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### The Key Determinants of the Green Bond Market for Sustainable Development in Nepal

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#### **Abstract**

*This study investigates the key determinants of green bond market development in Nepal, employing the Interactive Management Approach (IMA) as a qualitative research method. The analysis identifies two critical drivers: the legal and regulatory framework for green bond issuance, and the interest rate structure of green bonds. These factors are found to play a decisive role in enabling the green bond market to effectively support financing for the Sustainable Development Goals (SDGs). The findings suggest that green bonds can serve as a viable mechanism for mobilizing climate finance and attracting both public and private investment. However, their success hinges on the strategic alignment of supply-side and demand-side dynamics. The paper offers policy recommendations aimed at enhancing institutional capacity, improving legal and financial infrastructure, and guiding financial sector stakeholders in leveraging green bonds to support Nepal's transition to a low-carbon, climate-resilient economy.*

**Keywords:** green bonds, climate finance, sustainable development, Nepal, institutional readiness, financial policy, Interactive Management Approach.

**JEL:** N0, N10, O10, O23.

#### **I. Introduction**

Green bonds, debt securities issued by government entities, multilateral institutions, or corporations, are designed to raise capital for projects that support a low-carbon, climate-resilient economy (Inderst et al., 2012). These bonds play a pivotal role in advancing sustainable finance

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# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

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and environmental sustainability, with their global use steadily increasing. Since their inception by the European Investment Bank in 2007, green bonds have become a significant financial instrument for sustainable development (Muhammad et al., 2022). Key milestones in their evolution include the introduction of the Green Bond Principles in 2014, which catalyzed growth in both bond issuance and academic research (Reboredo, 2021). Moreover, legal frameworks and regulatory developments—particularly in China—have been instrumental in shaping the market, underscoring the critical role of policy in promoting sustainable finance (Huang & Yue, 2020). The impact of green bonds on financing environmental projects highlights their importance in fostering sustainable development globally (Pham, 2021; Flammer, 2021).

It is widely acknowledged that private sector participation is essential to complement the limitations of state capital and enhance capital mobility for green projects within countries. Mazzucato and Semieniuk (2018) and Polzin et al. (2019) argue that the private sector often serves as a more reliable and agile investor in environmental initiatives due to its social responsibilities and efficiency in economic activities. Green bonds (GBs) have emerged as a novel, asset-linked fixed-income instrument capable of helping countries mobilize capital for projects aimed at improving environmental quality and mitigating climate change risks (Anh et al., 2021; Aung et al., 2017; Esfahani & Rasoulinezhad, 2015). Introduced by the World Bank in 2008 through its Strategic Framework on Development and Climate Change, green bonds have become a credible mechanism to accelerate green projects and support the achievement of Sustainable Development Goals (SDGs). Trang (2015) highlights that the green bond market can provide sufficient financing for initiatives focused on greening the economy and expanding green energy resources.

Despite the distinct advantages of green bonds, their success has not been consistent, with evidence of market failures reported in several countries (Ferrer et al., 2021; McInerney & Bunn, 2019). While numerous studies have examined various aspects of the green bond market (e.g., Trang, 2015; Tu et al., 2020; Wang et al., 2020; Naeem et al., 2021; Taghizadeh-Hesary et al., 2021), there remains a notable gap in research focused on identifying the key success factors of the green bond market in Nepal. This paper aims to address this gap by investigating the primary determinants of the green bond market in Nepal through the application of an Interactive Management Approach (IMA). The study's key findings emphasize the critical role of a robust legal framework in ensuring the efficient functioning of the market, alongside the importance of competitive interest rates in attracting private investment to green projects in Nepal.

This paper is organized into five sections. The first section introduces the key issues and objectives of the study. The second section presents a literature review, highlighting seminal works and identifying existing research gaps. The third section outlines the methodology, detailing the research approach and theoretical framework. The fourth section discusses the findings, interpreting the results and relating them to the existing literature. The final section offers key conclusions and practical policy recommendations.

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# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

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### II. Literature Review

Nepal, characterized by ecological diversity and high vulnerability to climate change, requires substantial investment in climate-resilient infrastructure to achieve its environmental and developmental objectives (Pandey & Dahal, 2022). The issuance of corporate green bonds can be theoretically explained through signaling theory, which suggests that these bonds serve as a signal of a firm's commitment to environmental responsibility, especially in situations where investors face information asymmetry (Lyon & Maxwell, 2011; Lyon & Montgomery, 2015). Green bonds are versatile financial instruments that can be used to finance or refinance a broad range of projects, including infrastructure, renewable energy, and low-carbon transportation (Inderst et al., 2012). By definition, green bonds are fixed-income securities dedicated exclusively to funding environmentally beneficial initiatives (Campiglio, 2016).

