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Green Finance, Financial Technology, and Environmental Innovation Impact on CO_2 Emissions in Developed Countries

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Abstract

The primary objective of this study is to examine the effects of green finance, financial technology, and environmental innovation on carbon dioxide emissions in developed countries. This research aims to explore the role of these variables in the context of environmental impact, providing a valuable contribution to the existing literature. The purpose statement for this study is designed to facilitate an in-depth analysis of how green finance, financial technology, financial inclusion, economic growth, and environmental innovation collectively influence carbon dioxide emissions within developed nations. In particular, this study seeks to integrate and analyze current theoretical and empirical literature on these critical factors, focusing on their potential to mitigate or exacerbate environmental issues. By systematically reviewing the relationship among green finance, financial technology, financial inclusion, and economic growth, the study provides a comprehensive understanding of how these factors contribute to or curb carbon emissions. Additionally, it explores the role of environmental innovation as a strategic factor in promoting sustainable development practices that can lessen ecological impacts. Furthermore, this research intends to deepen the exploration of the existing literature by evaluating both theoretical frameworks and empirical findings presented in prior studies. By analyzing theoretical foundations, this paper clarifies the relationships and mechanisms through which these factors interact, offering a cohesive framework for understanding their collective impact on environmental sustainability. In doing so, the study not only highlights the complex interplay of financial and technological innovations with environmental outcomes but also emphasizes the need for sustainable financial practices that align with ecological goals. This research ultimately aims to provide insights that can inform policymakers, financial institutions, and businesses on the potential benefits of adopting green finance and advanced financial technologies while fostering innovation in environmental practices. Through this comprehensive analysis, the study offers a robust perspective on the ways developed nations can enhance sustainability efforts, contributing to the broader goal of reducing carbon footprints in a technologically advanced and financially inclusive global economy.

Keywords: Green finance, Financial technology, Environmental innovation

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1. INTRODUCTION

In response to the potential threats that climate change poses to ecosystems and societal well-being, the Paris Climate Agreement was established in 2015. This global accord aims to limit global warming to well below 2 degrees Celsius above pre-industrial levels, with a target of restricting it to 1.5 degrees Celsius. Currently, nearly all countries are mandated by law to develop greenhouse gas reduction strategies aligned with these objectives (Singh & Kumar, 2023; Udeagha & Breitenbach, 2023). However, rising carbon dioxide emissions in countries heavily reliant on fossil fuels and historically focused on economic growth over environmental concerns are causing increasing global alarm (Wang & Manopimoke, 2023; Hao et al., 2023; Udeagha et al., 2023). For many nations, prioritizing economic development has led to a lack of attention to environmental protection, resulting in significant levels of carbon emissions. This pattern of industrial growth and reliance on fossil fuels directly challenges the goals of the Paris Agreement. Particularly, countries with strong economic growth histories driven by oil and gas production are now increasingly concerned about the environmental impact of these practices (Limjaroenrat & Ramanust, 2023; Udeagha et al., 2023). These issues highlight the urgent need for implementing carbon reduction strategies that align economic progress with environmental sustainability. As countries worldwide recognize the long-term impacts of high carbon emissions, there is a global shift towards adopting sustainable practices that balance economic goals with environmental protection. This transformation emphasizes the need to reimagine energy sources and industrial processes to address the serious consequences of climate change on a global scale.

The rapid economic growth and industrial expansion of G-20 nations have led to a significant increase in carbon dioxide emissions (Saluy & Nuryanto, 2023; Huang et al., 2024; Song et al., 2024). Given the varied fiscal constraints among these countries, which often limit their environmental performance, the adoption of robust global financial network policies may become essential to addressing these environmental challenges. BRICS nations, in particular, possess the

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autonomy to design policies that can effectively support the Global Financial Network (Almasri & Wimand, 2024; Zhao et al., 2023). However, these countries are also heavily reliant on oil imports and domestic energy production, and their environmental impact has grown as economic development in their power sectors progresses at the expense of ecological sustainability. In the current economic landscape, growth that disregards environmental sustainability is increasingly unsustainable. High growth rates now necessitate practices that include limiting carbon dioxide emissions, as environmental sustainability has become an essential component of economic strategies. Green finance and financial technology, commonly referred to as fintech, have emerged as crucial factors in promoting sustainability and enabling countries to balance economic growth with environmental protection (Kosyak & Popov, 2020; Kanwal et al., 2023). Interest in green finance and fintech has thus increased significantly in recent research, as these tools are recognized as essential for advancing sustainable growth (Denial, 2023; Udeagha et al., 2021; Dima, 2022; Kanwal et al., 2023).

