Green Finance and Sustainable Development Goals: Challenges and Opportunities in Developing Economies

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Abstract

In developing Asian economies, marked by climate vulnerability, rapid urbanization, and institutional fragility, green finance is a potential driver of the United Nations Sustainable Development Goals (SDGs). Yet its measurable impact remains unclear, particularly where economic inequality and social vulnerability persist. This study examines the relationship between green finance and SDG performance across 21 developing Asian countries over 15 years, incorporating macroeconomic moderators such as GDP, inflation, CO_2 emissions, and poverty. Results show that poverty is the most statistically significant determinant of sustainable development, while GDP and CO_2 emissions lose significance once other macroeconomic factors are included. This suggests a weak linkage between financial flows and tangible development outcomes. The findings highlight that current green finance mechanisms are insufficiently inclusive and misaligned with the structural realities of low-income, climate-vulnerable nations. Recalibrating green finance frameworks to explicitly prioritize poverty reduction, social equity, and institutional capacity is essential for achieving inclusive, resilient, and transformative development.

Keywords: Green Finance, Sustainable Development Goals, Poverty Reduction, Developing Economies

INTRODUCTION

In recent decades, the dual crises of climate change and unsustainable development have prompted a global shift toward financial systems that promote environmental and social well-being. This transition has fostered the rise of green finance, which refers to financial instruments, policies, and market mechanisms designed to support environmentally sustainable investments and activities. Green finance encompasses a wide array of products and strategies, including green bonds, sustainability-linked loans, dedicated credit facilities, and climate risk mitigation tools, all geared toward reducing carbon emissions, enhancing resource efficiency, and encouraging low-carbon technologies (Tang & Zhang, 2020). Green bonds, in particular, have emerged as a prominent vehicle for mobilizing private and public capital to fund renewable energy projects, sustainable infrastructure, and biodiversity conservation. In addition to traditional lending and investment mechanisms, financial institutions are increasingly integrating climate-related risk assessments and environmental, social, and governance (ESG) criteria into their decision-making processes (Flammer, 2021; Radas, 2023; Zhang, 2023; Mehdi et al., 2025). Such instruments are seen as essential to bridging the estimated multi-trillion-dollar funding gap required to meet the ambitious objectives of the Paris Agreement and the 2030 Agenda for Sustainable Development set by the United Nations (UNEP, 2021). Policy initiatives from central banks and international bodies, such as the European Union's Sustainable Finance Action Plan and the recommendations of the Task Force on Climate-related Financial Disclosures, have further accelerated the mainstreaming of green finance globally (Campiglio et al., 2018; Marc & Yu, 2024; Arshi et al., 2025). These coordinated efforts are fostering innovation in climate-aligned financial products and strengthening transparency, accountability, and standardization in green investment markets. Despite the growing momentum, challenges remain, including issues of greenwashing, fragmented regulatory frameworks, and the need for robust metrics to measure environmental impact (Banga, 2019; Khan & Ullah, 2020; Altaf & Shahzad, 2021; Batool et al., 2025). Nevertheless, green finance is increasingly recognized as a critical lever in the global transition to sustainable development, enabling countries and companies to align financial flows with environmental goals, build resilience to climate risks, and achieve long-term inclusive growth.

Developing countries in Asia face a distinct intersection of challenges that render green finance both urgent and difficult to implement. These economies are contending with significant infrastructure deficits, rapid urbanization, and increasing greenhouse gas emissions, all while managing constrained fiscal resources and competing development priorities (Ahmad, 2018; Farahmand, 2019; Ameliet al., 2021; Urban & Radas, 2021; Naeem et al., 2025; Ali et al., 2025). The vulnerability of the region to climate-related hazards—such as floods, droughts, typhoons, and extreme weather events—amplifies the urgency for investment in sustainable and resilient infrastructure (Bhandary et al., 2021; Ahmad, 2022; Ali et al., 2025). Furthermore, the concentration of economic activity and population in urban areas often accelerates environmental degradation, placing additional pressure on local governments to invest in clean energy, sustainable transport, and climate-adaptive infrastructure (Asian Development Bank, 2021). Despite this need, many developing Asian economies encounter barriers to green finance mobilization, including limited access to international capital markets, weak regulatory and institutional frameworks, and a lack of standardized green finance taxonomies or disclosure requirements (Krishna & Singh, 2020; Audi et al., 2020; Zhang, 2023; Marc & Ali, 2023; Baydur, 2024; Jamel & Zhang, 2024; Ali et

al., 2025). Local banking sectors may be risk-averse or lack the technical capacity to evaluate and finance green projects, while government incentives and policy support are often insufficient to catalyze large-scale investment (Campiglio et al., 2018; Ramanust, 2023; Khalid & Abdul, 2025). Additionally, social equity concerns arise: ensuring that green finance solutions are inclusive and do not exacerbate existing inequalities is critical, particularly for vulnerable populations who are most at risk from both environmental and economic shocks (UNEP, 2021). Despite these barriers, there is growing momentum across Asia to design innovative financial instruments and policy frameworks that address the dual imperatives of environmental sustainability and socio-economic development. Regional collaboration, technical assistance, and blended finance models—combining public, private, and multilateral resources—are increasingly recognized as effective strategies to unlock capital for green projects while supporting broader development goals (Banga, 2019; Singh & Kumar, 2023). Ultimately, advancing green finance in Asia's developing countries will require a coordinated effort to strengthen institutions, build capacity, and foster inclusive, climate-resilient economic growth.

Regardless of heightened policy interest and growing international support, the impact of green finance on Sustainable Development Goals (SDG) progress in Asia remains ambiguous and insufficiently documented. While there has been significant attention on tracking aggregate climate finance flows and assessing the effectiveness of green financial instruments, much of the literature centers on high-income or upper-middle-income economies, overlooking the nuanced realities and challenges present in low- and middle-income Asian countries (Bhandary, Gallagher, & Zhang, 2021; Ameli, Drummond, Bisaro, Grubb, & Chenet, 2021; Wang & Manopimoke, 2023). As a result, the intersection between green finance, institutional development, and poverty reduction, key pillars for achieving SDGs in the region, has not been comprehensively studied. Research focusing exclusively on financial metrics often misses the broader developmental outcomes of green finance, such as social inclusion, equitable growth, and community resilience to environmental shocks (United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP, 2022). Moreover, dominant theoretical frameworks in green finance tend to emphasize market-based mechanisms, capital mobilization, and environmental returns while underappreciating the importance of institutional quality, governance, and social dimensions that are critical for effective and sustainable development (Banga, 2019; Kosyak & Popov, 2020; Asian Development Bank, 2021).

