and strategic decisions of regions;

Low-carbon development and ESG transformation complement each other in the environmental sustainability of regions: the combined application of low-carbon technologies and ESG principles creates the conditions for environmentally safe, socially oriented, and managed regional development [7].

In her work, the Russian scholar has developed a periodization of sustainable development, examining the history of the emergence and development of the concept of sustainable development. She identifies three stages of sustainable development: the formation stage, the institutional stage, and the functional stage. Table 1 presents this periodization [8].

Based on the Russian scholar's views, it can be said that the environmental vector of sustainable regional development is considered a long-term strategic necessity. Further research and practical measures should be aimed at more deeply incorporating environmental factors, low-carbon aspects, and ESG criteria into models of sustainable regional development.

Table 1. Periodization of sustainable development

Stage Name	Period of stage	Approach	Characteristics
Formation of the concept	Mid-20th century – 1992	Triune	Interdependence of environmental, economic and social spheres
Институциональный (нормативный)	1992-1997 гг.		
Functional	1997-present	Technical and economic Managerial	Practical solution
1) 1) low-carbon transformation		Technical and economic	The process of converting resources available to society into low-carbon products using various types of technologies: renewable energy sources, BAT
2) 2) responsible investing within the framework of the ESG agenda		2004-present	Management

As other Russian scholars, M. M. Manukyan and K. I. Goman, emphasize, a key condition for sustainable regional development is stabilizing and limiting the growth of industries that exploit nature, while simultaneously accelerating the development of manufacturing, knowledge-intensive, and resource-saving activities. Examples from Japan and OECD (Organization for Economic Co-operation and Development) countries demonstrate that structural shifts in favor of knowledge-intensive and resource-saving industries simultaneously reduce environmental impacts and ensure regional economic growth[9].

Russian scientists argue that rational environmental management is linked to the technological level and economic structure of regions; structural restructuring and repurposing of production facilities offer high environmental protection potential; the regional aspect of greening is particularly significant for resource-rich areas; positive intersectoral environmental effects are an important resource for sustainable development; the development of low-waste and resource-saving technologies is a key area for sustainable regional development; and that the priority of environmental policy should shift from addressing the consequences to eliminating the causes of pollution[10].

However, according to scientists, there are a number of problematic issues that require solutions: the natural resource intensity of the economy is the main environmental constraint on regional development; the industrial structure of the economy exacerbates environmental risks in regions; increased energy intensity is seen as a negative factor in sustainable regional development; and nature-intensive export policies worsen the environmental situation in regions.

In general, to summarize the above opinions of Russian scientists, sustainable regional development requires a comprehensive and multidisciplinary approach that emphasizes the need to combine economic, environmental, social, and institutional factors, as well as the participation of government, business, science, and local communities.

Local scientist A. A. Isadzhanov argues that environmental challenges (climate change, ecosystem degradation, water issues, the Aral Sea disaster) are transboundary in nature, necessitating the development of regional cooperation and coordination of environmental policies. Climate change increases the vulnerability of regional socio-economic systems: rising temperatures, changing precipitation patterns, and more frequent droughts and floods impact agriculture, food security, and the resilience of Central Asian regions, including Uzbekistan [11].

According to the scientist, sustainable regional development is linked to the transition to a low-carbon economy, the implementation of clean technologies, increased energy efficiency, and the expansion of renewable energy sources. Furthermore, the scientist emphasizes that state environmental policy plays a systemically important role in the sustainable development of regions. Monitoring the environmental status of regions is a necessary element of sustainable development; restoring ecologically unfavorable areas is a key task of regional sustainability; improving energy efficiency helps reduce the environmental burden on regions; developing environmental innovations and "green" infrastructure is considered a factor in sustainable regional growth; and international and regional initiatives strengthen the potential for sustainable development in regions.

Based on the opinions of the aforementioned scholar, it can be argued that environmental sustainability is viewed as an integral part of regional socio-economic development, and sustainable regional development is interpreted as the integration of economic, environmental, and social factors, with a priority on preserving the environment and improving the population's quality of life[12].

Local researcher L.P. Seitova notes that modern theories and models of regional development are evolving under the influence of climate change, environmental degradation, and the depletion of natural resources. Sustainable regional development is associated with the long-term preservation of conditions for the reproduction of a region's socio-economic and natural potential, rather than with the extensive extraction of resources. The extraction of natural resources and the anthropogenic impact on traditional economic sectors are inconsistent with the conditions for sustainable regional development [13].

According to the local researcher:

1. Environmental constraints shape new criteria for sustainable regional development, which include the balance of subsystems, dynamic equilibrium, competitiveness, harmony, stability, and environmental safety of regional development;

2. The institutional environment plays a crucial role in ensuring regional sustainability, meaning that sustainable development is linked to the functioning of formal and informal institutions that regulate economic, social, and environmental processes at the macro, meso, and micro levels;
3. Modern sustainable development models are based on environmentally oriented economic concepts, such as the "green economy" and the circular economy, aimed at reducing negative environmental impacts and increasing resource efficiency.

L. P. Seitova emphasizes that state strategy is an important tool for sustainable regional development, and, using Uzbekistan as an example, demonstrates that regional sustainability is ensured through strategic planning, the transition to a "green" economy, increased energy efficiency, and the development of renewable energy sources.

Summarizing the opinions of the aforementioned local researcher, it can be said that sustainable regional development presupposes the use of innovation as a tool for preserving and enhancing potential. In other words, sustainable development is defined as a process that ensures economic growth, environmental sustainability, and the reproduction of regional potential through the use of innovation [14].

