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## Optimizing Nepal's Natural Resources and Mineral Potentialities for Sustainable National Security

Santosh Budhathoki\*

### Abstract

*The abundant natural resources of Nepal, such as its minerals, forests, water resources, and potential for renewable energy, provide impetus for augmenting national security as well as economic growth that is sustainable. On the contrary, factors such as poor infrastructure, policy inconsistencies, and inappropriate enforcement of the laws have blocked full realization. In this regard, this appraisal provides a detailed resource management critique of Nepal and puts forward some measures in which resource utilization practices can be used for the benefit of national security. In analyzing the current situation, policy literature reviews, government publications, best practices, and scientific articles were used; the study shows the policy and management systems regarding community enclosing different segments of society to resources perform poorly. The systematic review on the basis of exclusive and inclusive criteria reinforces the connection between security and economic development by analyzing Nepal's resource management. It highlights obstacles like poor infrastructure, policy gaps, and weak enforcement while proposing a Strategic Resource Management Plan. The Nepali Army, and international collaboration, the study suggests that better resource utilization can enhance national security, foster socio-economic balance, and combat climate change. Some of these are enhancing the existing laws and policies, employing the Nepal army to protect natural resources, and collaborating with foreign countries to promote technological development and enhancement of human competencies. Such measures will allow Nepal to fully harness resources, enhance economic self-sufficiency, and maintain environmental and socio-economic balance. Besides improving national security, this integrated perspective would also facilitate social solidarity and help Nepal in combating climate change, making it a model for sustainable development within the region.*

**Keywords:** *Natural resources, national security, sustainability, optimization, Nepali Army's capabilities*

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\* PhD Scholar in Sociology  
Email ID : budhathokisantosh@gmail.com

## **Introduction**

### ***Overview of Nepal's Natural Resources***

Nepal has abundant mineral resources, including iron ore, copper, and rare earth elements, which can drive economic growth and reduce imports (Bhattarai & Shrestha, 2020; Singh et al., 2021). Forestry, covering 40% of the land, supports environmental security and local economies, with community forestry successfully promoting sustainable management (Department of Forest Research and Survey, 2020; Pokharel et al., 2021). The country also has vast hydropower potential, which can enhance energy security (WECS, 2020), alongside untapped solar and wind energy resources to diversify its energy mix (Dhakal & Silwal, 2021). Effective management of these resources is key to bolstering economic resilience and national security.

### ***Strategic Importance of Natural Resources for Nepal***

Natural resources are vital to Nepal's economy, supporting industries like construction and forestry and contributing significantly to GDP (Shrestha et al., 2019). Proper management of these resources can drive sustainable economic growth, reducing import dependence, creating jobs, and increasing foreign exchange earnings. However, unsustainable practices risk resource depletion and economic instability, which could impact national security. Employment in sectors like mining, forestry, and renewable energy is crucial for rural communities, reducing poverty and fostering social stability (Acharya & Dhungana, 2018). Sustainable resource management can also reduce conflicts over access, promoting social cohesion and indirectly strengthening national security. Regionally, Nepal's water resources play a critical role in its diplomatic relationships with India and China. Effective water-sharing agreements can prevent conflicts and foster cooperation (Gyawali, 2019). Additionally, managing resources along borders can prevent illegal extraction and reduce tensions with neighboring countries, thereby enhancing regional stability and safeguarding sovereignty.

### ***Nepal's Socio-Economic Stability and Geopolitical Security***

Nepal's natural resources hold great potential for national security and economic development, but challenges like infrastructure gaps, limited technology, and weak governance need to be addressed for effective management. Sustainable resource use is crucial for both economic growth and security (Paudyal et al., 2023; Sharma, 2019). The mineral wealth in Nepal, including deposits of iron, copper, and limestone, represents an underutilized sector with the potential to make significant economic contributions if adequately developed (Paudel, 2019). However, factors such as a lack of investment, advanced technology, and skilled labor have historically hindered effective resource extraction and utilization. This underexploitation limits the economic benefits these resources could provide, thereby weakening their role in enhancing national security (Paudel, 2019). In addition to mineral resources, energy security through the development of hydropower and other renewable sources is a crucial aspect of Nepal's security strategy. With its abundant rivers, Nepal has significant hydropower potential, which could meet domestic energy needs and allow for electricity exports to neighboring countries (Poudel, 2021). However, realizing this potential requires a coordinated national energy policy that emphasizes sustainable development and energy self-sufficiency.