Beyond meeting financial objectives, green bonds also represent a firm's environmental commitments, which enhance their attractiveness to investors prioritizing environmental, social, and governance (ESG) criteria (Bartels et al., 2016). The increasing integration of ESG factors into corporate strategies reflects a broader shift in investment paradigms (Hart & Zingales, 2017). However, the growth of green bonds in low-income countries faces significant barriers, such as limited technical capacity within financial institutions and difficulties in issuing bonds of sufficient size to ensure market liquidity (Banga, 2019). During the COVID-19 pandemic, the legal framework governing green bond operations and the offered interest rates have been identified as critical determinants of market success (Rasoulinezhad, 2022). Alternative theoretical perspectives, including the fundamental channel hypothesis, argue that green bond issuance can signal valuable investment opportunities and reveal internal firm information (Myers & Majluf, 1984; Kang & Stulz, 1996). Empirical studies on green bond pricing often use matching methods, comparing green bonds with non-green counterparts issued by the same entity (Choi et al., 2019; Zerbib, 2019). Findings generally indicate that green bonds tend to yield higher returns than similar non-green instruments (Bachelet et al., 2019), although the generalizability of some results, particularly those focused on municipal issuances, may be limited (Larcker & Watts, 2019).

A significant barrier to the development of the green bond market is the issue of trust, as investors often question the authenticity of the environmental claims made by issuers (Reed et al., 2017). Notably, studies indicate that negative stock market reactions to green bond issuance tend to be more pronounced in developed markets compared to emerging ones (Lebelle et al., 2020). Enhanced access to credit and the promotion of public-private partnerships have enabled countries such as China to effectively leverage green finance for environmentally sustainable growth (Wang, Liu, & Wang, 2024; Chen, Huang, & Wu, 2023). From a financial market perspective, green bonds exhibit strong correlations with treasury and investment-grade corporate bonds, while green stocks generally align closely with broader equity indices across varying time horizons (Ferrer, Benitez, & Bolos, 2024).

Reboredo (2018) highlights that the diversification benefits of green bonds for both investors and issuers are a key factor driving the growth of the green bond market. In a recent study, Tu et al. (2020) examine the development of Vietnam's green bond market and identify fiscal and

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# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

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monetary policies, interest rates, and market regulations as the most influential factors. Wang et al. (2020) focus on China, the pioneer of green bond issuance globally, and emphasize that the green bond price premium plays a crucial role in attracting private investors. Pham and Huynh (2020) argue that market transparency and the availability of sufficient information for investors are essential elements for green bond market development. Yi et al. (2021) study the impact of the COVID-19 pandemic on China's green bond market, finding that information asymmetry and issuers' financial capacity are critical to mitigating negative effects during the crisis.

Jakubik and Uguz (2021) underscore the importance of green bond regulations in enhancing the activities and efficiency of insurers. Chen and Zhao (2021), along with Zhou et al. (2021), explore the role of green bonds in expanding China's financial market, demonstrating their positive contribution to financial development. Ferrer et al. (2021) describe green bonds as a strategic tool for energy decarbonization and improving environmental protection. Regulatory support and policy frameworks are essential to fostering green bond markets by providing credibility and reducing investment risks (Flammer, 2021).

Issuer characteristics such as firm size, creditworthiness, and environmental performance significantly influence the likelihood of green bond issuance (Tang & Zhang, 2020). Market demand from environmentally conscious investors drives issuance by creating financial incentives for sustainable financing (Zerbib, 2019). Additionally, green certifications and third-party verifications enhance investor confidence and are key determinants of green bond success (Karpf & Mandel, 2018).

Macroeconomic stability and financial market development form the foundation for the growth of green bond markets, particularly in emerging economies (Taghizadeh-Hesary & Yoshino, 2020). Climate vulnerability and environmental risks motivate governments and corporations to raise capital through green bonds (CBI, 2019). Monetary policy tools and central bank involvement—such as green quantitative easing—also influence market development (Volz, 2018). Corporate sustainability goals and ESG integration within firm strategies increase the likelihood of green bond issuance (Baker et al., 2018).

