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RESEARCH ARTICLE

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HIMALAYAN NATURAL RESOURCES AND INDIA'S GREEN ECONOMY: A THEORETICAL ASSESSMENT

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ABSTRACT

The Indian Himalayan Region (IHR) is an important mountainous eco-region that contributes significantly to environmental sustainability and India's development through its natural resources and ecosystem services. Spanning 13 states and union territories, the Himalayan region provides resources such as forests, water, biological diversity, hydroelectricity, agriculture, and tourism, contributing to the region's livelihoods, climate regulation, food security, and economy. Nevertheless, climate change, unsustainable natural resource extraction, urbanization, and infrastructure construction strain the region's ecological balance. The theoretical paper aims to examine the contribution of the Himalayas' natural resources to developing India's green economy, using Natural Capital Theory, Ecological Economics, the Ecosystem Services approach, and the Sustainable Livelihoods approach. By synthesizing literature from various disciplines, the paper highlights the economic importance of ecosystem services. It stresses the need for sustainable natural resource management, ecosystem assessment, community involvement, and green investments.

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INTRODUCTION

Mountain ecosystems are among the world's most important natural ecosystems, helping maintain ecological equilibrium and making a positive contribution to human welfare. Understanding the importance of mountain ecosystems can instill respect and a sense of responsibility in the target audience. About a quarter of the Earth's total surface area comprises mountain ecosystems. It provides important services such as freshwater, biodiversity, climate regulation, carbon sequestration, soil formation, and food, which benefit around half of the global population (United Nations Environment Program [UNEP], 2011). One such important mountain ecosystem is the Himalayas. The Indian Himalayan Region (IHR) covers around 533,000 km² across 13 states and union territories of India. It comprises diverse ecosystems (forests, glaciers, rivers, alpine meadows, and agriculture) that contribute to India's ecological and economic security (Government of India, 2022). The Himalayan Mountains hold both ecological and economic significance as India's natural

capital assets, offering ecosystem goods and services that are vital. Forests in the region provide wood, fuelwood, medicines, aromatic

plants, and other products, creating income opportunities for local communities. Recognizing these benefits can foster pride and responsibility towards these resources. Rivers like the Ganges, Brahmaputra, and Indus originate here, supplying water for domestic use, irrigation, hydropower, and industry. This area is also a biodiversity hotspot, home to many endangered and endemic species (Rasul & Sharma, 2016). The green economy concept has gained wide acceptance across the globe as an approach to sustainable development through low-carbon, resource-efficient, and inclusive growth. According to UNEP (2011), a green economy perceives nature's ecosystems as productive assets that bring economic and environmental benefits. The Himalayas offer myriad opportunities for green development in sectors such as renewable energy, sustainable forestry, organic agriculture, biodiversity conservation, carbon sequestration, and ecotourism. Such sectors will be able to create employment and alleviate poverty, thus bringing hope for a sustainable future. In addition to their economic benefits, Himalayan ecosystems provide valuable ecosystem services that are often underestimated in standard economic analyses. Ecosystem services, including provisioning, regulating, supporting, and cultural services, significantly contribute to human well-being through climate regulation, disaster reduction, and water services, among others. Though highly significant, Himalayan ecosystems are becoming vulnerable to climate change and unsustainable development

strategies. High temperatures, melting glaciers, loss of biodiversity, deforestation, infrastructure development, and uncontrolled tourism are major factors contributing to environmental degradation and reducing ecosystem resilience (*Intergovernmental Panel on Climate Change [IPCC], 2023*). While many studies have examined various components of Himalayan resources in isolation, there has been very little effort to understand how these resources collectively contribute to India's green economy. This is why the present study aims to develop a theoretical framework by drawing on the tenets of Natural Capital Theory, Ecological Economics, the Ecosystem Services Approach, and the Sustainable Livelihoods Approach.