Environmental sustainability is crucial for Nepal's national security, given its vulnerability to natural disasters like landslides and floods (Upreti, 2010). The Asta-Ja Framework (Eight-Resource Framework) is a sustainable development model focusing on water, land, forest, climate, people, livestock, crops, and biodiversity. It focuses on the integrated management of resources such as water, land, and biodiversity and presents a holistic solution to mitigate climate change impacts and enhance community resilience (Poudel, 2009). Effective governance remains a significant challenge due to weak policy implementation and insufficient regulatory frameworks, which exacerbate resource-related conflicts (Sharma, 2019). By adopting adaptive and inclusive governance models, Nepal can ensure sustainable resource management, thereby strengthening national security and promoting social and economic stability (Sharma, 2019). Nepal's strategic location between India and China underscores the importance of its natural resources in shaping foreign and security policies (Upreti, 2019). By strategically leveraging its resources, particularly through "hydro-diplomacy," Nepal can enhance its sovereignty and foster cooperative relationships with its neighbors (Wagner, 2013). Effective management of shared resources, like water, can transform these assets into tools for economic growth and diplomatic influence, strengthening Nepal's security and regional stability (Upreti, 2019; Wagner, 2013).

Nepal is transitioning from a traditional, militaristic view of national security to a more comprehensive, multidimensional approach, reflecting new challenges like climate change and economic instability (Gandhi, 2010; Holmes, 2015). The 2016 National Security Policy embodies this shift, but critics argue it lacks effective implementation mechanisms to address both conventional and nontraditional threats (Ghimire, 2019). For long-term stability, Nepal must continue evolving its strategy to include economic, environmental, and societal security while adapting insights from global frameworks to its specific context.

### ***National Security and Sustainable Resource Management***

The approach to national security has been enhanced from solely military protection to the incorporation of economic, environmental, and developmental aspects as well (Brown, 2018; Krause & Williams, 2019). Economic vulnerability and resilience are important today, and especially so due to climate change, where natural resources determine the economy, as in the case of Nepal (Gleditsch, 2020). To achieve sustainable resource management that attempts to reconcile economic prosperity and social and environmental well-being, Ostrom (1990) and Pearce & Turner (1990) argue that resources should be used in a responsible manner. In frameworks such as the Natural Resource Governance Framework, transparency and community involvement are central objectives (UNEP, 2019), and according to the Environmental Kuznets Curve, during economic growth, the negative environmental impacts will reduce (Grossman & Krueger, 1995). For Nepal, the implication of these strategies can link sustainable resource management towards national security, thereby increasing preparedness against natural disasters as well as regional rivalry (Sharma et al., 2022).

The theme of the study revolves around the strategic management of Nepal's natural resources to enhance national security, economic development, and environmental sustainability. It emphasizes the interconnectedness of resource management with national security and socio-economic stability, addressing challenges like infrastructure deficiencies,

policy inconsistencies, and weak enforcement. The objective of the study is to assess Nepal's current resource management practices and propose a comprehensive Strategic Resource Management Plan that integrates improved policies, law enforcement, and collaboration with the Nepal Army and international partners. This plan aims to optimize resource utilization for national security, economic self-sufficiency, climate change mitigation, and social cohesion, ultimately contributing to sustainable development in the region.

### **Methodology**

This review paper employs a systematic approach to gather and analyse data on the role of natural resources in enhancing Nepal's sustainable national security. The methodology involves an extensive review of academic literature, government reports, and policy documents to provide a comprehensive understanding of the intersection between resource management and national security.

### **Data Collection**

The primary sources of information for this review include academic databases (e.g., JSTOR, Google Scholar, ScienceDirect, and ResearchGate) to access peer-reviewed journal articles, books, and conference proceedings. Keywords such as “national security,” “sustainable resource management,” “natural resources in Nepal,” “hydropower potential in Nepal,” “mineral resources,” and “economic resilience” were used to identify relevant literature. Additionally, government reports from Nepal's Ministry of Forests and Environment, Ministry of Energy, Water Resources and Irrigation, and Ministry of Industry, Commerce, and Supplies were reviewed to gather up-to-date information on existing policies, strategies, and data regarding Nepal's natural resources.