Moreover, public-private partnerships and blended finance approaches are critical for mobilizing large-scale capital via green bonds (OECD, 2017). Finally, international cooperation and alignment with global climate goals, such as the Paris Agreement, encourage countries to establish domestic green bond frameworks (World Bank, 2018).

The effective implementation of green finance and the readiness of Nepal's green bond market are hindered by several factors, including the absence of a comprehensive regulatory framework, limited green investment opportunities, perceived financial risks, and a lack of knowledge and experience among banking professionals. Additionally, strong institutional support and leadership commitment are essential but currently insufficient (Bhandari et al., 2024).

Banks in Nepal play a crucial role in financing electric mobility, promoting energy-efficient housing, and supporting renewable energy projects such as hydropower. Innovative initiatives,

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# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

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including green savings accounts, sustainable agriculture loans, and financing for low-carbon industries, further demonstrate their commitment to environmental responsibility (Acharya et al., 2024).

Aligned with its obligations under the United Nations Framework Convention on Climate Change (UNFCCC), the Government of Nepal has allocated public funds for climate-related initiatives and introduced policies to address climate risks (Rawal, 2024). Regulatory approval from the Securities Board of Nepal (SEBON) and Nepal Rastra Bank is a prerequisite for issuing green bonds in Nepal's financial market (Nepal Infrastructure Bank, 2024). Furthermore, technical assistance from international partners such as the Global Green Growth Institute (GGGI) and KOICA has been instrumental in developing Nepal's green bond ecosystem. Adherence to international standards, such as the ICMA Green Bond Principles, enhances the credibility and attractiveness of Nepalese green bonds to investors. Mandatory allocation of proceeds to green projects—including hydropower, solar energy, and other renewables—ensures alignment with sustainability criteria (Global Green Growth Institute, 2024).

However, several challenges remain, including limited green finance awareness, gaps in institutional and regulatory frameworks, insufficient capacity-building and technical expertise among financial institutions, the need for policy reforms and legal amendments (such as securities registration and issuance regulations), and constrained demand and market forces from both investors and issuers. These factors collectively limit the supply and uptake of green bonds in Nepal (Pandey & Ghimire, 2025).

The practice of green banking in Nepal is primarily influenced by three factors: stakeholder demand, environmental interest, and brand image, with brand image emerging as the most significant driver. It plays a vital role in reducing carbon footprints and addressing broader sustainability dimensions within the banking sector (Mishra & Aithal, 2023).

A significant boost to green finance in Nepal came from policies introduced by Nepal Rastra Bank (NRB). The Environment and Social Risk Management (ESRM) framework, implemented in 2018, guides financial institutions in managing environmental risks. This commitment was further reinforced in 2020 with the inclusion of ESRM within the NRB's Unified Directives (Nepal Rastra Bank, 2022). Additionally, the Nepal Green Finance Taxonomy (2024) provides a standardized framework for classifying financial flows and investments that qualify as "green" within the national context. According to this taxonomy, banks and financial institutions must ensure their lending and investment portfolios align with environmental objectives such as climate mitigation, renewable energy, sustainable forestry, and clean transportation.

Existing literature indicates that key determinants of the green bond market in Nepal—such as official interest rates on green bonds, the legal framework, institutional infrastructure, international cooperation, and monetary policy—have not yet been empirically examined using the Interactive Management Approach (IMA). This study aims to fill this gap in the literature.

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# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

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### III. Methodology and Results

The present section is devoted to the methodology and results, the details of which are presented in upcoming sub-sections.

#### A. Methodology

To identify the key determinants influencing the development of Nepal's Green Bond market, this study employs the Interactive Management Approach (IMA). Originally proposed by Warfield and Cardenas (1994), IMA is a well-established method designed to unravel complex economic and social problems. As noted by Gholami et al. (2016), this approach helps transform vague, ill-defined issues into clear, structured solutions.

The IMA involves several steps, beginning with the identification of the major stakeholders in the Green Bond market, namely issuers and investors. In the first stage of this study, determinants were identified by addressing questions developed by Mason and Mitroff (1981), which were answered by a panel of 25 experts. The second stage involved generating a list of key factors based on the experts' perceptions and experiences. Finally, these determinants were organized and clarified through the construction of a model or digraph that illustrates their interrelationships.

#### B. Results & Discussion

The findings indicate that the official interest rate of green bonds is the most critical determinant of Nepal's green bond market, receiving the highest level of agreement at 96%. This is followed by the legal framework governing green bonds, which was identified as important by 85% of the experts. Institutional infrastructure was recognized by 83%, while international cooperation in the green bond market was acknowledged by 77% of respondents (see Table 1 for details).