The literature is particularly concerning given the complex institutional landscapes in many Asian countries, where regulatory capacity, financial infrastructure, and stakeholder engagement can greatly influence the effectiveness of green finance initiatives (Campiglio et al., 2018; Saluy & Nuryanto, 2023; Alvi & Mudassar, 2025). Additionally, without explicit attention to poverty reduction and the needs of vulnerable populations, there is a risk that green finance could inadvertently exacerbate social inequalities or fail to deliver meaningful SDG progress (Zhang, 2023; Sharma & Das, 2024; Rozan & Ibrahim, 2025). Addressing these gaps will require a more holistic, context-sensitive research agenda that integrates financial, institutional, and social perspectives to better evaluate and maximize the developmental impact of green finance in Asia.

The transition to a sustainable and low-carbon economy requires unprecedented financial investment across various sectors, including renewable energy, green infrastructure, climate adaptation, and environmentally sound technologies. This shift is particularly urgent given accelerating climate change, environmental degradation, and

growing socio-economic disparities, which disproportionately impact developing countries in Asia. Within this context, green finance has become a critical mechanism for mobilizing and directing capital toward sustainable development goals. By aligning the incentives of capital markets with environmental objectives, green finance enables the allocation of resources to projects that reduce greenhouse gas emissions, promote resource efficiency, and improve climate resilience.   Taken together, these perspectives underscore the need to understand not only how green finance functions within complex institutional settings and interacts with stakeholder networks, but also how socio-economic constraints influence its effectiveness. Building on this foundation, the present study investigates whether and to what extent green finance contributes to SDG progress in developing Asian countries, and how institutional quality moderates this relationship. Specifically, it seeks to address the research question: *Does green finance improve SDG performance in the context of institutional and socio-economic challenges?* To answer this, a panel data methodology is applied to examine both the direct and moderated effects of green finance on SDG Index performance across 21 developing Asian countries over 15 years, thereby providing empirical evidence to inform both policy and scholarly debates.

LITERATURE REVIEW

Literature review provides a comprehensive synthesis of the theoretical foundations, empirical findings, and evolving policy frameworks that collectively inform the development and effectiveness of green finance. The review begins by exploring key economic theories, such as the credit rationing model by Stiglitz and Weiss (1981), which demonstrates how information asymmetries in credit markets justify policy intervention, and the Porter Hypothesis (Porter and van der Linde, 1995), which suggests that well-designed environmental regulations can stimulate innovation and enhance competitiveness rather than hinder economic growth. The analysis also incorporates macroeconomic arguments from the Stern Review (Stern, 2007), which quantifies the long-term economic benefits of early climate action and frames green finance as a strategic necessity rather than a cost. Alongside these theoretical perspectives, the review draws upon a growing body of empirical research evaluating the real-world impact of green finance instruments. Studies such as Flammer (2021) and Zhang et al. (2021) offer strong evidence regarding the role of green bonds and credit in improving corporate environmental performance and fostering green innovation. Additionally, policy-oriented analyses by Volz (2018) and the State Bank of Pakistan (2017) emphasize the importance of regulatory and institutional interventions for creating a supportive green financial ecosystem. These include climate-related financial disclosures, green lending guidelines, taxonomies for sustainable investment, and public-private partnerships aimed at reducing the risks associated with climate finance.

The review also considers recent innovations, including environmental, social, and governance standards, technology-enabled sustainable investing, and climate risk assessment tools, all of which are shaping the field of green finance. Particular attention is paid to the distinct challenges and opportunities present in developing Asian economies, where structural obstacles, such as limited financial sector development, inadequate regulatory capacity, currency risk, and data limitations, continue to restrict green capital flows. At the same time, these countries provide opportunities for innovative financial mechanisms, blended finance approaches, and regional cooperation to attract private investment in climate-resilient development. Stiglitz and Weiss (1981) provided a foundation for understanding market imperfections through their credit rationing theory,

which remains central to financial economics. They showed that information asymmetries between lenders and borrowers, especially regarding risk, may lead financial institutions to restrict credit even if borrowers are willing to pay higher interest rates. This arises due to concerns about adverse selection, where higher rates attract riskier borrowers, and moral hazard, where borrowers might take riskier actions after obtaining funds. These issues are particularly pronounced in green finance, where sustainable and climate-oriented projects often have long time horizons, rely on unproven technologies, and involve complex environmental outcomes. Such characteristics make these projects more difficult to evaluate using traditional financial metrics. Consequently, government intervention or public-private partnerships are often needed to address these market failures, ensure the provision of green finance, and promote investments that private financiers might otherwise avoid due to perceived uncertainty.

Porter and van der Linde (1995) challenged the notion that environmental regulation inevitably hampers economic growth and competitiveness, proposing instead in their influential Porter Hypothesis that well-designed regulations can spur innovation, enhance productivity, and create new market opportunities. From a green finance perspective, this view underscores the importance of regulatory policies that actively encourage sustainable investment by aligning financial incentives with environmental outcomes—through mechanisms such as green credit lines, tax incentives, and structured green bond frameworks—thereby delivering both environmental benefits and economic gains. Ambec et al. (2013), in a comprehensive meta-review, provided strong empirical support for the Porter Hypothesis, finding that predictable and coherent environmental policies foster investment in research and development, improve efficiency, and strengthen competitiveness across industries. For developing Asian economies, where concerns persist that regulation could hinder economic growth and where regulatory frameworks are often weak or inconsistent, these findings highlight a crucial policy implication: strengthening institutional capacity and ensuring policy coherence are essential for attracting green finance flows and unlocking the innovation-driven potential of sustainable investments.

Stern (2007), in the Stern Review, presented a thorough economic case for early climate action. He showed that the long-term economic consequences of failing to address climate change far outweigh the near-term costs of mitigation. Importantly, Stern reframed climate change as not just an environmental problem, but as a core threat to economic stability and development. This perspective encouraged both policymakers and financial actors to recognize and address climate risks. Stern's work highlights the urgent need to scale up green finance, not only as a climate response but as a crucial safeguard for economic well-being. For developing Asian countries, this reframing shifts the conversation from questioning the affordability of green finance to emphasizing the risks of delaying action—an essential step in mobilizing resources for sustainability.

Flammer (2021) provided empirical evidence of the financial and environmental effectiveness of green bonds using corporate data. Her research showed that firms issuing green bonds achieved improved environmental performance, higher stock market valuations, and greater capital investment in sustainability initiatives. This supports green bonds as a strong market-based tool for directing resources toward green projects. In developing Asia, where fiscal resources are often limited and private investment is crucial, Flammer's work underlines the value of expanding green bond markets to scale climate finance and improve corporate transparency and accountability.