Reports and publications from international organizations, such as the United Nations Environment Programme (UNEP), World Bank, and the International Union for Conservation of Nature (IUCN), were also included to provide a global perspective on sustainable resource management and its connection to national security. These sources contributed valuable insights into best practices, frameworks, and challenges in resource management from countries with similar geographical or socio-political contexts to Nepal.

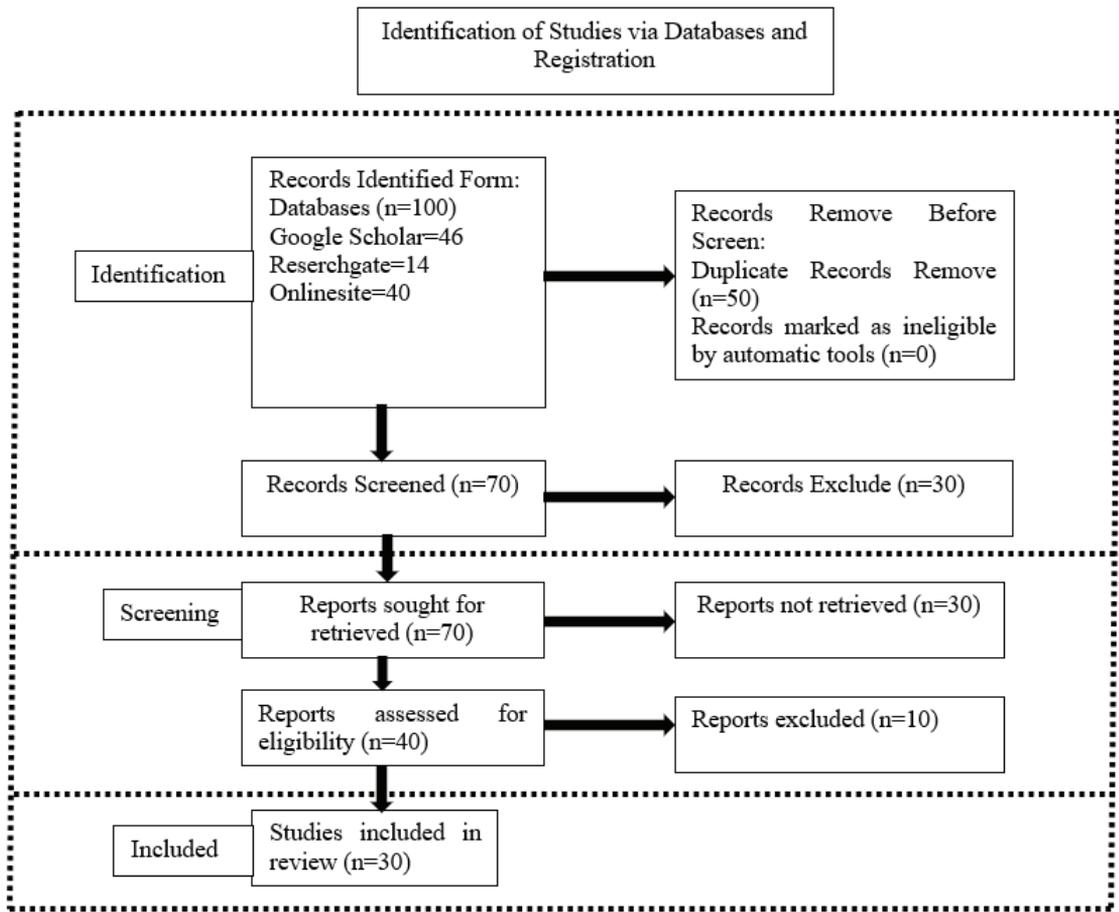
### **Inclusion Criteria**

The selection of literature and reports for this review was guided by specific inclusion criteria:

- a. **Relevance to Nepal:** Sources directly discussing Nepal's natural resources, environmental challenges, and economic conditions were prioritized.
- b. **Focus on National Security and Sustainability:** Studies that address the role of natural resources in national security, including economic resilience, energy security, and environmental protection, were included.
- c. **Date of Publication:** To ensure the relevance of information, literature published within the last 15 years was emphasized, though older foundational theories and frameworks in resource management were also considered.
- d. **Credibility of Source:** Only peer-reviewed articles, government publications, and reputable reports from recognized organizations were used to ensure the reliability of data.