**Table 1: Determinants of Green Bond Market Development in Nepal**  
(Source: Authors' Calculation based on Experts' Opinions Survey, 2025)

Key Determinants	Response by Experts in (% Percentage)
Official Interest Rate of Green Bond	96%
Legal Framework of Green Bond	85%
Institutional Infrastructure	83%
International Cooperation in Green Bond	77%
Monetary Policy	73%
Fiscal Policy	70%
Inflation Rate	64%
Political Stability	56%
Official Exchange Rate	52%

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# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

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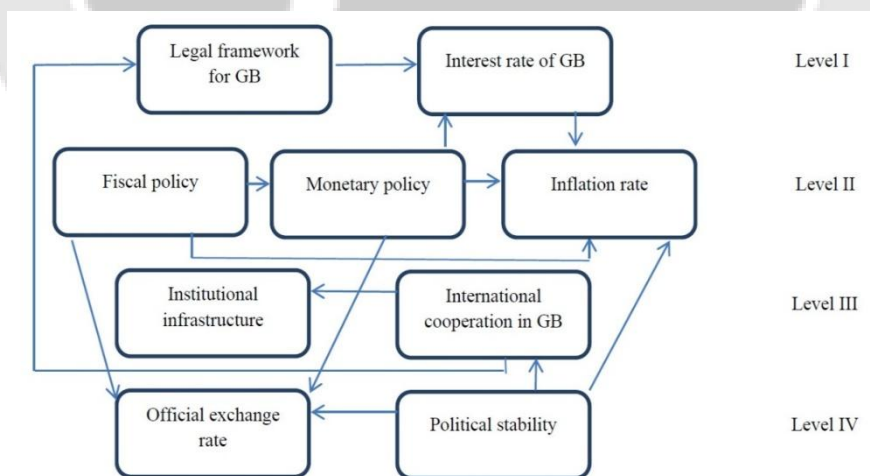
In the next phase of the study, the authors constructed a Structural Self-Interaction Matrix (SSIM) by conducting pairwise comparisons of the key determinants identified earlier. Each expert evaluated the relationship between determinant factors  $i$  and  $j$  using four symbols:

- V- Indicating that factor  $i$  influences factor  $j$ ;
- A- Indicating that factor  $j$  influences factor  $i$ ;
- X- Indicating that factors  $i$  and  $j$  mutually influence each other; and
- O- Indicating no specific relationship between factors  $i$  and  $j$ .

This process revealed the interrelationships among the key determinants listed in Table 1. From the SSIM, a reachability matrix was generated, which was then used to develop a digraph model illustrating the transitive links among nine key determinants.

As shown in Figure 1, the legal framework of the Green Bond market—issued by the central bank—and the official interest rates of green bonds were positioned at the top level of the hierarchy. This indicates that these two factors are the most influential determinants driving the development of Nepal’s Green Bond market.

It is important to note that inflation rate, monetary policy, and fiscal policy occupy the second level in the hierarchy of success factors. Institutional infrastructure and international cooperation in green bonds are positioned at the third level. The final level includes official exchange rates and political stability, which were considered less influential for the success of the green bond market during the current pandemic. However, the placement of exchange rate and political stability at the lowest level does not imply that they are unimportant—rather, the experts assigned them lower priority compared to the other determinants examined in this study.



**Figure 1: The Interpretive Structural Model (ISM) for Four Level Ranks**  
(Source: Authors’ Composition, 2025)

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# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

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In Figure 1, the direction of the arrows represents the relationships between key determinants across different levels. For instance, the relationship between the legal framework for green bonds and their interest rate is unidirectional, indicating that the legal framework influences the interest rate. Additionally, monetary policy appears to impact the inflation rate, official exchange rate, and the interest rate of green bonds. At the third level, international cooperation in green bonds can influence both institutional infrastructure and the strengthening of the legal framework for Nepal's green bond market.

In the context of Nepal, sustainable banking refers to the integration of environmental, social, and governance (ESG) principles into the core operations of financial institutions to support long-term sustainable development. Given Nepal's vulnerability to climate change and its abundant natural resources, ESG principles play a vital role in promoting responsible lending and investment decisions that prioritize environmental protection and social equity. Green financial instruments—such as concessional loans and investment funds targeting renewable energy, sustainable agriculture, and eco-tourism—are designed to channel capital into environmentally sound projects. These instruments help bridge the financing gap for climate-resilient infrastructure and green enterprises.