Zhang et al. (2021) analyzed the impact of green finance on innovation in Chinese firms. Their study found that access to green credit and capital directly increases corporate investment in green technologies, energy efficiency, and pollution control. This is especially relevant for other developing Asian countries, as it demonstrates how targeted financial instruments can foster environmental innovation at the firm level. Their results show that green finance does more than support current sustainable practices—it shapes new ones, highlighting its strategic role in development planning and the pursuit of sustainable development goals.

Buchner et al. (2019), through the Global Landscape of Climate Finance, presented a macro-level analysis of global climate finance flows. They identified substantial obstacles for developing countries, including limited institutional capacity, exposure to currency risk, and shallow capital markets. These factors hinder the effective use and absorption of green finance. For many Asian countries, this emphasizes the importance of improving both the volume and quality of climate finance through stronger governance, risk management instruments, and capacity building to ensure equitable and effective fund allocation.

Taghizadeh-Hesary and Yoshino (2019) examined the private sector's role in expanding green finance in Asia. Their study noted that without clear policies, investor protections, and institutional support, private capital remains largely disengaged from sustainable finance. They proposed a regional approach that emphasizes collaboration among Asian governments, development banks, and regulators to build an integrated green finance ecosystem. In a region marked by diverse economies and cross-border environmental challenges, their findings suggest that national efforts need to be complemented by regional integration and harmonized standards to expand green investment.

Bhattacharyya (2022) studied various policy innovations in green finance, comparing emerging and developed economies. The research highlighted how India utilized regulatory tools—such as green bond guidelines, environmental taxonomies, and disclosure mandates—to stimulate its green finance market. These findings are relevant for other developing Asian countries that face similar institutional barriers and developmental objectives. The Indian experience offers a practical model for combining regulatory oversight with private sector involvement to mobilize sustainable investment at scale.

Atteridge (2011) investigated the limited allocation of climate finance to adaptation projects in vulnerable regions. The research indicated that market forces alone often do not channel investment toward adaptation because these projects tend to offer limited immediate financial returns, are less tangible, and carry high uncertainty. For countries in South and Southeast Asia—among the most climate-vulnerable globally—this suggests a need for specialized, risk-aware financial products like concessional loans, climate insurance, and adaptation funds. Atteridge's work underscores that without addressing these barriers, green finance may favor mitigation efforts while neglecting urgent adaptation needs.

Pauw (2015) reinforced this argument by demonstrating that structural obstacles deter private sector investment in adaptation. These include unattractive risk-return profiles, inefficiencies in institutions, and the lack of credible adaptation metrics. Pauw recommended that governments and multilateral donors adopt blended finance models and public guarantees to de-risk adaptation investments. In developing Asia, this is a critical lesson—public leadership is needed not only to mobilize green finance, but also to

direct it toward the most pressing needs, particularly for resilience in marginalized and climate-sensitive communities.

Trabacchi and Stadelmann (2013) introduced new instruments, such as resilience bonds and weather-indexed insurance, for financing climate adaptation. Their analysis of the Pilot Program for Climate Resilience showed that tailored financial products can address specific risks and build investor confidence. For Asian countries facing challenges such as monsoon variability, water scarcity, and coastal erosion, these instruments provide practical alternatives to conventional lending. Their study highlights the necessity of aligning financial innovation with local needs and vulnerabilities to make climate finance both effective and equitable.

Tamazian et al. (2009) explored the relationship between financial sector development and environmental sustainability in BRIC countries. Their research indicated that well-developed financial institutions help channel capital toward cleaner technologies and sustainable industries. This supports the broader claim that environmental outcomes depend not just on environmental policy, but also on financial system design. For developing Asian countries, the implication is that financial sector reforms—such as expanding access to green credit, strengthening capital markets, and improving disclosure—should be integral to strategies for scaling up green finance.

Schmidt-Traub (2015) provided one of the most widely cited estimates of the global sustainable development goals financing gap, placing it at approximately 2.5 trillion United States dollars annually. He argued that public finance sources—including aid and domestic revenues—are not sufficient to close this gap, especially in low- and middle-income nations. Therefore, private capital must be mobilized through mechanisms like green bonds, blended finance, and sustainability-linked loans. For developing Asia, which is home to much of the world's poor, this represents both a challenge and an opportunity. Schmidt-Traub's analysis provides strong justification for creating inclusive, private-sector-oriented financial systems aligned with the Sustainable Development Goals.

Kharas et al. (2018), in their work for the Brookings Institution, highlighted the role of impact investing and blended finance in inclusive development. They contended that financial instruments should target both financial returns and maximum social and environmental benefits. This dual objective is especially relevant to developing Asia, where inequality and environmental issues persist. By encouraging instruments that blend concessional and commercial finance, governments can draw private capital into areas like education, health, and clean energy, thus extending the developmental reach of green finance.

Berg et al. (2022) analyzed inconsistencies in environmental, social, and governance ratings, revealing that differing methodologies among rating agencies result in fragmented sustainability assessments. This lack of standardization undermines investor confidence and market efficiency, particularly in emerging markets where environmental, social, and governance adoption is in the early stages. For Asian financial markets, which are building green finance systems, developing transparent, credible, and consistent environmental, social, and governance standards is crucial. Without such standards, green finance risks becoming ineffective or disconnected from actual sustainability outcomes.

Volz (2018) identified the vital role of central banks and regulators in constructing green finance ecosystems. He advocated regulatory interventions such as mandatory climate disclosures and preferential capital requirements for green assets to incentivize sustainable finance. In Asia, where regulatory capabilities differ, Volz's recommendations

stress the need for proactive leadership and cross-border cooperation to unify standards and increase green investment.

Wang et al. (2022) assessed the impact of green finance on firms' corporate social responsibility objectives. They found a positive association between access to green financial products, especially green bonds, and improved environmental and social results. For emerging markets, this indicates that green finance is a strategic lever for corporate change, supporting both environmental goals and broader social priorities like employment, gender equity, and community well-being.

Maltais and Nykvist (2020) reviewed green bonds in supporting clean energy and adaptation. They noted the instrument's value in attracting capital, but also cautioned that weak standards and oversight risk enabling greenwashing. In developing Asian economies, where regulatory frameworks and investor protection can be limited, this threat is heightened. The study stresses the necessity for strong governance structures to ensure that green finance is used effectively and transparently for sustainability.

Feng et al. (2022) examined the interaction between green finance, globalization, and human capital. Their findings showed that green finance is most effective in countries with openness to international trade and investment in education and innovation. For Asian economies, this suggests that green finance must be accompanied by broader strategies in human capital development and integration with the global economy, as financial flows alone are insufficient without the supporting skills, institutions, and technologies to achieve sustainable results.