**Framework of Analysis**

The literature analysis focused on key themes like economic resilience, energy security, environmental protection, and sustainable development, using a thematic framework to explore how these contribute to Nepal’s national security through resource management. A comparative approach evaluated Nepal’s policies against global best practices, focusing on countries with similar contexts to identify successful strategies. The policy analysis framework examined government strategies for resource management, highlighting gaps and implementation challenges. This comprehensive approach offers insights into optimizing Nepal’s natural resources for sustainable national security, with recommendations for policymakers. By utilizing this multi-dimensional methodology, the review paper offers a thorough evaluation of Nepal’s resource management policies and practices. This approach provides insights into the ways Nepal can optimize its natural resources to enhance sustainable national security, offering recommendations for policymakers and stakeholders to consider. The selection of articles for this research review is summarized in Figure 1 below.



*Figure 1. Flow chart of systematic review*

## Discussion and Analysis

### *Nepal's Current Approach to Resource Management*

- a. ***Policies and Governance:*** Despite progress in community forestry and hydropower development, Nepal has not yet established institutions that address both sustainable resource use and national security. While policies like the National Forest Policy (2019) and National Water Resources Policy (2020) provide guidelines, enforcement remains weak due to infrastructure gaps and limited regulatory control. There is a disconnect between national policies and local governance, leading to inconsistent implementation and inequitable resource distribution (Shrestha & Adhikari, 2021). The absence of a unified natural resource policy encompassing minerals, forests, water, and renewable energy has resulted in fragmented management and enforcement, with gaps in climate resilience, leaving Nepal vulnerable to environmental shocks.
- b. ***Role of Government and Private Sector:*** Nepal's resource management is characterized by a mix of private sector investment and government oversight, with agencies like the Department of Mines and Geology and the Ministry of Forests and Environment responsible for regulating licenses and ensuring environmental standards. However, limited financial and technical resources hinder government interventions, relying heavily on private companies. While private investment can drive economic growth, it often leads to environmental degradation, such as deforestation and pollution, due to inadequate regulations and monitoring. Nepal faces a dilemma between fostering private investment and ensuring sustainable resource use, requiring clearer guidelines for government and private sector roles (Dhakal, 2022).
- c. ***Challenges in Implementation:*** Resource management in Nepal faces significant challenges, including inadequate infrastructure, investment constraints, and technological limitations. The country's reliance on foreign aid often conflicts with national security and sustainability goals (Gyawali, 2020). A shortage of trained personnel and political instability further complicate efforts to implement effective resource management policies.

## Optimizing Mineral and Natural Resources for Security

### *Mineral Resource Optimization*

Sustainable mining practices, such as small-scale mining with community involvement, can optimize mineral resources while minimizing environmental impacts. Artisanal and small-scale mining frameworks that integrate local knowledge can reduce ecological harm and benefit local communities (Bhattarai et al., 2021). Mining projects should adopt low-impact technologies and reclamation plans to restore vegetation and soil health. Additionally, establishing a mineral wealth fund, like those in Norway, could help Nepal manage mining revenues, providing a long-term economic buffer that supports sustainable development and reduces dependency on aid, enhancing national security (Kristoffersen, 2019).

### *Hydropower and Water Management*

Hydropower has great potential to meet Nepal's domestic energy needs and even support exports. However, unregulated projects can harm local ecosystems, displace communities, and strain regional water resources. To achieve sustainable hydropower, Nepal should implement

a multi-level water governance approach involving local communities, regional stakeholders, and neighboring countries (Sharma et al., 2022). Integrated Water Resources Management (IWRM) can balance water use, energy production, and ecosystem health, preventing over-exploitation and conflicts with countries like India, which relies on Nepal's river flow. Run-of-river hydropower projects, which avoid large reservoirs, can minimize environmental impacts while maximizing energy production.