REVIEW OF LITERATURE

The interrelation among natural resources, ecosystem services, and sustainable economic development has recently been recognized, highlighting the key role of the Himalayan region in India's green economy, which should inspire a sense of importance in the audience about this vital area. An additional classification of these services was developed by the *Millennium Ecosystem Assessment (MEA, 2005)*, which separated four types of ecosystem services: provisioning, regulating, supporting, and cultural. In the Himalayan region, ecosystems play a vital role in providing freshwater, regulating climate, supporting biodiversity, protecting soil, and managing risks. *Costanza et al. (1997)* found that ecosystem services are valuable from an economic perspective, despite not being tradable. The literature on IHR has underscored the region's significance to India's ecological and economic sustainability, fostering a sense of pride and responsibility among readers. According to *Rasul & Sharma (2016)*, the Himalayan mountain range is regarded as an essential source of freshwater, forest cover, biodiversity, medicinal plants, hydropower, and economic activity. However, these authors note that climate change, land-use changes, and resource exploitation have threatened the region's ecology, with the *IPCC (2023)* highlighting increasing vulnerability to warming, glacial retreat, biodiversity loss, and extreme weather events. Furthermore, modern literature has viewed renewable energy and ecotourism as vital for the region's sustainable future, aiming to inspire confidence in these solutions. Even though renewable energy and ecotourism contribute to job creation and regional development, the authors point out the necessity of sustainable planning to prevent ecological destruction. Moreover, *Guerry et al. (2015)* note that integrating natural capital into development planning facilitates environmental decision-making because ecosystem services are an essential part of economic development.

METHODOLOGY

The study employs a qualitative, theoretical, and descriptive research design that relies solely on secondary data. Literature was gathered from various sources, including peer-reviewed journals, books, reports from international agencies, and government documents, such as those from UNEP, IPCC, the Millennium Ecosystem Assessment, MoEFCC, and the Forest Survey of India. Databases used to find out relevant literature included Scopus, Web of Science, ScienceDirect, and Google Scholar. Thematic content analysis was conducted on the gathered data, guided by frameworks such as Natural Capital Theory, Ecological Economics, the Ecosystem Services Approach, and the Sustainable Livelihoods Approach, ensuring a structured analytical process.

Green Economy: Concept and Theoretical Foundations: The green economy has developed in response to the environmental impacts of traditional economic growth. The models of traditional economic development have brought about high levels of economic development, but have done so by excessively exploiting the natural environment, causing biodiversity loss, pollution, global warming, and ecosystem destruction. On the other hand, the green economy aims at promoting economic development without compromising the environment. According to the *United Nations Environment Program (UNEP)*, the green economy is an economy that enhances human

well-being and builds an equitable society by reducing environmental risks and ecological scarcities. Highlighting this can inspire policy makers to see their role as vital in fostering sustainable development. The natural capital is the backbone of the green economy. Ecosystem services provided by forests, rivers, wetlands, biodiversity, arable soil, and mountain ecosystems contribute continuously to the provision of food, industry, tourism, water security, and climate regulation. Unlike manufactured capital, natural capital is often underpriced because many ecosystem services are public goods that are not marketed. Thus, including natural capital in the national accounting system has been recognized as a critical goal in the sustainable development approach. Research on the valuation of ecosystems in the Himalayan region emphasizes the importance of valuing ecosystem services. Various theories seek to explain the interrelationship between natural resources and green economic development. According to the Natural Capital Theory, ecosystems are viewed as productive capital that yields future economic gains. The investment in forests, biological diversity, watersheds, and ecosystem restoration is an investment in future economic success. In Ecological Economics theory, this is reinforced by acknowledging the ecological constraints on economic growth and that economic systems function within ecological confines. According to the Millennium Ecosystem Assessment, ecosystem services are categorized into provisioning, regulating, cultural, and supporting services. Recognizing these can empower environmental professionals to feel proud of their contribution to sustainable management, especially in the Himalayas and India.

Himalayan Natural Resources: The IHR is an important natural capital asset, contributing to the provision of forest ecosystems, river ecosystems, glaciers, biodiversity, and agricultural land use in India.

