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RESEARCH PAPER

Green Economy Challenges and Feasible Opportunities of the Mountainous state Uttrakhand in India

Shilpa Yadav[1] and Vinod Kumar Yadav[2*]

[1]Department of Botany, Government Dungar College, Bikaner, Rajasthan, India
[2]ICAR-National Research Centre on Camel, Bikaner, Rajasthan, India
[2]Forest Ecology and Environment Division, Forest Research Institute, Dehradun, India

*Corresponding author: vinu932@gmail.com (**ORCID ID:** 0000-0002-6795-4752)

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ABSTRACT

The mountainous regions of Uttarakhand are home to unique ecosystems and indigenous communities. However, they also confront low capacity to cope with environmental and socioeconomic changes, resulting in increased poverty, vulnerability to hazards, and other challenges. Limited access to finance, inadequate policies, and a lack of awareness hinder the transition to a green economy. Despite these challenges, there are significant feasible opportunities to promote sustainability in Uttarakhand. Renewable energy transition, including the hydro power, can contribute to reduced carbon emissions and enhanced energy security. Emphasizing energy efficiency in buildings, transportation, and industries can lead to substantial energy savings. Sustainable agriculture practices, nature conservation, and responsible tourism can protect the region's rich biodiversity and create economic opportunities. Present study provides an overview of the green economy challenges and feasible opportunities based on pair wise ranking preference in Uttarakhand. By embracing these feasible opportunities, the state can achieve sustainable development, preserve its natural heritage, and improve the well-being of its mountain communities.

HIGHLIGHTS

- Ensuring remunerative ecological livelihoods for mountain dwellers must be the top most priority of economic development.

Keywords: Uttrakhand, Green economy, Energy, Mountain, Sustainable

Mountains encompass a significant portion of the Earth's surface, serving as a habitat for a diverse array of species and indigenous cultures. They also play a crucial role in providing essential goods and ecosystem services (Yadav *et al.* 2021) that are vital for the well-being of downstream populations, which constitute approximately half of humanity (Yadav *et al.* 2022). Recognizing the heritage value of mountains as a global commons and natural capital is imperative. The green economy model presents an opportunity to appreciate and assess this value.

A green economy is characterized by its focus on enhancing human well-being and promoting social equity, alongside the substantial reduction of environmental risks and ecological scarcities. It represents an economic development model rooted in sustainable practices and informed by ecological economics (Brand & Ulrich, 2012). The state's environment and ecosystem are particularly susceptible to the impacts of green growth, which

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in turn pose threats to the lives and livelihoods of marginalized and disadvantaged communities residing in mountainous areas, as well as impede the progress of lowland regions.

Study area and resource strength of the region

Uttarakhand, a region with a total area of 53,566 km², predominantly comprises mountains, accounting for 93% of its land, with forest covering 64% of the area. The northern part of the state is dominated by towering Himalayan peaks and glaciers, which have a pivotal role in regulating the global climate system. In contrast, the lower foothills boast dense forest cover. The climate and vegetation exhibit significant variation based on elevation, ranging from glaciers in the highest elevations to subtropical forests in the lower regions.

On a global scale, ecosystem services are estimated to have a total value of approximately US$ 33 trillion annually, nearly twice the global gross domestic product (GDP) (Costanza *et al.* 1997). However, there is a lack of comprehensive studies focusing on the valuation of ecosystem goods and services specifically in mountainous regions (Yadav *et al.* 2022). Utilizing a similar methodology employed by Costanza *et al.* (1997), Singh (2007) conducted an assessment of forest ecosystem services in Uttarakhand, India, estimating their total value to be around US$ 2.4 billion per year. It is worth noting that the market value of food production and raw materials only accounts for a small portion, approximately 18.7%, of the overall total value.

METHODOLOGY

An evaluation of people's preference ranking for the opportunities in uttrakhand was conducted using the pair wise ranking for PRA (Jain *et al*. 1999 and Pretty *et al*. 1995). For this ten feasible opportunities are taken from the youth declaration of national youth forum of green solutions in India. The exercise was conducted with a group of 22 individuals. They were at least graduated in various subjects and between the age group of 18 to 35 year old belong from various parts of Uttrakhand. Before the exercise all the feasible items are elaborated and explained in detail to every individual. The collected data was subjected to statistical analysis through Excel to arrive at the conclusion for the ranking of actionable items. The group discussions were conducted for the green economy challenges based on existing literature on this.

RESULTS AND DISCUSSION

Green economy challenges

Green economy challenges refer to the obstacles and difficulties faced in transitioning to and implementing sustainable and environmentally-friendly economic practices. These challenges can vary across different sectors and regions, but some common green economy challenges include:

1. Mountain communities' exhibit limited capacity to effectively cope with and adapt to the unprecedented changes occurring in their surroundings. As a result, they face escalating poverty levels, heightened exposure to both natural and human-induced hazards, and various socioeconomic challenges.
2. The likelihood of more frequent and intense climate-related natural hazards is significantly amplified by climate change, thereby increasing the potential threat posed by such disasters. In the absence of community-level awareness and preparedness, these altered scenarios of natural disasters render mountain communities even more vulnerable. Additionally, the absence of comprehensive regional or local studies further hinders the formulation of well-informed policy decisions concerning mitigation, adaptation, and risk reduction strategies.
3. Livelihoods in mountainous regions are significantly more vulnerable to both environmental and economic changes compared to those in the plains. These communities experience immediate and strong impacts that are intricately tied to the management and availability of natural resources.
4. Mountains possess a distinctive feature wherein the climate undergoes rapid transformations with increasing elevation over relatively short horizontal distances. This phenomenon extends to vegetation patterns and hydrological systems as well. Consequently, mountains exhibit rich biodiversity, often characterized by abrupt

shifts in vegetation sequences and rapid transitions from vegetation and soil to snow and ice.