### ***Renewable Energy Initiatives***

Renewable energies, beyond hydropower, can significantly boost Nepal's energy security and resilience to climate risks. Solar energy is a viable solution for remote rural electrification and can reduce fuel imports, contributing to national security. Wind energy, though less common, has potential in high-altitude regions. Integrating solar and wind into the energy grid would diversify sources, stabilize energy supply, and reduce vulnerability to seasonal changes in river flow (Dhakal & Silwal, 2021). A community-based approach, supported by public-private partnerships, can ensure reliable energy access during grid disruptions, further enhancing national security and environmental benefits.

### **Sustainable Development and National Security**

A formal definition of national security is essential to provide clarity and direction. Developing a common understanding among all stakeholders will ensure a unified approach to addressing the diverse challenges related to security, encompassing not only military threats but also economic, environmental, and societal factors.

### ***Integrating National Security with Sustainable Development***

Nepal requires a holistic framework to integrate national security with sustainable development, focusing on long-term environmental and economic stability. The Sustainable Security Frameworks (SSF) model can address root causes of insecurity through environmental resilience, economic stability, and social well-being (Evans, 2019). True security goes beyond military power; it lies in equitable and sustainable resource management. Integrating sustainable resource practices into national security planning can guide policies on resource extraction, energy production, and forestry. Additionally, community participation in resource management can promote social stability and reduce conflicts. As McNamara stated, "Development means security, and without security, there is no development." Thus, aligning national security with sustainable development is crucial for achieving long-term peace and prosperity.

### ***Role of the Nepali Army for Sustainable National Security***

The traditional view of national security, centred predominantly on military defence, is evolving to encompass a broader and more complex set of challenges that includes environmental sustainability, resource management, and socio-economic stability (Holmes, 2015; Ghimire, 2019). For Nepal, a country endowed with abundant yet underutilized natural resources, this shift necessitates a strategic recalibration in which the Nepali Army plays a pivotal role. However, it is important to emphasize that the Army's role in sustainable resource management does not imply a complete shift in its traditional function. Instead, its involvement could be framed as complementary to its security mandate, where the Army assists in safeguarding critical

natural resources while working in partnership with civilian agencies and other stakeholders. To manage this, a clear delineation of roles and responsibilities should be established, ensuring that the Army's primary defense functions remain intact while contributing to national security through sustainable resource management. This collaboration could enhance overall national security by addressing environmental and socio-economic stability without compromising the Army's core mandate.

- a. **Resource Protection and Surveillance:** Nepal's mineral wealth and forests, while economically valuable, are vulnerable to illegal extraction and unregulated exploitation (Sharma, 2019; Upreti, 2019). The Nepali Army, established in remote areas, can play a key role in protecting these critical resources, supporting economic growth and national security (Paudyal et al., 2023). However, military involvement must be balanced carefully to avoid alienating local communities. A collaborative approach, where the Army works alongside community-led initiatives, fostering trust and equitable resource distribution, is crucial for sustainable development (Acharya & Dhungana, 2018).
- b. **Disaster Management and Environmental Resilience:** Nepal's unique geography and monsoon-driven climate make it highly vulnerable to natural disasters like landslides, floods, and earthquakes, causing long-term economic and social instability (Upreti, 2010). The Nepali Army's disaster response experience positions it well to contribute to environmental conservation efforts. Integrating disaster management with resource protection enables the Army to play proactive roles in ecosystem preservation and climate resilience (Gandhi, 2010). However, the Army needs to shift from reactive to preventive approaches, focusing on climate adaptation and ecological restoration for long-term national security benefits, though this requires retraining and political will (Poudel, 2009).
- c. **Supporting Infrastructure and Technological Development:** Nepal faces a significant challenge in infrastructure and advanced extraction technology despite its abundant natural resources (Paudel, 2019). The Nepali Army, with its engineering capabilities, can help bridge these gaps by working with civilian agencies and the private sector to develop critical infrastructure, particularly in remote areas (Gyawali, 2019). However, clear boundaries must be set between military and civilian responsibilities to avoid over-reliance on military resources, which could undermine development efficiency (Dhakal & Silwal, 2021). Sustainable outcomes require a balanced approach, utilizing public-private partnerships and the Army's logistical strength.
- d. **Resource Diplomacy:** Nepal, strategically positioned between India and China, has the potential to leverage its natural resources for diplomatic and economic benefits (Upreti, 2019). For example, its water resources can be used in "Hydro Diplomacy" to negotiate advantageous agreements and promote regional stability (Wagner, 2013). By securing these resources, the Nepali Army can indirectly strengthen the country's bargaining power in regional negotiations, enhancing national security beyond traditional defense. However, resource diplomacy requires careful management of geopolitics, with the Army playing a supportive role to keep diplomatic channels open and align resource management with Nepal's long-term foreign policy goals without escalating regional tensions (Paudyal et al., 2023).