Banks and Financial Institutions (BFIs) in Nepal are mandated to incorporate environmental and social (E&S) risk management into their overall credit risk assessment processes to ensure sustainable financing practices (Nepal Rastra Bank, 2020). The Green Finance Taxonomy provides a classification system to identify economic activities that qualify as environmentally sustainable within the context of Nepal's climate commitments and development priorities (Nepal Rastra Bank, 2024).

Green investment opportunities typically aim to reduce carbon emissions, lower greenhouse gas outputs, and minimize the depletion of natural resources, while simultaneously promoting sustainable livelihoods. Research in Nepal and other developing countries has proposed specific criteria for identifying green technologies and highlighted key sectors with strong potential for green investment (GGGI, 2017; Hepburn et al., 2020).

**Table 2: Nepalese Green Bond Landscape**

(Source: Authors' Composition, 2025)

Key Aspects	Status
Governance Authority	Nepal Rastra Bank (NRB), Securities Board of Nepal (SEBON)
Key Procedures	ESRM Guidelines (2020) by NRB Green Bond Provisions (2023) by SEBON
Taxonomy Framework	"Nepal Green Finance Taxonomy" (2024) by NRB
Market Position	Emerging no official green bond issuance as of yet
Potential Sectors	Renewable energy (hydro, solar), sustainable transport (EVs), waste management, green buildings

# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

Challenges	Limited municipal investor base Currency risk for foreign investors Lack of hedging instruments Low awareness & capacity in municipalities
Prospects	Strong potential in hydropower, solar, and agriculture Growing climate finance interest
Official Support	UNDP, GGGI, IFC, GCF, ADB, World Bank, TDF – providing policy, capacity, and technical assistance
Concern Stakeholders	SEBON enabling green bond issuance NRB taxonomy for defining green investments
Future Outlook	Dependent on taxonomy adoption, investor mobilization, and development of local project pipeline

Table 2 highlights key aspects of Nepal’s Green Bond landscape, including the regulatory authorities, relevant regulations, taxonomy framework, market status, proposed eligible sectors, challenges, opportunities, institutional support, current initiatives, and future outlook. Nationally, Nepal’s regulatory framework for green finance is evolving steadily. The Nepal Rastra Bank (NRB) introduced the Environmental and Social Risk Management (ESRM) guidelines in 2018, which were incorporated into the Unified Directives in 2020 to promote sustainable banking practices. However, challenges such as the lack of standardized definitions, limited capacity among financial institutions and municipal governments, and a shortage of bankable green projects continue to hinder widespread adoption of green bonds. The Securities Board of Nepal (SEBON) has also played a key role through provisions introduced in the seventh amendment to the securities registration and issuance regulations, enabling companies to issue green bonds with proceeds earmarked for sustainable development and climate change initiatives.

Globally, green bonds have emerged as a pivotal tool for mobilizing finance toward climate-resilient and sustainable development. In Nepal, the discourse around green bonds is growing, particularly with the introduction of the Nepal Green Finance Taxonomy and the evolving regulatory landscape led by NRB and SEBON. However, Nepal’s green bond market is still maturing and must develop sufficient capacity to reach a balance between supply and demand.

Nepal has significant potential to leverage green bonds as a powerful financial instrument to bridge the gap between the supply of sustainable finance and the increasing demand for climate-resilient development. Achieving market equilibrium in Nepal’s green bond sector requires a coordinated approach that simultaneously stimulates investor interest (demand) and enhances the availability of viable green projects (supply).

On the demand side, a well-regulated and transparent green bond framework can attract both institutional and retail investors seeking environmentally responsible investment opportunities. Policies that ensure credibility—such as third-party certification, tax incentives, and robust

# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

environmental reporting standards—can bolster investor confidence and sustain demand for green bonds.

On the supply side, Nepal must prioritize strengthening the pipeline of bankable green projects. This involves improving the technical and financial capacities of public institutions, municipalities, and private enterprises to design, implement, and manage green infrastructure initiatives. Sectors like renewable energy, sustainable agriculture, climate-smart urban development, and eco-tourism hold strong investment potential if supported through capacity building and concessional financing.