THEORETICAL MODEL

This research examines the influence of Green Finance on the attainment of Sustainable Development Goals in the context of Pakistan. Establishing a robust theoretical foundation is crucial for understanding the mechanisms by which Green Finance supports sustainable development. This section introduces the principal theories that underpin the study's conceptual framework and guide hypothesis formulation. The connection between Green Finance and the achievement of Sustainable Development Goals is complex and can be interpreted through various theoretical lenses. The present study integrates Stakeholder Theory, Legitimacy Theory, the Resource-Based View, and Institutional Theory to develop a comprehensive framework for explaining this relationship within Pakistan's socio-economic environment. Stakeholder Theory, as developed by Freeman (1984), underscores the necessity of considering the interests of a broad array of stakeholders beyond shareholders. These include government agencies, local communities, environmental organizations, and international development entities. Green Finance initiatives, such as green bonds, sustainable banking activities, and investments in renewable energy, operate as avenues for involving these stakeholders by illustrating organizational dedication to environmental and social objectives. In Pakistan, where stakeholder expectations are evolving due to climate vulnerabilities and resource challenges, effective green financing can strengthen public confidence, draw in foreign investment, and foster socio-economic resilience, all of which facilitate progress towards Sustainable Development Goals.

Legitimacy Theory, advanced by DiMaggio and Powell (1983) and Suchman (1995), asserts that organizations function within a matrix of societal norms and expectations. In developing nations like Pakistan, where international environmental concerns and global commitments such as the Paris Agreement exert external pressure, Green Finance acts as a means to gain social and regulatory legitimacy. Financial institutions and corporations that engage in green financing signal alignment with both global and national sustainability

objectives, which may open avenues for concessional finance, tax benefits, and reputational gains, thereby indirectly advancing national Sustainable Development Goals. The Resource-Based View, articulated by Barney (1991), proposes that rare, valuable, and inimitable resources create competitive advantage. Within this context, the creation of green financial products, the adoption of sustainable technologies, and the development of environmental risk assessment expertise are considered strategic resources. Pakistani firms and financial institutions that implement green finance practices can utilize these assets to improve operational effectiveness, manage environmental risks, and distinguish themselves in both domestic and international arenas, thereby contributing to Sustainable Development Goals such as affordable clean energy, industrial innovation, and climate action.

Institutional Theory, as developed by Scott (1995), focuses on the role of formal rules, norms, and shared cognitive frameworks in shaping organizational behavior. In Pakistan, evolving institutional dynamics—including governmental green policies, central bank regulations related to sustainable finance, and guidelines from multilateral development organizations—are steering the financial sector towards sustainability. Consequently, the adoption of Green Finance is not only a voluntary or profit-oriented choice but also a response to institutional requirements and expectations that are essential for aligning national development agendas with the 2030 Sustainable Development Agenda.

In this model, Green Finance is defined by the volume and quality of financial resources allocated to environmentally sustainable projects, including renewable energy, improvements in energy efficiency, green infrastructure, and climate-resilient agriculture. The achievement of Sustainable Development Goals is assessed based on progress across selected metrics concerning environmental sustainability, economic growth, and social welfare, as outlined in Pakistan's national Sustainable Development Goal framework.

Hypothesis 1: There is a significant relationship between Green Finance and Sustainable Development Goal (SDG) achievement in Pakistan

Green Finance supplies critical funding for environmental initiatives that directly advance several Sustainable Development Goals, including clean energy, climate action, and sustainable urban development. Theoretical perspectives such as Stakeholder Theory and the Resource-Based View indicate that these investments yield both developmental outcomes and organizational advantages.

$$SDG = \beta_0 + \beta_1 * GF + \varepsilon_1 \qquad (1)$$

where:

- SDG = Sustainable Development Goal achievement score
- GF = Green Finance (in millions USD)
- ε_{21} = Error term

Hypothesis 2: Gross Domestic Product (GDP) moderates the relationship between Green Finance and SDG achievement

Higher levels of Gross Domestic Product can enhance the availability of financial resources, technological advancement, and institutional capacity required for the effective implementation of green finance initiatives. Conversely, lower levels of gross domestic product may limit these efforts.

$$SDG = \beta_0 + \beta_1 * GF + \beta_2 * GDP + \beta_3 * (GF * GDP) + \varepsilon_2 \qquad (2)$$

where:

- SDG = Sustainable Development Goal achievement score

- GF = Green Finance (in millions USD)
- GDP = Gross Domestic Product (current US$)
- GF×GDP = Interaction term capturing the moderating effect of GDP on the impact of green finance
- ε_2 = Error term

Hypothesis 3: Inflation moderates the relationship between Green Finance and SDG achievement, such that the positive effect of Green Finance on SDG progress is weaker in high-inflation environments

In countries where inflation remains stable, green finance can be allocated and managed more effectively, supporting greater progress toward sustainable development goals. By contrast, high inflation erodes the value of financial resources, increases project costs, and introduces fiscal uncertainty, thereby reducing the effectiveness of green finance. As a result, inflation may undermine the capacity of green finance to achieve measurable Sustainable Development Goal outcomes. Carbon dioxide emissions and poverty are included as control variables, as they reflect environmental burden and social deprivation, respectively—both of which significantly influence progress toward Sustainable Development Goals.

$$SDG = \beta_0 + \beta_1 (GF) + \beta_2 (Inflation) + \beta_3 (GF \times Inflation) + \beta_4 (CO_2) + \beta_5 (Poverty) + \varepsilon \quad (3)$$

Where:

- SDG = Sustainable Development Goal achievement score
- GF = Green Finance (in millions USD)
- Inflation = GDP deflator (annual %)
- GF × Inflation = Interaction term for moderation
- CO_2 = Carbon dioxide emissions (total, excluding LULUCF)
- Poverty = Headcount ratio at $2.15/day
- ε = Error term

Hypothesis 4: Carbon dioxide (CO_2) emissions moderate the relationship between Green Finance and SDG achievement, such that the positive effect of Green Finance on SDG performance is stronger in countries with higher CO_2 emissions

Green finance is frequently allocated to projects targeting the reduction of carbon emissions and the mitigation of climate change impacts. In countries with elevated levels of carbon dioxide emissions, there is usually increased policy urgency, institutional attention, and technological demand for green investment. Consequently, green finance in high-emission environments is more likely to be utilized in impactful environmental and infrastructure projects, thereby strengthening its role in advancing Sustainable Development Goals—particularly those associated with clean energy, climate action, and sustainable urban development. Thus, higher carbon dioxide emissions may increase the effectiveness of green finance in promoting sustainable development.

$$SDG = \beta_0 + \beta_1 (GF) + \beta_2 (CO_2) + \beta_3 (GF \times CO_2) + \beta_4 (Inflation) + \beta_5 (Poverty) + \varepsilon \quad (4)$$

where:

- SDG = Sustainable Development Goal achievement score
- GF = Green Finance
- CO_2 = Carbon dioxide emissions (total, excluding LULUCF)
- GF × CO_2 = Interaction term (moderating effect)
- Inflation = GDP deflator (annual %) (control variable)

- Poverty = Poverty headcount ratio at $2.15/day (control variable)
- ε = Error term

Hypothesis 5: Poverty moderates the relationship between Green Finance and SDG achievement, such that the positive impact of Green Finance on SDG performance is stronger in countries with lower poverty levels.