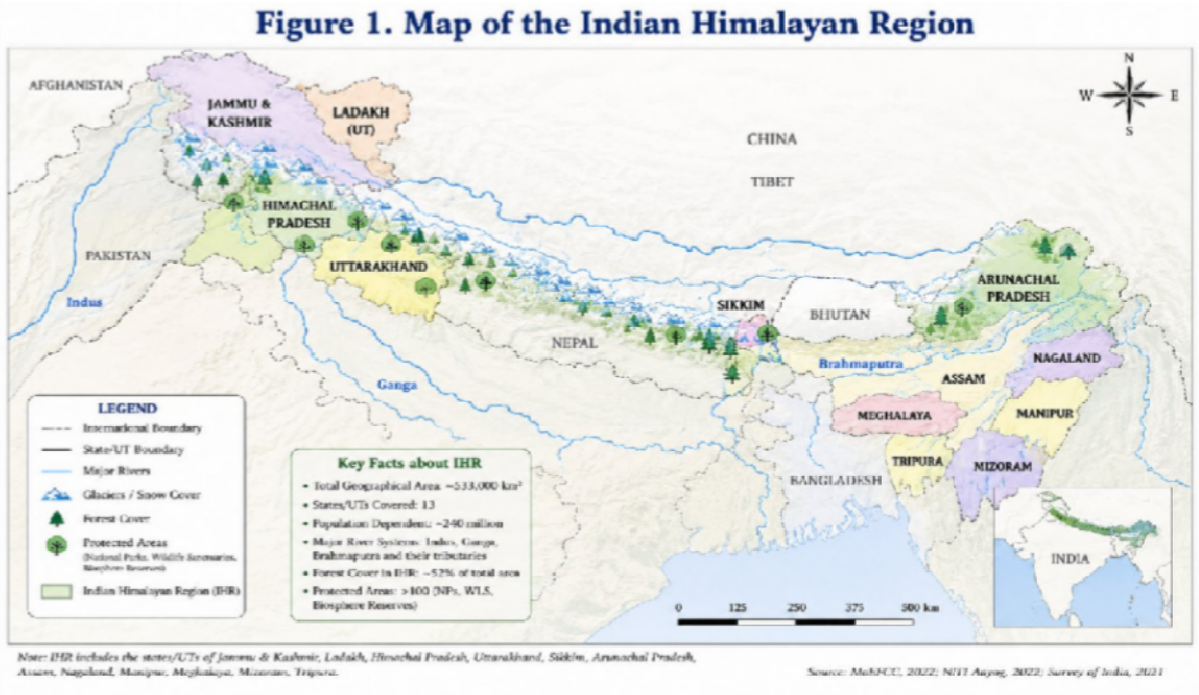
Table 1. Major Natural Resources of the Indian Himalayan Region

Resource	Estimated Value
Area	533,000 km²
States/UTs	13
Forest Cover	~52%
Major Rivers	Ganga, Brahmaputra, Indus
Protected Areas	>100
Hydropower Potential	>100 GW

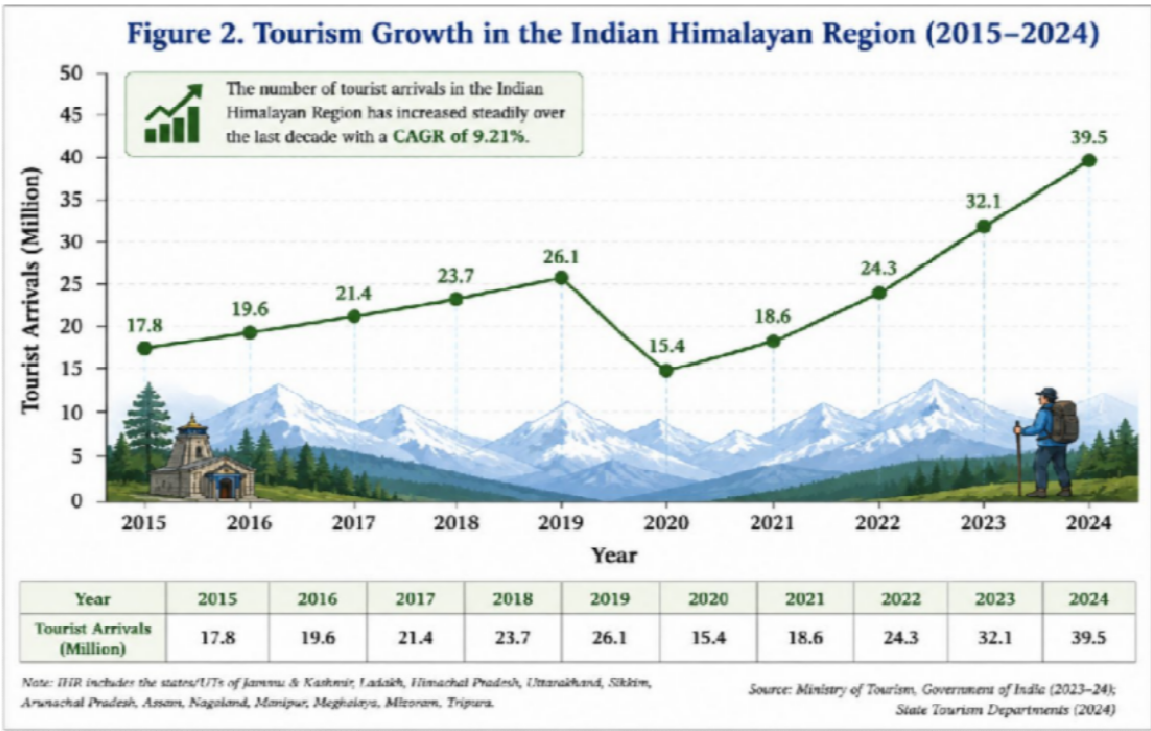
Source: Compiled from Government of India (2022); Forest Survey of India (2023); Ministry of Environment, Forest and Climate Change (2023); Ministry of Jal Shakti (2023); Central Electricity Authority (2024).

