

Evaluation of Ecological Niches for Economic-socio-natural Complex Ecosystem: A Literature Review

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Abstract

In the current context of globalization, the economy has moved from a high growth stage to a high-quality development stage. High quality economic development requires a sustainable relationship among economic growth, social development and ecological environment. Now, with the outbreak of the COVID-19 and the shrinking of international trade and investment, all countries in the world are facing major risks and challenges, especially some developing countries are facing serious difficulties in economic and social development. In this context, this paper combs the current situation from the three dimensions of economic niche, social niche and natural niche, in order to make suggestions for future development.

Keywords

Ecological Niches; Economic-socio-natural; Complex Ecosystem; Sustainable Development.

1. Introduction

In the face of the world's unprecedented changes in a century, leading the economy from a stage of high growth to one of high-quality development is an objective requirement of globalization at this stage. High-quality economic development requires a sustainable relationship between economic growth, social development and the ecological environment. The construction of an ecological civilization is essentially the evolution of sustainable development aspirations at the level of green development and is an inevitable requirement for building a high-quality economic system. Its goal is to promote high-quality economic growth with minimal resource consumption and adverse environmental impacts. COVID-19 burst out in 2020, which posed a serious threat to the lives and health of people in all countries and caused a severe impact on the world economy [1]. The supply chain cycle of the industrial chain was disrupted, international trade and investment shrank, commodity markets were turbulent. And some countries, especially developing countries, faced serious difficulties in economic and social development [2]. It can be said that all countries in the world have encountered major risks and challenges. The "One Belt, One Road" initiative put forward by China since 2013 is the world's largest international cooperation platform and the most popular international public product. Against this background, it is of profound value and relevance to promote the building of a community of human destiny through the high-quality development of the Belt and Road. In this context, this paper explores the development status and evolution of the three dimensions of economy, society and ecology. Taking this as the logical continuation and foundation, I hope to put forward suggestions for future development from the three dimensions of economic niche, social niche and natural niche.

2. Literature Review

2.1. Literature Review on Ecological Niche

Given assessing the sustainability outcomes of the economic-social-natural complex ecosystem in the selected study area, it is necessary to identify a method to measure the degree of interaction between the natural environment and human activities. "Ecological niche" was first proposed by Grinnell in 1917 and referred to the basic living unit occupied by a population of organisms, principally in terms of physical space [3]. In 1927, Elton defined it as the functional position of the organism concerning its environment [4]. In 1957, Hutchinson defined the basic ecological niche as the multidimensional ecological factor space in which an individual organism or species can live unrestrictedly [5]. E. P. Odum pointed out that ecological niches determine where organisms live, how they live and how they are constrained by other organisms [5]. To summarize, an ecological niche is a qualitative or quantitative description of the relationship between an organism and its environment [6, 7]. It is set of ecological factors or relationships that are required for the survival of an individual organism or population or that can be used by it, and it is the degree to which the ecological factors or relationships are suitable for the environment in which the organism lives [8,9]. In the case of a certain study area, regional ecological niches include not only living but also production conditions, material and energy factors, cultural and information factors. At the same time, the regional ecological niche encompasses both spatial and temporal concepts [10]. It reflects the suitability of a region for various economic and living activities, its properties, functions, status, role and population as well as the advantages and disadvantages of its population, resources and environment, thus determining its attractiveness and centrifugal force for different types of economic activities and people of different occupations and ages [11, 12]. Human society is fundamentally a complex population-resource-environment ecosystem with human behavior as the dominant factor, the natural environment as the backbone, resource flows as the lifeblood and social institutions as the meridian [13].

2.2. Literature Review on Sustainable Development

The ecosystem we are studying is complex [14]. Composed of social, economic and natural subsystems, they are often referred to as "socio-economic-natural" complex ecosystem (hereafter referred to as "complex ecosystem"). Each of these three subsystems has its characteristics and not only has its differences in structure, function and evolutionary patterns but also influences and constrains each other [15, 16]. The process of urbanization has promoted rapid social and economic development. But at the same time, it has caused ecological pressure on the nature on which human beings depend for their survival. For example, population concentration, traffic congestion, resource shortage, biodiversity reduction, "heat island" effect, noise, and both air and water pollution [17-20]. There is a growing recognition of the importance of sustainable development, which will eliminate or mitigate these problems [21,22]. Countries around the world are experiencing urbanization and post-industrialization, accompanied by rapid GDP growth, rapidly expanding urban infrastructure, and dramatic changes in the quality of urban life [22, 23]. Therefore, building an efficient, healthy, and civilized society, including livable human settlements and regional ecological security, has become a top priority for governments around the world. At the same time, cities are the source of global environmental pollution and ecological damage, as well as a major concentration point for capital, population, energy, and information. In a broader sense, sustainable development refers to the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development does not imply the sustainability of any single economic, social or environmental subsystem. Rather, it attempts to balance economic growth, ecological construction, environmental protection, and social

progress. The difficulty of this challenge has made it a major focus of current research worldwide [24-26].

The concept of sustainable development was developed in the context of a growing awareness that there are some important relationships between the social, economic and environmental dimensions in the global, regional and local environment. With sustainable development as a goal, there is a growing demand for the use of urban monitoring and management indicators [27]. Zhang et al. did a lot of research work on complex ecosystem assessment and proposed a system of indicators [28]. The workshop of the Lebanese Environment and Development Observatory (LEDO) presented 110 indicators related to population, livelihoods, consumption standards, production patterns, agriculture, industry, energy, services, transport, air, water, environment, soil, biodiversity, etc. These indicators are an empirical and indirect interpretation of reality and are increasingly used in assessments. Indicators are used with increasing frequency in the assessment of ecosystems, sustainability, and management of the environment [29, 30]. The purpose of indicators is to provide a guiding tool for sustainability policy, including monitoring of measures and their results, and communication with the public [31]. It promotes a better understanding of complex phenomena and provides a common reference for different stakeholders with different concerns. However, the measurement of these indicators remains difficult and there are substantial challenges in developing a system of sustainability indicators on society [32].

3. Conclusion

The importance of ecosystem sustainability has been recognized and some studies have been conducted. However, research on such assessment methods is still in its early stages. Most studies have focused on specific aspects rather than an integrated set of indicators or methods to assess a wider range of factors and integrate their interactions. There are no effective indicators and evaluation methods for measuring the sustainability of complex ecosystem, and the indicator system of regional complex ecosystem ecological niches is still weak. First, scholars have not been able to establish a unified index system for evaluating sustainability due to different understandings of the connotation of complex ecosystem ecological niches and the limitation of indicator data availability, which has led to differences in evaluation results. Second, most of the previous studies have taken provinces, cities, districts as the research regions, and relatively few studies have been conducted at the national level. Considering this research deficiency, this paper hopes to develop a more comprehensive set of indicators for the sustainable development of complex ecosystems in the future. The ecological niches of the economic, social and natural subsystems of the regional composite ecosystem are evaluated in four dimensions: economic, social, resource and environmental. It provides a promising basis for supporting decisions on the sustainable development of composite ecosystems and monitoring the effectiveness of these decisions.

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