Although green finance is designed to foster sustainable development, its effectiveness can be limited in countries experiencing high rates of extreme poverty. In these settings, meeting the immediate needs of the population often takes priority over long-term environmental or infrastructure investments. Additionally, institutional capacity, governance quality, and the ability to effectively utilize green finance are generally weaker where poverty is widespread. As a result, green finance is likely to achieve greater developmental impact in countries with lower levels of poverty, where the integration of green technologies and sustainability initiatives is more feasible. Therefore, poverty may reduce or constrain the capacity of green finance to advance Sustainable Development Goal targets.

$$SDG = \beta_0 + \beta_1 (GF) + \beta_2 (Poverty) + \beta_3 (GF \times Poverty) + \beta_4 (CO_2) + \beta_5 (Inflation) + \varepsilon \quad (5)$$

Where:

- SDG = Sustainable Development Goal achievement score
- GF = Green Finance
- Poverty = Headcount ratio at $2.15/day (2017 PPP)
- GF × Poverty = Interaction term (moderator)
- CO_2 = Carbon dioxide emissions (control variable)
- Inflation = GDP deflator (control variable)
- ε = Error term

EMPIRICAL RESULTS AND DISCUSSION

Table 1 presents the descriptive statistics for the dataset, which consists of 315 observations spanning 15 cross-sections, providing a solid foundation for panel data analysis. The descriptive statistics illustrate a wide range of economic, environmental, and social indicators, each exhibiting considerable variability and distinctive distributional patterns across countries and over time. The mean value of Gross Domestic Product is approximately 264.7 billion United States dollars, while the median is only 73.18 billion United States dollars, and the mode is even lower at 21.6 billion United States dollars. This indicates that most countries in the sample have much smaller economies, with a few large economies raising the average substantially. The high standard deviation of more than 516 billion United States dollars further emphasizes the significant disparity in economic size among the countries analyzed.

Inflation, as measured by the Gross Domestic Product deflator, has an average of 10.32 percent, a median of 6.22 percent, and a higher mode of 14.85 percent. The standard deviation of 15.84 percent signals considerable volatility in inflation rates across the sample. The difference between mean and median inflation indicates that a few countries with very high inflation skew the average, reflecting episodes of regional macroeconomic instability. Similarly, carbon dioxide emissions are highly unevenly distributed, with a mean of 214.68 million metric tons and a median of 36.98 million metric tons (SD = 474.82), showing that a small number of countries account for most emissions while the majority contribute relatively little. This highlights the need for differentiated climate responsibilities.

The Sustainable Development Goal Index exhibits a mean of 62.80, a median of 64.35, and a mode near the average at 62.92. The relatively low standard deviation of 7.89 indicates that Sustainable Development Goal performance across countries is moderately consistent, with most countries clustered around a similar level of achievement. Nonetheless, these figures suggest that although the average level of Sustainable Development Goal attainment is moderate, additional efforts are necessary to reach higher standards of sustainability worldwide. The poverty headcount ratio at the two dollars and fifteen cents per day threshold has a mean of 8.45 percent, a median of 2.20 percent, and a mode of 0.61 percent. This distribution indicates that while many countries have made progress in reducing extreme poverty, a few still experience high poverty rates. The large standard deviation of 13.40 percent reflects stark disparities in poverty levels, underscoring the need for targeted interventions.

Green finance displays a mean of 32.11 million United States dollars, a much lower median of 2.71 million United States dollars, no reported mode, and a standard deviation of 55.22 million United States dollars. These figures show that the majority of green financial flows are concentrated in a few countries, while most receive minimal funding. This imbalance points to the necessity of reforming the allocation of green finance to ensure that it supports both climate mitigation and broader sustainable development, particularly in countries with high poverty rates and limited institutional capacity.

TABLE 1: DESCRIPTIVE STATISTICS

Variables	Mean	Standard Error	Median	Mode	Standard Deviation
GDP	64,687,856,737.01	27,826,417,599.42	73,180,037,914.91	21,606,160,783.98	516,852,767,395.09
Inflation	10.32	0.85	6.22	14.85	15.84
Carbon dioxide	214.68	25.56	36.98	32.98	474.82
SDG Index	62.80	0.42	64.35	62.92	7.89
Poverty headcount	8.45	0.72	2.20	0.61	13.40
Green finance	32.11	2.97	2.71	-	55.22

The correlation matrix in Table 2 illustrates the relationships among a range of economic, environmental, and social variables in the context of sustainable development. Gross domestic product shows a very strong positive correlation with carbon dioxide emissions (0.96), highlighting the widely observed pattern that higher levels of economic activity are closely associated with increased environmental impact, particularly in the form of emissions. This relationship is well documented in the literature on economic growth and environmental sustainability, which often describes the "environmental Kuznets curve" pattern, where emissions rise with income at initial stages of development (Grossman & Krueger, 1995). Inflation exhibits very weak correlations with other variables, including gross domestic product (0.03), carbon dioxide emissions (0.10), poverty (0.03), green finance (0.13), and the sustainable development goal index (0.02), suggesting that inflationary pressures do not directly influence the structural and sustainability-related dimensions measured here.

The Sustainable Development Goal Index shows its strongest association with poverty (0.74), indicating that reductions in poverty are closely linked to improved sustainable development outcomes. This high positive correlation underscores the role of poverty alleviation as a core component of broader progress toward sustainable

development (United Nations, 2022). In contrast, the sustainable development goal index has only weak correlations with gross domestic product (0.06), inflation (0.02), carbon dioxide emissions (0.03), and green finance (0.04). These findings suggest that while economic growth, financial innovation, and environmental indicators each play a role, poverty reduction remains the most direct driver of sustainable development in this analysis. Green finance is moderately correlated with gross domestic product (0.59) and carbon dioxide emissions (0.56), reflecting that both economic growth and higher emissions may be associated with increased investments in environmentally-oriented financial instruments. However, its direct connection to the Sustainable Development Goal Index is weak (0.04), indicating that while green finance is an important policy tool, its immediate impact on overall sustainable development scores is less pronounced in this sample. The matrix highlights that the key structural linkages in this context are between gross domestic product and emissions, as well as between poverty and sustainable development outcomes, in line with the literature on the social, economic, and environmental dimensions of sustainability (Sachs et al., 2019; United Nations, 2022).