Local expert F. S. Shamsieva believes that environmental factors are an integral part of the sustainability of a region's socioeconomic development, as the natural environment directly and indirectly impacts population health, labor productivity, the condition of fixed assets, and the overall economic potential of the territory. Factors of regional sustainable development are classified by their impact as external and internal, with environmental factors present in both groups: external factors – through environmental impacts and environmental risks; and internal factors – through the quality of the natural environment, climate, topography, and the availability of natural resources.

According to F. S. Shamsieva, sustainable regional development is impossible without considering environmental factors in strategic analysis, which involves assessing the strengths and weaknesses of the internal environment in relation to the opportunities and threats of the external environment. A regional sustainable development strategy should be developed considering the principles of sustainable development, ensuring a balance between economic growth, social stability, and environmental safety [15].

Speaking about the mechanism for implementing a regional sustainable development strategy, F. S. Shamsieva emphasizes that this mechanism presupposes targeted government management interventions, including regulatory, organizational, and resource support, which allows for consideration of environmental constraints and requirements when implementing regional policy (see Figure 2).

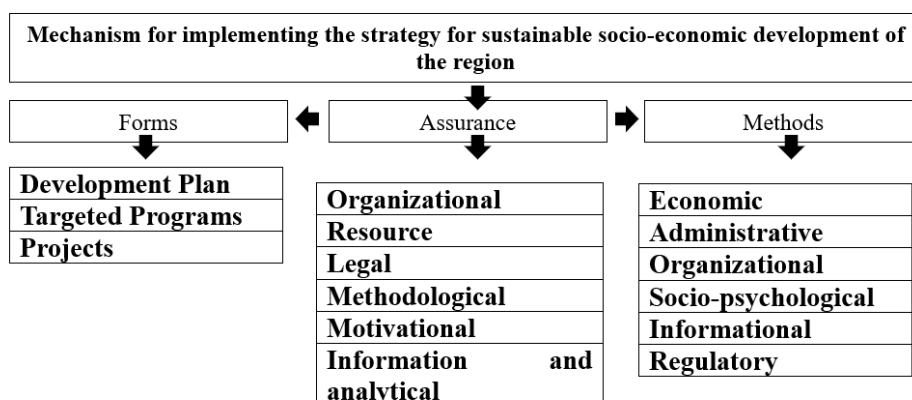


Figure 2. Mechanism for implementing the regional sustainable development strategy

4. Conclusion

Based on the opinions of the aforementioned local expert, it can be concluded that monitoring the implementation of a region's sustainable development strategy should include an assessment of socio-economic indicators, which allows for the identification of the impact of environmental factors on the achievement of strategic goals and the adjustment of management decisions.

In general, summarizing the above, it can be concluded that sustainable regional development and environmental factors are closely interrelated concepts. This is primarily due to the specific nature of the concept of "sustainable development," which presupposes creating conditions for the life of future generations in ecologically healthy regions while preserving natural resources and the environment.

Since the economic and social development of regions varies, sustainable regional development, considering environmental factors, must be implemented through effective management, the application of integrated, differentiated, and innovative approaches, and in strict compliance with government policy as part of the transformation to a green and low-carbon economy and the achievement of the Sustainable Development Goals.

REFERENCES

- [1] United Nations, *Our Common Future (Brundtland Report)*. Oxford, UK: Oxford University Press, 1987.
- [2] United Nations, *Transforming our world: The 2030 Agenda for Sustainable Development*, New York, NY, USA, 2015.
- [3] World Bank, *World Development Report 2020: Trading for Development in the Age of Global Value Chains*. Washington, DC, USA, 2020.
- [4] OECD, *Green Growth Indicators 2021*. Paris, France: OECD Publishing, 2021.
- [5] N. L. Nikulina, "Characteristics of sustainable regional development in the context of low-carbon and ESG transformations," *Vectors of Well-Being: Economy and Society*, vol. 52, no. 1, pp. 13–25, 2024.
- [6] E. V. Karanina and K. E. Kartavykh, "Environmental aspects of sustainable regional development," *Problems of Risk Analysis*, vol. 20, no. 1, pp. 26–35, 2023.
- [7] M. M. Manukyan and K. I. Goman, *Regional Sustainable Development: Economic Aspects of Nature Management*. Samara, Russia: Samara University Press, 2024.
- [8] L. P. Seitova, "Theoretical foundations of sustainable regional development under environmental constraints," *Iqtisodiy taraqqiyot va tahlil*, pp. 422–430, 2024.
- [9] F. S. Shamsieva, "Mechanism of sustainable regional development strategy," *International Finance & Accounting*, no. 6, 2023.
- [10] A. A. Isadzhanov, "Environmental aspects of sustainable development in Uzbekistan," in *Proc. Int. Conf. Scientific Discussion of Modern Youth*, Penza, Russia, 2019, pp. 61–64.
- [11] J. F. de Lima, "Sustainable regional development," *DRd – Desenvolvimento Regional em Debate*, vol. 11, pp. 132–143, 2021.
- [12] M. M. Naseer, A. I. Hunjra, A. Palma, and T. Bagh, "Sustainable development goals and environmental performance," *Research in International Business and Finance*, vol. 73, 2025, doi:10.1016/j.ribaf.2024.102646.
- [13] World Bank, *Inclusive Green Growth: The Pathway to Sustainable Development*. Washington, DC, USA, 2012.
- [14] UNEP, *Green Economy Report: Towards a Green Economy*. Nairobi, Kenya, 2011.
- [15] Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2023: Synthesis Report*. Geneva, Switzerland, 2023.