This shift highlights the critical role of innovative financial mechanisms like GFN and fintech in fostering environmentally conscious growth across both G-20 and BRICS nations. The growing emphasis on sustainable finance and technology suggests that a new economic model, which prioritizes ecological responsibility alongside growth, is becoming a priority for policymakers and researchers alike. As these nations continue to confront the environmental challenges associated with rapid industrialization, the integration of green finance and fintech into their economic strategies will be essential to achieving balanced, sustainable progress. Given that finance and information technology are increasingly interlinked (Kanwal et al., 2023), financial technology (fintech) plays a pivotal role in efficiently connecting surplus financial resources to areas experiencing financial deficits. By reducing trade costs and minimizing information asymmetry, FinTech offers a streamlined approach to financial transactions and investments (William, 2021; Nenavath, 2022; Audi & Ali, 2023). Fintech's advantages include affordability, convenience, and a high level of transparency, making it accessible and attractive to a broad audience. Moreover, fintech facilitates the expansion of the investor base, lowers barriers to entry, and helps to identify latent financial needs among investors (Wang & Chen, 2021; Qadri et al., 2023). This capability to reach untapped markets not only fosters inclusivity but also uncovers new investment opportunities, thereby contributing to a more dynamic and responsive financial ecosystem. Through these features, fintech is shaping modern finance by enhancing accessibility, promoting transparency, and aligning financial resources with a wider array of investment opportunities. In many countries traditionally categorized as low-tech economies, financial technology has significantly transformed the delivery and cost of financial services, contributing to the advancement of sustainable development and green financing initiatives. Fintech serves as a critical tool in reducing carbon dioxide emissions by promoting more sustainable financial practices, particularly in three core areas: enhancing the efficiency of financial transactions, reducing the environmental impact of traditional banking infrastructure, and supporting green finance initiatives.

In parallel, ecologists are actively discussing ways to decouple carbon emissions from economic growth, focusing on green finance as a central environmental investment strategy aimed at minimizing environmental impact (Zhan & Wu, 2020; Kanwal et al., 2023; Muganyi et al., 2021; Ashiq et al., 2023). Green finance, facilitated by fintech, helps direct investments toward eco-friendly projects, thereby supporting sustainability goals. Through innovative fintech applications, green finance can efficiently channel resources to renewable energy, conservation efforts, and other green projects, effectively bridging the gap between financial growth and environmental preservation. Due to financial constraints, the Global Financial Network (GFN) has become essential for enabling corporations to fund projects that prioritize environmental sustainability. With over 4 trillion dollars in foreign currency reserves and access to a significant proportion of the global population—more than 21%—the GFN provides crucial resources for environmentally responsible growth. Such initiatives are instrumental in promoting ecological integrity, fostering the emergence of sustainable industries, and supporting credit intermediaries that align with international economic strategies focused on green growth (Lisha et al., 2023; Audi & Ali, 2023). The GFN framework empowers corporations and governments to invest in renewable energy, pollution reduction technologies, sustainable infrastructure, and green manufacturing processes, supporting a financial ecosystem that values long-term ecological stability alongside economic progress. By reducing reliance on fossil fuels and directing capital towards environmentally sustainable ventures, GFN initiatives help nations transition to low-carbon economies, which is essential in meeting global climate targets. Furthermore, the Global Financial Network encourages innovation within the financial sector itself, promoting new financial products and services that incentivize sustainable practices. For example, green bonds and sustainability-linked loans directly connect financial returns to environmental impact, allowing investors to prioritize projects that offer both ecological and economic returns. Such financial tools make it easier for corporations to access funding while committing to sustainable practices, creating a positive feedback loop that continually channels capital into green projects.

By fostering collaboration across national and sectoral boundaries, GFN supports an integrated approach to sustainable development, where resources from different economic powerhouses can collectively target shared environmental challenges. The accelerated growth of credit intermediaries within this framework is essential, as these intermediaries connect large-scale funding sources with on-the-ground sustainable projects. Their role enhances capital flows into sectors crucial for the green economy, including renewable energy, sustainable agriculture, waste management, and environmentally friendly urban development. Ultimately, the Global Financial Network's efforts contribute to a balanced economic landscape where environmental concerns are integral to financial decision-making. This approach not only helps corporations and nations achieve sustainability goals but also reinforces resilience within the global economy by investing in the industries of the future. By ensuring that economic progress and environmental stewardship go hand-in-hand, the GFN serves as a critical pathway toward a more sustainable global economy. In recent decades, there has been a growing focus on the economics of sustainability, which adds a new dimension to understanding financial systems,

technological advancements, and the legal frameworks that govern environmental practices (Awan et al., 2023; Younas et al., 2023). This intersection of sustainability, green finance, environmental innovation, and financial technology has emerged as a central topic of inquiry among policymakers, researchers, and industry leaders. However, despite the expanding research in these areas, a substantial knowledge gap remains in understanding the combined effects of these factors on environmental degradation.