TABLE 2: CORRELATION MATRIX

Variables	GDP	Inflation	Carbon dioxide	Poverty	Green finance	SDG Index
GDP	1.00					
Inflation	0.03	1.00				
Carbon dioxide	0.96	0.10	1.00			
Poverty	0.15	0.03	0.12	1.00		
Green finance	0.59	0.13	0.56	0.10	1.00	
SDG Index	0.06	0.02	0.03	0.74	0.04	1.00

The regression analysis in Table 3 explores the factors influencing green finance, using gross domestic product, inflation, carbon dioxide emissions, and poverty as explanatory variables. The intercept is positive and highly significant, representing the baseline level of green finance when all predictors are set to zero. Gross domestic product shows a positive and statistically significant association with green finance, as indicated by a coefficient of 0.10. This finding suggests that as economies grow, investments and activities classified as green finance also tend to increase. This relationship is consistent with the literature on sustainable finance, which argues that economic growth often provides both the resources and institutional capacity to support green financial initiatives (Ng & Tao, 2016). Inflation is also positively and significantly related to green finance, with a coefficient of 0.40. This suggests that higher inflation may be associated with increased green finance activity, potentially because inflationary environments create incentives to seek alternative or innovative investment strategies, including those in the green sector. However, this relationship can also be influenced by broader macroeconomic dynamics, such as monetary policy responses or investor sentiment during periods of economic adjustment (Sachs et al., 2019). Carbon dioxide emissions have a positive coefficient (0.10). Although this result is not significant at the conventional five percent level, it does indicate a potential association between higher emissions and greater green finance, possibly reflecting that countries or regions with higher environmental challenges are investing more in financial solutions to address sustainability (Bhandari et al., 2022). Poverty has a very small and statistically insignificant effect on green finance. This result suggests that poverty levels do not directly influence green finance activities, perhaps because such financial products and investments are more closely linked to broader economic structures

or policy environments rather than immediate social conditions. The model explains a moderate proportion of the variation in green finance, with an R-squared of 0.36, indicating that the included variables capture some, but not all, of the factors that drive green finance activities. This moderate explanatory power is typical in cross-country or cross-sectional analyses, given the diversity of institutional contexts and policy regimes (Bhandari et al., 2022).

TABLE 3: REGRESSION ANALYSIS GREEN FINANCE

	Coefficients	Standard Error	t Stat	P-value
Intercept	19.98	3.63	5.50	0.00
GDP	0.10	0.04	2.50	0.00
Inflation	0.40	0.15	2.65	0.01
Carbon dioxide	0.10	0.02	5.00	0.09
Poverty	0.04	0.18	0.24	0.81
Multiple R	0.60			
R Square	0.36			
Adjusted R Square	0.36			
Standard Error	44.31			
Observations	345.00			

The regression analysis in Table 4 evaluates the determinants of the Sustainable Development Goal (SDG) index score, focusing on the influence of gross domestic product, inflation, carbon dioxide emissions, and poverty. The intercept is positive and highly significant, providing the baseline SDG score when all independent variables are zero. Gross domestic product has a positive and statistically significant effect on the SDG Index, with a coefficient of 0.10. This implies that increases in GDP are closely linked to improvements in sustainable development outcomes, reinforcing the idea that economic growth, when effectively managed, can contribute to broader social and environmental progress (Sachs et al., 2019). Inflation does not have a statistically significant impact on the SDG index, as indicated by its low coefficient. Similarly, carbon dioxide emissions, while positive, are not statistically significant in this model. This lack of significance can be interpreted through an institutional lens: it suggests that countries with higher emissions do not necessarily translate environmental pressure into policy action or sustainable development gains, particularly in contexts where regulatory frameworks, enforcement capacity, and institutional quality are weak. In other words, without effective institutions and governance, environmental stressors like CO_2 emissions may not trigger meaningful investment in sustainable outcomes. The poverty variable is strongly negative and highly significant, with a coefficient of –0.44. This underscores that higher poverty levels are associated with lower SDG scores, highlighting the crucial role of poverty reduction in advancing sustainable development objectives. Addressing poverty remains a central pillar in achieving progress across all dimensions of the SDGs (Costanza et al., 2016). From a policy perspective, these results indicate that macroeconomic growth alone is insufficient for sustainable development unless it is accompanied by strong institutional capacity and targeted social policies. The insignificance of CO_2 emphasizes the need for environmental governance, regulatory enforcement, and policy coherence to convert environmental challenges into actionable development outcomes. The model explains a substantial proportion of the variance in the SDG index, with an R-squared of 0.55, indicating that the included variables account for more than half of the observed

differences in sustainable development outcomes—a robust result for cross-sectional regression analysis.

TABLE 4: REGRESSION ANALYSIS SDG INDEX

	Coefficients	Standard Error	t Stat	P-value
Intercept	6.83	0.44	15.52	0.00
GDP	0.10	0.04	2.50	0.00
Inflation	0.02	0.02	0.93	0.35
Carbon dioxide	0.10	0.04	1.26	0.21
Poverty	(0.44)	0.02	20.19	0.00
Multiple R	0.74			
R Square	0.55			
Adjusted R Square	0.55			
Standard Error	5.31			
Observations	345			

CONCLUSION

This study provides an in-depth analysis of the role of green finance in advancing sustainable development within developing Asian economies. By integrating multiple theoretical perspectives and conducting an empirical investigation using panel data from twenty-one countries over fifteen years, the research offers a nuanced and, in many respects, sobering assessment of green finance's functioning in the region. Although green finance has gained momentum as a policy instrument for environmental mitigation, its alignment with broader Sustainable Development Goal attainment, particularly in low-income and vulnerable settings, remains constrained. This indicates that green financial resources, which are frequently directed toward higher-income, higher-emission countries, are not adequately reaching those areas with the most urgent developmental needs and institutional weaknesses. Such a pattern undermines the inclusive objectives of the Sustainable Development Goals and points to a fundamental disconnect between the distribution of green finance and the pursuit of multidimensional sustainability. Regression results also demonstrate that inflation exerts a negative influence on green finance allocation, underscoring the deterrent effect of macroeconomic instability on sustainable investment. Notably, carbon dioxide emissions, which are often considered a key driver for prioritizing mitigation-focused green finance, do not display a statistically significant relationship with green finance flows or Sustainable Development Goal outcomes when controlling for other variables. The evidence points to the necessity for green finance to be not only economically viable and environmentally effective but also socially inclusive and institutionally anchored. To address these gaps, green finance frameworks should be recalibrated to explicitly integrate poverty reduction and social equity. This could include linking financing eligibility to demonstrable impacts on low-income populations, incorporating poverty and vulnerability indicators into project evaluation, establishing dedicated funds or blended-finance mechanisms for underserved regions, and strengthening institutional capacity through technical assistance and regulatory support.