e. ***Building Local Capacity and Promoting Community Resilience:*** In the context of Nepali Army deployment away from its operational base, its broad reach in rural areas can be utilized in support of sustainable community-based resource management initiatives. Investment in training and capacity-building programs enables the Army to invest trust and to enable local communities to play an active role in conserving their natural resources, thus promoting social stability and reducing the risk of conflicts over resource access (Pokharel et al., 2021). However, if the Army is actually going to make any headway with these initiatives, they must embrace a more collaborative, inclusive approach to them. Indeed, top-down directives will defeat anything if you simply impose them. A people-centered approach, where the people find themselves involved in the decision-making process, leads to trust building and sustainable, culturally appropriate resource management practices (Sharma et al., 2022).

### **Policy Recommendations**

A multipronged approach (a strategy that tackles a problem or achieves a goal through multiple methods, perspectives, or initiatives simultaneously) extending from careful planning and regulatory improvement through international collaboration to capacity building is necessary if Nepal's natural resources are to optimally contribute to national security in an environmentally sensitive way. This section outlines specific policy recommendations in order to optimize the utilization of natural abundances of Nepal in a manner consistent with the spatial and broader security objectives of the state.

#### ***Developing a National Security Strategy Resource Management Plan***

A nation with societal security goals must create a comprehensive strategic resources management plan that is consistent with the resource use in question. The latter resource use will encompass all the key resources of the economy, such as minerals, forests, water, and renewable energy, in a sustainable manner to ensure no harm to the economy, society, and environment in the long run (Bringezu et al., 2016).

- a. ***Setting Clear National Goals:*** These national goals should also ensure the country is able to attain energy self-sufficiency by minimizing the amount of importation of resources: The SRMP should therefore set clear such goals. And such objectives should be incorporated with the Sustainable Development Goals (SDGs) so that the exploitation of the natural resources of Nepal will lead to more substantive development objectives.
- b. ***Integrating Community Involvement:*** The local community should actively engage in the planning and implementation process of a certain aspect. As demonstrated in Nepal, the community management of water, trees, and related resources has worked well, and this model, if extended to other areas, will not only ensure equity but also minimize social tensions. The SRMP ought to institutionalize community participation in resource management together with the associated benefits and responsibilities towards sustainable development.
- c. ***Promoting Inter-Sectoral Coordination:*** Management of resources involves diverse sectors such as forestry, mining, energy, and agriculture, which in effect calls for coordination. A designated entity like a National Resource Management Council

could manage these different sectors and ensure that policies on resource planning and use are integrated. This council would foster the coordination of government ministries, industry, and local authorities, resulting in efficient utilization of resources and lesser policy orthodoxy.

d. ***Environmental Impact Assessments Reporting:*** The SRMP must facilitate environmental impact assessments (EIA) for each of the resource -centric projects to ensure their sustainability. EIAs may physically recognize likely impacts on the ecology of areas at risk at the commencement stage of planning and consequently identify strategies to avert the risk to the environment and society.

By formulating an SRMP that incorporates the facets of national security, Nepal stands the chance of assuring its citizens of the prudent management of natural resources, which in turn would enhance economic viability, ensure social order, and advance environmental protection.

