Ecological and economic indicators of sustainable development of regions

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Abstract. This article is a comprehensive study of environmental and economic indicators related to sustainable development of regions. The authors highlight various aspects of the interaction between the state of the environment and economic indicators, analyzing their impact on the sustainability of regional ecosystems and the well-being of the population. The article discusses in detail methods for collecting and analyzing data on environmental and economic indicators, and also identifies key factors influencing the sustainable development of regions. Based on the analysis, the authors offer practical recommendations and strategies for improving the sustainability of regional ecosystems and economic growth, taking into account environmental aspects. The study aims to ensure more effective management of regional resources and create conditions for sustainable and balanced development in the long term.

1 Introduction

Ecological and economic indicators serve as key metrics for evaluating the economic status, ongoing processes, and trends within regional economies, as well as assessing the quality of life for local populations, ultimately reflecting the degree of sustainable development achieved within regions. These indicators are crucial for regional decision-makers as they navigate management strategies for regional development. However, it's often observed that these indicators are developed in isolation from one another, leading to outdated and fragmented data analysis from statistical reports.

The study delves into the root causes associated with the challenges hindering sustainable development within regional economies, highlighting their interconnectedness with the population's quality of life. It's acknowledged that the pursuit of high economic growth in regions frequently comes at the expense of environmental degradation and diminished environmental quality. Moreover, the study notes Russia's alignment with

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international trends in regional economic development, particularly in adhering to Sustainable Development Goals (SDGs) and promoting the concept of a "green economy" as part of the global economic development strategy.

Examining the components of environmental quality indicators in Russian regions, the article establishes correlations between these indicators and the criteria used to assess the performance of regional leaders and executive authorities, providing insights into the overall development level of regions. By utilizing the National Environmental Rating for 2020 of Russian Federation subjects, the study identifies leading and lagging regions based on their environmental conditions. The authors developed a comprehensive indicator comprising six key components: harmful substance emissions, polluted wastewater discharge, production and consumption waste, water and energy consumption, and environmental protection expenditures.

Analyzing the Chechen Republic position in terms of both quality of life indicators and its ranking within the environmental rating of Russian Federation subjects, the study proposes a regional grouping based on composite indicators. Furthermore, it explores the ecological status of regions and establishes correlations between sustainable development efforts and the population's quality of life within these regions.

Over the past ten years, the Chechen Republic has seen rapid economic growth, which is confirmed by individual macroeconomic indicators. GRP growth in current prices per year averages 15%, the unemployment rate has been reduced four times. There is a twofold increase in per capita income. The agro-industrial complex and tourism industry are actively developing. Taking into account the high dependence on gratuitous revenues from the federal budget (82% of consolidated budget revenues in 2022) and the low share of its own tax revenues (17-18% in 2022) in the consolidated budget, the Chechen Republic was chosen as the object of study [3].

2 Research methodology

The research methodology will be comprehensive and multi-level using various approaches and methods aimed at obtaining a specific scientific result - identifying the parameters and structure of the formation of economic potential and proposals for ensuring a sustainable region.

3 Results and Discussions

Ecosystems can be understood as the intricate interactions between plants, animals, and their non-living environment. These interactions are characterized by factors such as species dominance, energy flow, and nutrient cycles. Humans are integral components of ecosystems, and thus, ecosystems can also be viewed through their socio-cultural dimensions. Human activities have significantly altered natural systems to the extent that socio-economic influences now play a dominant role in ecosystem dynamics. Moreover, human activities have led to the creation of entirely human-engineered ecosystems, such as agro-ecosystems, agro-forestry, aquaculture, and large-scale infrastructure projects like dams and river diversions for irrigation or energy purposes.

The concept of sustainable development has gained significant recognition, yet its true understanding remains limited among many. Its emergence into public consciousness can be traced back to the release of the Brundtland Report in 1987, followed by the 1992 Earth Summit in Rio de Janeiro and the promotion of Agenda 21 by the United Nations. Since then, numerous national governments have enacted various policies to promote sustainability, which may seem positive on the surface. However, it prompts us to question

whether these efforts have truly propelled us towards the goal of sustainable development. Have we perhaps focused too narrowly on policy measures, neglecting the need for comprehensive indicators to assess a nation's sustainable development performance? Alternatively, do we possess adequate indicators but lack effective implementation of sustainable development policies? These questions highlight the risk of unwittingly steering towards a catastrophic outcome or falling into a 'social trap' due to reliance on misleading signals or ignoring warning signs provided by established indicators.

The primary objective of this book is to stimulate deeper consideration among academics, policymakers, civil servants, business leaders, and activists regarding three key aspects:

1. The significance of sustainable development indicators.
2. The potential value and limitations of existing indicators.
3. How sustainable development indicators can be enhanced to provide better insights into the impact of past policies and prevent previous shortcomings.

The book features chapters focusing on indicators specifically tailored to measure sustainable development. Each contributor is either an expert practitioner in the field of sustainable development indicators or possesses substantial knowledge and experience in this area.

The diverse contributions and presentation of the book aim to empower readers to form their own opinions on the efficacy of sustainable development indicators in guiding policy decisions. Despite acknowledging weaknesses in certain indicators, the collective message from contributors underscores the critical importance of striving for appropriate indicators. However, there is a pressing need to refine and enhance existing indicators. Additionally, advocates of sustainable development indicators bear the responsibility to discard ineffective or misleading measures.

4 Conclusions

Managing sustainability involves efforts to reduce the ecological footprint of human activities, which has significantly degraded the viability of the Earth's major ecosystems over time. Parameters that define socioeconomic development, such as macroeconomic performance, investments, employment, information and communication technologies, research and development, and tourism, must be thoroughly analyzed and adequately measured to assess the potential for sustainable progress in a society's future. It is essential to identify and address weaknesses that hinder societal development. Socioeconomic development, along with education, serves as a catalyst for overall progress and impacts indicators such as poverty, social inclusion, and access to essential services like energy and clean water.

In terms of public health, measurable values include healthy life years, mortality rates, healthcare delivery, nutritional status, and exposure to health risks such as toxic chemicals. Climate change and energy present significant challenges, with indicators encompassing greenhouse gas emissions, renewable energy consumption, air quality, energy dependency, and vulnerability to natural hazards.

Indicators for natural resources cover land use, seas and coasts, freshwater availability and quality, and biodiversity. Sustainable transport indicators aim to reduce emissions and fatalities from road accidents, while demographic changes encompass population trends, tourism patterns, and employment rates among older workers.

Sustainable consumption and production indicators include resource productivity, household electricity consumption, waste generation, and environmental management systems. Good governance indicators measure aspects such as infringement cases, corruption, crime rates, voter turnout, and environmental taxes compared to labor taxes.

Education indicators assess education levels and literacy rates, while indicators for global economic partnership focus on trade, external financing, and CO2 emissions per capita. These indicators provide valuable insights into societal progress and inform decision-making for achieving sustainable development goals.

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