Future research should extend this analysis by conducting comparative studies with developing economies in Africa and Latin America to assess whether the patterns observed in Asia hold in other low- and middle-income regions. Such cross-regional investigations could identify context-specific constraints, highlight best practices, and improve the global

effectiveness of green finance as a tool for inclusive, resilient, and transformative development.

REFERENCES

Ahmad, K. (2018). Addressing demographic challenges: Strategies for sustainable economic growth in Pakistan. *Journal of Business and Economic Options, 1*(4), 120-130.

Ahmad, S. (2022). Managing Microfinance: Navigating Efficiency and Sustainability Challenges in Bangladesh's Financial Landscape. *Journal of Business and Economic Options, 5*(1), 1-7.

Ali, A., Abbas, N., & Ahmad, K. (2025). Technological Innovation and Green Finance: Catalysts for Sustainable Development in Developing Economies. *Qualitative Research Review Letter, 3*(1), 46-82.

Ali, A., Longston, P., & Audi, A. (2025). Environmental, Social & Governance Disclosures and Corporate Financial Performance: Evidence from Selected Asian Economies. *Journal of Business and Management Research, 4*(1)

Ali, A., Usman, M., & Ahmad, K. (2025). Environmental Risks and Sovereign Credit Ratings: Evidence from Developed and Developing Economies. *Competitive Research Journal Archive, 3*(01), 356-370.

Altaf, A., & Shahzad, S. (2021). Environmental innovation and sustainability in remanufacturing: A strategic review. *Journal of Policy Options, 4*(2), 10-21.

Alvi, A. A., & Mudassar, M. (2025). Assessing the Impact of Green Energy Strategies on Natural Resource Rents in Pakistan. *Journal of Energy and Environmental Policy Options, 8*(1), 37-50.

Ambec, S., Cohen, M. A., Elgie, S., & Lanoie, P. (2013). The Porter hypothesis at 20: Can environmental regulation enhance innovation and competitiveness? *Review of Environmental Economics and Policy, 7*(1), 2-22.

Ameli, N., Drummond, P., Bisaro, A., Grubb, M., & Chenet, H. (2021). Climate finance and developing countries: How addressing the needs of developing countries can promote sustainable energy transitions. *Energy Research & Social Science, 77*, 102082.

Arshi, A., Ali, A., & Audi, M. (2025). Evaluating the Impact of Sustainability Reporting on Financial Performance: The Mediating Role of ESG Performance and the Moderating Role of Firm Size. *Bulletin of Business and Economics (BBE), 14*(2), 42-54.

Asian Development Bank. (2021). *Asia's journey to prosperity: Policy, market, and technology drivers of clean energy transition*. Asian Development Bank.

Atteridge, A. (2011). Will private finance support climate change adaptation in developing countries? Historical investment patterns as a window into future private climate finance. *Stockholm Environment Institute Working Paper*, 2011-05.

Audi, M., Ali, A., & Kassem, M. (2020). Greenhouse gases: A review of losses and benefits. *International Journal of Energy Economics and Policy, 10*(1), 403-418.

Banga, J. (2019). The green bond market: A potential source of climate finance for developing countries. *Journal of Sustainable Finance & Investment, 9*(1), 17–32.

Batool, A., Ali, A., & Audi, M. (2025). Assessing the Impact of Sustainability Initiatives on Greenhouse Gas Emissions in Sweden and Finland. *Annual Methodological Archive Research Review, 3*(6), 150-176.

Baydur, I. (2024). Sustainable development of regional tourism for economic resilience in Azerbaijan. *Journal of Business and Economic Options, 7*(3), 10-18.

Berg, F., Koelbel, J. F., & Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings. *Review of Finance, 26*(6), 1315-1344.

Bhandari, B., Khanal, S., & Uddin, M. M. (2022). Green finance and environmental sustainability: Evidence from emerging markets. *Environmental Science and Pollution Research, 29*(20), 30672–30685.

Bhandary, R. R., Gallagher, K. S., & Zhang, F. (2021). Climate finance policy in practice: A review of the evidence. *Climate Policy, 21*(4), 543–557.

Bhattacharyya, R. (2022). Green finance for energy transition, climate action and sustainable development: Overview of policy research from developed and emerging economies. *Energy for Sustainable Development, 70,* 1-15.

Brammer, S., Jackson, G., & Matten, D. (2012). Corporate social responsibility and institutional theory: New perspectives on private governance. *Socio-Economic Review, 10*(1), 3-28.

Buchner, B. K., Trabacchi, C., Mazza, F., Abramskiehn, D., & Wang, D. (2019). *Global landscape of climate finance 2019.* Climate Policy Initiative.

Campiglio, E., Dafermos, Y., Monnin, P., Ryan-Collins, J., Schotten, G., & Tanaka, M. (2018). Climate change challenges for central banks and financial regulators. *Nature Climate Change, 8*(6), 462–468.

Costanza, R., Kubiszewski, I., Giovannini, E., Lovins, H., McGlade, J., Pickett, K. E., ... & Wilkinson, R. (2016). Time to leave GDP behind. *Nature, 535*(7613), 283–285.

Farahmand, N. F. H. (2019). Strategic planning and innovation: Driving growth and sustainability in organizations. *Journal of Business and Economic Options, 2*(1), 26-34.

Feng, S., Zhang, R., & Li, G. (2022). Green finance and green growth nexus: Evaluating the role of globalization and human capital. *Journal of Cleaner Production, 336,* 130421.

Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics, 142*(2), 499-516.

Grossman, G. M., & Krueger, A. B. (1995). Economic growth and the environment. *Quarterly Journal of Economics, 110*(2), 353–377.

Jamel, M., & Zhang, C. (2024). Green finance, financial technology, and environmental innovation impact on CO_2 emissions in developed countries. *Journal of Energy and Environmental Policy Options, 7*(3), 43-51.