5. From a socioeconomic perspective, mountain landscapes attract a substantial number of individuals seeking recreational and tourism opportunities. These dynamics include the direct effects of environmental changes on water resources, hydropower generation, slope stability, as well as hazards related to avalanches and glacier lakes. The impacts of these factors have a profound influence on the well-being and livelihoods of mountain communities
6. Inadequate or insufficient policies, regulations, and incentives that support green practices can impede the transition to a green economy. Lack of clear guidelines, inconsistent policies, and regulatory barriers can discourage investments and hinder the adoption of sustainable practices.
7. Limited access to finance and investments for green projects and initiatives can be a significant challenge. Green technologies and infrastructure often require upfront costs, and accessing funding for such projects can be challenging, especially for small and medium-sized enterprises (SMEs).
8. A lack of awareness and understanding about the benefits of a green economy and sustainable practices can hinder progress. Education and awareness campaigns are crucial for encouraging behavioral change and fostering a culture of sustainability.
9. The availability and management of natural resources pose challenges in the green economy. Balancing resource use, ensuring sustainable practices, and addressing issues like resource scarcity and waste management are critical aspects.
10. Building partnerships and collaborations among different stakeholders, including governments, businesses, civil society, and communities, is crucial for the successful implementation of green economy initiatives. Collaboration can face challenges due to varying interests, lack of trust, and coordination difficulties.

Addressing these challenges requires a comprehensive approach, involving supportive policies, financial mechanisms, education, technological advancements, and inclusive decision-making processes. Overcoming these obstacles is essential for the transition to a more sustainable and environmentally-friendly economy.

Feasible Opportunities for Green economy

There are several feasible opportunities for implementing a green economy, which can bring numerous benefits to society, the environment, and the economy. The ranking of the most feasible to least feasible is given in table 1.

Table 1: Feasible opportunities for Green economy

Rank	**Feasible Opportunity**
1	Promote small and sustainable hydro---projects in the mountain region.
2	Promote better and robust road, telecom and electronic connectivity in remote mountain areas to connect them.
3	Promote sustainable and pro---poor ecotourism in the mountains
4	Promoting afforestation of Region specific Plants to promote green cover, generate livelihood, mitigate disaster and Enhance carbon credits.
5	Green economy should be driven by significant involvement of private sector in the mountain areas.
6	Promoting the production and use of Sustainable products by adopting modern technology and promoting indigenous knowledge from the mountain regions.
7	Low cost renewable energy and appropriate technology should be promote in the mountain state
8	Enabling environment for sustainable, small and medium socio-environmental `enterprises by involving Corporate social responsibilities.
9	Capacity building and awareness program on green solutions should b promoted at different levels Governments, Media, Youth And Students.
10	To mainstream Cumulative and comparative assessment of mountain areas for filling the data gaps.

These are the rank wise feasible items for promoting the green economy in view of the youth of Uttarakhand.

The mountainous regions of India face unique

challenges and offer promising opportunities in the pursuit of a green economy. These regions are particularly vulnerable to environmental and economic changes, leading to increasing poverty, hazards, and socioeconomic hardships. However, within these challenges lie feasible opportunities for sustainable development.

By addressing policy and regulatory barriers, improving access to finance and investments, and raising awareness and education about the benefits of a green economy, mountain communities can overcome obstacles and transition towards sustainable practices. Embracing renewable energy, enhancing energy efficiency, promoting sustainable transportation, and adopting circular economy principles can contribute to reducing carbon emissions, enhancing energy security, and minimizing resource consumption.

Moreover, sustainable agriculture, nature conservation, and responsible tourism can safeguard ecosystems, preserve biodiversity, and generate economic opportunities for local communities. By investing in green infrastructure, embracing sustainable building practices, and promoting green innovation and research, mountainous regions can foster economic growth while preserving their unique natural heritage.

It is crucial for stakeholders, including governments, businesses, civil society organizations, and local communities, to collaborate and work together to unlock the full potential of a green economy in these regions. By doing so, we can create resilient and inclusive mountain communities that thrive economically while safeguarding the precious ecosystems and resources that are vital for the well-being of both present and future generations.

CONCLUSION

The journey towards a green economy in the mountainous regions of India is a shared responsibility and a tremendous opportunity to build a sustainable and prosperous future that balances environmental protection, social equity, and economic growth. Through concerted efforts and collective action, we can overcome challenges and seize the feasible opportunities that lie ahead for a greener and more sustainable mountainous India.

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