**Table 3: Market Equilibrium**  
(Source: Authors' Composition, 2025)

Component	Demand Side	Supply Side	State of Equilibrium
Key Actors	Institutional investors, insurance firms, international investors, banks, ESG	Government (NRB, ministries), private companies, banks, municipalities	Interaction depends on trust in regulation and volume of investable green projects
Incentives	ESG compliance, impact investment, portfolio diversification	Access to climate finance, branding, concessional funding	Equilibrium achieved if incentives align with national green investment opportunities
Policy Support	Green Finance Taxonomy, ESRM guidelines, SEBON provisions	Same as demand side	Strong policy clarity supports investor confidence and increases issuance volume
Challenges	Limited awareness, lack of ESG data, small market size	High upfront costs, limited technical capacity, regulatory complexity	Disequilibrium if challenges are not addressed from both ends
Investment Criteria	Return on investment, environmental impact, project transparency	Project bankability, certification standards, risk-sharing mechanisms	Balanced when projects meet financial + environmental viability
Risk Consideration	Currency risk, liquidity risk, project default risk	Issuance cost, reputational risk, regulatory compliance	Equilibrium improves with hedging tools, guarantees, and blended finance instruments

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# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

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Market Development Need	Clear reporting standards, green project pipelines	Capacity building, technical assistance, international support	Coordination through public-private partnerships ensures steady development
Resulting Market Status	Emerging interest, cautious optimism	Low supply of investable projects, limited issuers	Market remains underdeveloped but promising with targeted policy and institutional effort

Table 3 illustrates the market equilibrium based on its major components. Nepal stands at a critical juncture in developing a green finance ecosystem that supports its climate commitments and sustainable development goals. Although early regulatory measures and growing investor interest show promise, the green bond market remains underdeveloped due to persistent imbalances between supply and demand. Achieving market equilibrium will require coordinated, systemic efforts to build institutional capacity, de-risk green investments, and align policies with investor expectations. By addressing these challenges, Nepal can unlock the full potential of green bonds as an effective tool to finance a greener and more resilient future.

#### IV. Conclusions and Policy Recommendations

This study empirically investigates the key determinants influencing the operation of the Green Bond market in Nepal. To achieve this, the authors conducted semi-structured interviews with 25 experts familiar with Nepal’s green finance landscape. Through an opinion survey analysis, nine major determinant factors were identified. These factors were then analyzed using an Interpretive Structural Modeling (ISM) approach to explore their interrelationships. The results underscore the critical importance of a robust legal framework to ensure the efficient functioning of the Green Bond market, alongside the role of competitive interest rates in attracting private investment to green projects in Nepal. In addition to these primary determinants, fiscal policy, monetary policy, and inflation rate also emerged as significant drivers, while international cooperation and institutional infrastructure contribute to the effective implementation of Green Bonds in Nepal’s economy.

The study concludes that Green Bonds offer a viable mechanism for mobilizing climate finance, with strong potential to attract both public and private capital, provided that supply-side and demand-side dynamics are strategically aligned. Policy recommendations emphasize strengthening institutional readiness and guiding financial sector stakeholders to leverage Green Bonds to support Nepal’s transition toward a low-carbon, climate-resilient economy.

Practically, the findings align with multiple United Nations Sustainable Development Goals (SDGs), including Goal 7 (Affordable and Clean Energy), Goal 11 (Sustainable Cities and Communities), Goal 13 (Climate Action), and Goal 15 (Life on Land). To promote Green Bond markets across countries, enhanced partnership and coordination between private (both domestic and foreign) and public sectors are strongly encouraged.

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# International Journal of Innovations in Research

## ISSN: 3048-9369 (Online)

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Finally, the establishment of clear legal documentation at the governmental level concerning Green Bond initiatives is vital for market development in Nepal. Specifically, the adoption of a Green Taxonomy framework can ensure transparency and provide investors with clear information on the legal parameters and expected returns of Green Bonds. In developing economies like Nepal, reforms and revisions of fiscal and monetary policies related to the Green Bond market are highly recommended. A collaborative roadmap for policy reforms and implementation would help Nepal chart a clear path toward a functional and sustainable Green Bond market.

### Ethical Statement

The authors declare no conflict of interest related to this study.

### Summary

This study explores the factors that influence the development of green bonds in Nepal. Green bonds are a type of loan used to fund projects that help the environment, such as renewable energy or clean transportation. Our research shows that clear rules, good policies, and support from banks and the government are important for making green bonds successful. We also found that international partnerships and strong leadership can encourage more investment in green projects. This information can help policymakers and investors support Nepal's efforts to build a greener, more sustainable economy.

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