Khalid, M. A., & Abdul, M. (2025). Green Growth and Human Capital in Bangladesh: Evaluating the Roles of Financial Development and Foreign Direct Investment in Reducing Carbon Emissions. *Journal of Energy and Environmental Policy Options, 8*(1), 1-13.

Khan, H., Weili, L., & Khan, I. (2020). Environmental innovation, trade openness and quality institutions: An integrated investigation about environmental sustainability. *Environment, Development and Sustainability, 22*(7), 6759-6778.

Khan, R., & Ullah, B. (2020). Examining the impact of firm sustainability practices on firm growth: Evidence from the United States. *Journal of Policy Options, 3*(1), 11-25.

Kharas, H., McArthur, J. W., & Ohno, I. (2018). *Leave no one behind: Time for specifics on the Sustainable Development Goals.* Brookings Institution Press.

Kosyak, A., & Popov, S. (2020). Analyzing Consumer Preferences for Green Products and Environmental Impact. *Journal of Energy and Environmental Policy Options, 3*(4), 134-140.

Krishna, P., & Singh, R. (2020). Fiscal Sustainability and Debt Dynamics: Evidence from South Asian Countries. *Journal of Business and Economic Options, 3*(1), 26-32.

Maltais, A., & Nykvist, B. (2020). Understanding the role of green bonds in advancing sustainability. *Journal of Sustainable Finance & Investment*, 10(3), 233–251.

Marc, A., & Ali, A. (2023). Unveiling the Role of Business Freedom to Determine Environmental Degradation in Developing Countries. *International Journal of Energy Economics and Policy, 13*(5), 157-164.

Marc, A., & Yu, H. (2024). Strategic value creation through corporate social responsibility adoption for sustainable financial performance. *Journal of Policy Options*, 7(4), 14-21.

Mehdi, H., Ali, A., & Audi, M. (2025). Tourism, Sustainability and Growth: An Empirical Investigation of Long-Run Economic Impacts In Pakistan. *Contemporary Journal of Social Science Review*, 3(1), 1479-1493.

Naeem, H. Ali, A., & Audi, M. (2025). The Impact of Financial Stability on Environmental Degradation: Mediating Role of Green Investment and Moderating Role of Environmental Awareness. *Policy Journal of Social Science Review*, 3(1), 448–469.

Ng, A., & Tao, J. (2016). Bond market development, green finance and financial inclusion: Implications for ASEAN economies. *Review of Development Finance, 6*(2), 181–190.

Pauw, W. P. (2015). Not a panacea: Private-sector engagement in adaptation and adaptation finance in developing countries. *Climate Policy*, 15(5), 583-603.

Porter, M. E., & van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, 9(4), 97-118.

Radas, A. (2023). Inclusive business models as drivers of sustainable growth and social progress. *Journal of Policy Options, 6*(3), 9-14.

Ramanust, S. (2023). Green marketing tools and consumer behavior: Exploring the influence of eco-brands and environmental advertising on purchasing decisions. *Journal of Energy and Environmental Policy Options, 6*(4), 33-42.

Rozan, A., & Ibrahim, M. (2025). Integrating Green Finance, Economic Complexity, and Renewable Energy for Sustainable Development in Asia. *Journal of Energy and Environmental Policy Options, 8*(1), 66-74.

Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., & Fuller, G. (2019). *Sustainable Development Report 2019*. New York: Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN).

Saluy, B., & Nuryanto, W. (2023). Green Competitive Advantage in Indonesia's Chemical Manufacturing. *Journal of Energy and Environmental Policy Options, 6*(4), 1-11.

Schmidt-Traub, G. (2015). Investment needs to achieve the Sustainable Development Goals: Understanding the billions and trillions. *Sustainable Development Solutions Network Working Paper*.

Sharma, R., & Das, V. (2024). A review of sustainable agriculture and renewable energy pathways for reducing environmental degradation. *Journal of Energy and Environmental Policy Options*, 7(3), 14-22.

Singh, U., & Kumar, K. (2023). Exploring the interconnection between anthropogenic activities and greenhouse gas emissions: an empirical study. *Journal of Energy and Environmental Policy Options*, 6(4), 43-53.

Stern, N. (2007). *The economics of climate change: The Stern review*. Cambridge University Press.

Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *American Economic Review*, 71(3), 393-410.

Taghizadeh-Hesary, F., & Yoshino, N. (2019). The way to induce private participation in green finance and investment. *Finance Research Letters*, 31, 98-103.

Tamazian, A., Chousa, J. P., & Vadlamannati, K. C. (2009). Does higher economic and financial development lead to environmental degradation: Evidence from BRIC countries. *Energy Policy*, 37(1), 246-253.

Tang, D. Y., & Zhang, Y. (2020). Do shareholders benefit from green bonds? *Journal of Corporate Finance, 61*, 101427.

Trabacchi, C., & Stadelmann, M. (2013). Making adaptation a private sector business: Insights from the Pilot Program for Climate Resilience. *Climate Policy Initiative*.

United Nations Economic and Social Commission for Asia and the Pacific. (2022). *Financing for development in Asia and the Pacific: Progress and challenges*. UNESCAP.

United Nations. (2022). *The Sustainable Development Goals Report 2022*. New York: United Nations.

Urban, D., & Radas, S. (2021). Managing Cruise Tourism for Sustainable Development in Dubrovnik: Revisited. *Journal of Policy Options*, 4(4), 1-8.

Volz, U. (2018). Fostering green finance for sustainable development in Asia. In U. Volz (Ed.), *Routledge handbook of banking and finance in Asia* (pp. 488-504). Routledge.

Wang, J., & Li, J. (2024). Green Innovation and Economic Growth Balancing Development and Environmental Protection. *Journal of Energy and Environmental Policy Options*, 7(3), 1-13.

Wang, Z., & Manopimoke, P. (2023). Exploring the Interplay Between Supply Chain Dynamics and Organizational Culture in Green Practices Adoption: A Study of Thailand's Hospitality Sector. *Journal of Energy and Environmental Policy Options*, 6(4), 21-32.

Wang, Z., Shahid, M. S., Binh An, N., Shahzad, M., & Abdul-Samad, Z. (2022). Does green finance facilitate firms in achieving corporate social responsibility goals? Economic Research-Ekonomska Istraživanja, 35(1), 5400–5419.

Zhang, B. (2023). Green finance, sustainable development, and environmental policy. *Environmental Science & Policy, 146*, 13–22.

Zhang, D., Cao, H., Zou, P., & Wu, J. (2021). Green finance and enterprise green innovation: Evidence from Chinese listed companies. *Economic Analysis and Policy*, 71, 50-63.