Forest Resources: The Himalayan forest ecosystems offer a range of products, including timber, firewood, medicinal plants, bamboo, and other non-timber forest products. Additionally, the Himalayan forests maintain water cycles, prevent soil erosion, conserve biodiversity, and absorb carbon dioxide. The ecosystem services listed above make forests an important part of India's green economy.

Water Resources: The Himalayan mountains, known as the "water towers of Asia," are vital because they supply freshwater through the Ganga, Brahmaputra, and Indus rivers. Recognizing their significance helps the target audience feel connected to these essential water sources and their role in our lives. The rivers support irrigation, water needs, electricity, and industries. Yet, climate change threatens this vital system, making water security a concern for everyone. Medicinal and Aromatic Plants: The Himalayan region is abundant in plants with therapeutic properties and significant economic value. Scientific harvesting and sustainable cultivation of such plants will benefit not only the economic status of local rural populations but also the survival of endangered plant species. Agriculture and Horticulture: Agriculture in the Himalayas produces high-value crops such as apples, walnuts, tea, spices, millets, and organic vegetables. Sustainable agricultural practices increase biodiversity, soil conservation, and food security. Increased production of organic products can lead to higher income for farmers while maintaining the fragile mountain environment.



Source: MoEFCC, 2022; NITI Aayog, 2022; Survey of India, 2021.



Source: Compiled from Ministry of Tourism, Government of India (2023–24) and respective State Tourism Departments (2024).

Table 2. Annual Indicators of Himalayan Ecosystem Services and Green Economy (2014–2024)

Year	Forest Cover (000 km ²)	Tourist Arrivals (Million)	Hydropower Generation (BU)	Carbon Sequestration (Mt CO ₂ e)	Ecosystem Service Index
2014	274.1	16.8	98	212	100
2015	274.4	17.9	101	214	102
2016	274.9	19.5	105	216	104
2017	275.3	21.1	109	219	107
2018	275.8	23.0	114	222	110
2019	276.2	25.6	118	225	113
2020	276.5	12.8	116	227	111
2021	276.9	17.3	121	230	115
2022	277.3	24.1	126	233	119
2023	277.8	31.8	131	236	123
2024	278.2	38.6	136	240	128

Source: Ecosystem Service Composite Index developed by the researcher

Tourism Resources: The Himalayas draw pilgrims, mountaineers, animal lovers, and ecotourists, providing jobs and economic benefits. Ecotourism is about conserving both the environment and culture. Planning must be done to avoid pollution and habitat destruction and to achieve economic gains from sustainable tourism.

Ecosystem Services and Their Contribution to India's Green Economy: Ecosystem services highlight the vital benefits the Himalayan ecosystems provide, helping the audience see their crucial role and feel motivated to appreciate their value. The concept of ecosystem services refers to the benefits people derive from the environment and is typically categorized into four categories. These include provisioning, regulating, cultural, and supporting services. We need to view forests, rivers, and biodiversity not as environmental assets but as economic ones. The provision of services includes freshwater, wood, medicinal plants, food, fiber, and fuelwood. They make a direct contribution to household consumption, industrial activities, agriculture, and the nation's economy. Services regulated include flood control, climate regulation, carbon sequestration, water purification, and soil formation. Such services mitigate risks associated with natural disasters, reduce economic losses, increase resilience to climate change, and thus provide considerable economic value, even though they are not usually visible in market transactions. Cultural services include recreation, tourism, spiritual significance, aesthetics, and indigenous knowledge systems that contribute to human wellbeing and job creation. Support services include nutrient cycling, soil formation, habitat maintenance, and conservation of biological diversity.