### ***Strengthening Legal and Regulatory Frameworks***

The existing legal frameworks of Nepal for resource management lack specificity as well as necessary enforcement mechanisms to ensure sustainable practices. Strengthening these frameworks will enhance accountability and transparency in the systems for resource extraction while reducing excessive exploitation of resources for the benefit of future generations.

a. ***Establishing Clear Guidelines for Sustainable Extraction:*** It is necessary for Nepal to create or amend existing laws that incorporate more specific provisions on sustainable resource extraction, in particular for mining and forestry activities. These guidelines should specify acceptable methods for extraction, the amount of extraction that may be permitted in sensitive regions, and the standards and measures of environmental protection that any extracting company is required to observe (Government of Nepal: National Planning Commission, 2015). Clear and enforceable guidelines will encourage compliance with ‘improving practices’ while discouraging environmentally damaging activities.

b. ***Enhancing Regulatory Oversight:*** There is a need for an independent regulatory agency that is wholly concerned with resource management and which can monitor the adherence to environmental, social, and economic principles in the extractive operations of these resources (Nepal Rastra Bank, 2022). This agency would regularly perform audits of mining and forestry activities in order to ensure sustainability standards were being followed. Additionally, such an agency could implement sanctions against offenders as an inducement to accept the best practices.

c. ***Legalizing Small-Scale and Artisanal Mining:*** This type of mining is, however, an informal activity in Nepal which ends up being unregulated and has minimal economic impacts (Hentschel et al., 2003). By legalizing and properly regulating artisanal mining, it is possible in Nepal to advance sustainable practices, generate employment, and enhance resource management. Legalization would also enable the government to regulate these operations more effectively, which would reduce their adverse impacts on the environment and enhance accountability in the industry.

d. ***Implementing Stronger Reclamation Requirements:*** The government must introduce tougher reclamation requirements and guarantee that land degradation is reversed by mining companies after the extraction of useful natural resources is finished (Wu et al., 2024). Restoration policies must address issues including tree planting and soil and water quality targeting. These actions will reduce reasonable concerns regarding irreversible damage to the environment and the accessibility of the land for other uses, thus promoting conserved use of resources.

Legal and regulatory frameworks are also important in promoting the sustainable use of resources whereby they stabilize the security of the nation and internal environmental security.

### ***International Collaboration and Investment***

There is value for Nepal in going regional and international collaboration in what matters to investment, technology, and skills for the sustainable development of the resources. Strategic collaboration (HMG/NPC/MOPE, 2003) can be useful for Nepal in addressing the issues of capital inadequacy together with the tenability of technologies and fast tracking towards sustainable resource management.

a. ***Establishing Regional Compacts for Water Resources:*** Water sharing agreements between the riparian states are important to avoid disputes and promote collaborative efforts since the rivers of Nepal drain into the territories of India and China. As such, it is possible to explore negotiations over the Fair and Sustainable Water-sharing frameworks with the countries that share borders with Nepal. Initiatives as transboundary river basin management projects can also secure water resources and at the same time, improve bilateral diplomatic relations.

b. ***Encouraging Foreign Direct Investment in the Renewable Energy Sector:*** It is focused on the two areas of hydropower and solar energy because of the high capital and technology that are needed to establish these renewable energy projects. Foreign investors may be attracted to Nepal through incentives such as tax holidays, easy access to permits, and the execution of joint ventures. It is clear that by promoting international investments, Nepal will be able to develop its renewable energy sector and in the process reduce its fossil energy dependency and strengthen energy self-sufficiency.

c. ***Cooperation on Technology Transfer and Training:*** Nepal can partner with countries with developed sustainable mining, water management, and forestry. For example, countries like Norway, whose natural resources management is quite rich, and Bhutan, which has friendly practices in timbering, can be encouraging. Such technology transfer agreements would allow Nepal to follow the best practice models and modern instruments for optimum and sustainable resource harvesting. Their collaboration on training programs can also upskill Nepal's labor force and prepare them for systematic and scientific management of the resources.

d. ***Utilizing International Organizations:*** The World Bank, Asian Development Bank, and the United Nations are examples of organizations that extend technical help and financial support to sustainable resource management projects. Nepal might look for grants or soft loans in projects that can be embedded in the sustainability agenda,

for instance, the development of renewable energy resources, afforestation, and others. These partnerships will enable Nepal to lay the necessary infrastructure and technology for sustainable development without endangering national security.