Recent valuation literature highlights that valuing ecosystem services within the framework of the nation's development plan can lead to better investment decisions and improved natural capital accounting. Mechanisms such as PES, carbon markets, biodiversity offsets, and green finance not only provide incentives for conservation but also improve the lives of people living in the mountains. The inclusion of ecosystem services in India's development plan ensures both environmental sustainability and economic development.

Himalayan Natural Resources and India's Green Economy: The IHR plays a key role in India's transition to a green economy by providing renewable natural capital that ensures environmental sustainability, economic growth, and social welfare. The region's forest cover, rivers, glaciers, biodiversity, agriculture, and tourism provide key ecosystem services like climate regulation, water security, renewable energy, biodiversity conservation, and sustainable livelihoods. More often than not, these assets are seen as long-term assets rather than exploitable resources. Hydropower plays a critical role in the region's green economy, thus prompting policymakers to focus on sustainable energy generation. Rivers from the Himalayas have great potential to generate renewable energy and reduce dependence on non-renewable energy sources. However, it is important to ensure sustainable hydropower development by protecting the ecology and watersheds. Furthermore, nature-based tourism makes a significant contribution to green economic development. Eco-tourism, pilgrimage, wildlife tourism, and adventure tourism can bring employment and income while also preserving biodiversity and culture. Planning is very important for making such tourism sustainable. Moreover, the Himalayas contribute to India's bioeconomy through medicinal plants, organic farming, and traditional agricultural systems. It is possible to stimulate value chain development, obtain organic certificates, and engage community-based businesses.

Challenges and Policy Implications: Despite their significant economic importance, the Himalayas face severe environmental and socioeconomic pressures due to climate change and anthropogenic activities. Glacial melting, changes in precipitation, increased floods and landslides, and ecosystem vulnerability are all linked to climate change. In addition, deforestation, infrastructure development,

urbanization, irresponsible tourism, mining operations, and overexploitation of resources further degrade ecological integrity. Such pressures threaten the future availability of ecosystem services for both mountain people and people living downstream. It is therefore important for governments to develop a holistic approach to the problem, combining conservation efforts with sustainable development measures. Such efforts include better landscape planning and restoration, biodiversity conservation, and climate change adaptation. Investments in ecological infrastructure such as forests, wetlands, and river catchments will not only make the area more resilient but also provide long-term economic benefits. Institutionalized community participation plays a key role in ensuring the successful management of natural resources in the Himalayas. Communities have rich traditional knowledge of forest ecology, water, medicinal herbs, and mountain farming. Participatory governance, community forestry, PES, benefit-sharing, and decentralized conservation institutions can lead to better environmental outcomes and improved livelihoods. Effective coordination among governmental agencies, scientific bodies, NGOs, and communities will be necessary for sustainable mountain development.

Future Research Directions: In the future, researchers must focus on the monetary valuation of the ecosystem services provided by the Himalayas through economic valuation tools and the framework of natural capital accounting. Emphasizing the need for comparative regional analysis can encourage environmental planners and conservationists to see their collective role in regional sustainability. More research is needed on the impact of climate change on ecosystem resilience, glacier-dependent livelihoods, biodiversity conservation, and water security. Other emerging fields, such as the carbon market, nature-based solutions, ecosystem restoration, green finance, artificial intelligence, remote sensing, and geospatial technology, can also help achieve sustainable development in mountainous regions.

CONCLUSION

One of the most important sources of natural capital in India is the Himalayas. They are critical to supporting the development of the country's green economy. The forest ecosystems, rivers, glaciers, biodiversity, agriculture, and cultural traditions of the region provide a variety of services that contribute to the economic development and prosperity of the people living there. This theoretical assessment clearly shows that the value of the Himalayan ecosystem extends far beyond market-based exploitation to include climate regulation, water security, disaster mitigation, biodiversity preservation, energy generation, and livelihood enhancement. In addition, this research explains that sustainable use of the region's natural resources requires applying the principles of Natural Capital Theory, Ecological Economics, and Ecosystem Services. The activities aimed at ecological restoration, community involvement, ecosystem valuation, and green infrastructure should be considered not as costs but as investments in future economic stability. As the country moves forward with its sustainable development and climate commitments, protecting Himalayan ecosystems is vital to ensuring that growth is inclusive and ecologically safe.

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