Such assistance and benevolence put in place by international cooperation will place Nepal in an advantageous position to utilize its resources in the most appropriate manner with the assistance, technology, and investments available globally.

### ***Capacity Building and Technological Innovation***

Inadequate development and promoting new technologies in Nepal hinders the ability to optimally exploit the available natural resources. But managing more capable and modern processes and technologies (Pradhan, 2002) will enable better, more secure, and sustainable resource management.

a. ***Developing Training Programs for Sustainable Practices:*** Education and training are critical for the creation of people capable of practicing effective sustainable resource management. For example, the government may collaborate with universities and international organizations to conduct training in sustainable forestry practices, renewable energy engineering, and environmental impact assessments. Vocational training programs that include such elements can enhance the ability of the local population to properly and reasonably manage the available resources.

b. ***Research and Development Support (R&D):*** Environmental costs are often the most expensive and contain significant barriers to technological advancement in resource management. These can be addressed, for instance, by encouraging research into low-impact mining techniques, efficient hydropower-generating technologies, renewable energy sources, and energy management systems. It may also be effective to establish a national center for R&D in natural resource management to promote technologies and best practices in various sectors.

c. ***Promoting the Use of Digital Solutions for Data Analytics and Visualisation:*** There are several digital technologies, such as GIS and remote sensing, that can be used to monitor the use of resources, evaluate the effects on the environment, and assist in decision-making. The development of these tools in Nepal will assist in developing strategies that are based on data research to maximize resource access and minimize damage done to the environment. Data analytics will also provide insight into the mover resources that are available and make it possible to avert potential threats to the country's national security.

d. ***Stimulating the Development of Clean Energy Technologies:*** Affordable energy from the technology of solar and wind energy storage will foster energy self-sufficiency for resilience in Nepal. Reliable energy access, particularly in off-the-grid areas, is possible through advancements such as battery storage systems and microgrid technologies. Fostering R&D of clean energy technologies will assist in the attainment of a diversified national energy portfolio that strengthens national security.

e. ***Strengthening the Local Capacity for Maintenance and Management:*** For sustainable and efficient operations of the resource infrastructure, there is a need for qualified personnel for its operations and maintenance. The capacity of these people who

are trained and employed in the development of hydropower plants, renewable energy systems, and mining systems is key on such projects. Cost-effective and timely projects can be achieved by fostering local architectural skills, reducing reliance on outside skills to enhance long-term sustainability in resource management.

The article emphasizes the critical link between security and economic development, highlighting how natural resources, such as minerals, forests, water, and renewable energy, play a key role in both economic growth and national security. However, it could benefit from a deeper exploration of how these elements are directly interconnected, particularly by illustrating the challenges faced in aligning economic development with national security strategies. While the article addresses various natural resource management issues, it doesn't fully unpack the complexities that hinder a unified approach to integrating security concerns with resource utilization, such as inconsistent governance, lack of infrastructure, and underdeveloped technologies. A more focused discussion on these challenges and the reasons for the lack of common understanding would make the article more impactful in bridging the gap between economic and security policies.

### **Conclusion**

This article underscores the critical role that sustainable management of Nepal's natural resources plays in driving economic development and achieving national security objectives. By adopting a multi-pronged approach, Nepal can maximize the potential of its natural resources while safeguarding the environment and ensuring long-term prosperity. The implementation of a comprehensive National Security Strategy Resource Management Plan, coupled with a strengthened legal and regulatory framework, will enhance resource utilization efficiency, reduce exploitation, and foster a secure economic environment. Investing in technological innovation, capacity building, and international collaboration—particularly in the renewable energy sector—will not only improve energy self-sufficiency but also enhance Nepal's economic resilience. Through strategic partnerships and investments, the country can modernize its infrastructure, promote sustainable practices, and stimulate growth in key sectors such as energy, mining, and agriculture. Ultimately, aligning resource management with national security goals ensures that Nepal's natural wealth directly contributes to its economic development. By optimizing resource utilization in a sustainable manner, Nepal can achieve greater economic stability, social harmony, and a robust national security framework, securing a prosperous future for its people.

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