The complexity in examining these relationships arises from the intertwined impacts of green finance, environmental innovation, and financial technology on one side (Arslan et al., 2023), and the varied socio-economic and environmental contexts of G-20 countries on the other. While efforts are made to implement sustainable practices and green policies, achieving consistent results across different regions has proven challenging. These inconsistencies often create obstacles in formulating effective environmental policies, as factors such as economic priorities, regulatory standards, and tec hnological capacities vary widely across nations (Altaf et al., 2023). As a result, an in-depth, systematic analysis is necessary to clarify these complex interrelationships and assess the multifaceted impacts of such variables on sustainability. This comprehensive examination would involve evaluating how each factor—green finance, environmental innovation, and financial technology—independently and collectively influences sustainability goals. It also requires an understanding of how these factors interact with unique national policies, market structures, and social priorities. Only by systematically analyzing these interwoven influences can researchers and policymakers gain insights that could guide the development of coherent, adaptable, and effective strategies for sustainable development across diverse economic and environmental landscapes. The study identifies a crucial knowledge gap by examining the combined impact of green finance, financial technology, and environmental innovation on carbon dioxide emissions (Shahzadi et al., 2023). This research is highly significant, as it not only enriches existing literature but also offers valuable insights for policymakers, researchers, and industry stakeholders. By capturing the interconnected nature of economic, technological, and regulatory mechanisms, the study facilitates a more informed policy-making process, offering deeper insights into the pathways to sustainability. A notable strength of this research lies in its focus on the practical aspects of implementing sustainable measures, which enhances the development of more consistent and effective environmental policies. This emphasis on practical applicability adds to the study's credibility and relevance, as it addresses real-world challenges in applying green finance and environmental innovation strategies. Furthermore, by focusing on actionable insights, the study supports the formulation of improved strategies that can promote consistent and effective environmental policies, aligning economic growth with sustainability objectives (Ali, 2022; Dawood et al., 2023; Zahra et al., 2023; Ali et al., 2023).

The global significance of this research is particularly noteworthy, as its insights transcend national boundaries and contribute to the broader discourse on environmental sustainability. By taking an interdisciplinary approach that integrates economics, technology, and law, the study provides a comprehensive understanding of sustainability challenges and offers an exemplary integrated strategy for addressing them. This holistic perspective enhances the study's capacity to influence policy and practice across different regions, reinforcing the need for globally aligned environmental strategies. Furthermore, the study's focus on the long-term effects of sustainable practices underscores its commitment to promoting environmental stability. This forward-looking approach serves as a foundation for actions that address the complex challenges emerging from today's rapidly changing world (Ullah et al., 2023). Through its emphasis on enduring impact, the research encourages strategies that are resilient, adaptable, and rooted in sustainable development principles, contributing meaningfully to the global platform for environmental stability.

2. LITERATURE REVIEW

Unlike traditional financial services, green finance specifically aims to prioritize environmental benefits by directing monetary resources toward eco-friendly businesses and restricting funding to companies engaged in polluting activities (Hafiza et al., 2023). The main objective of green finance is to channel financial support to environmentally sustainable ventures, thus encouraging businesses to adopt practices that reduce their environmental footprint. For instance, Ren, Shao, and Zhong (2020) found that China's green finance policy significantly contributed to "carbon reduction." However, they observed that the effects were often asymmetric and predominantly short-term in nature. Despite the increasing attention to green finance, empirical studies focusing on individual businesses as the unit of analysis remain limited. Most existing research tends to emphasize the broader relationship between green finance and industries rather than examining its impact at the business level (Chaudhary et al., 2023). As green finance continues to evolve, there is a growing need for studies that explore its implications for individual firms, especially in assessing how these financial incentives influence companies' commitment to sustainable practices and environmental innovation.

According to Zhang et al., (2022), some indications plans to legally enforce stricter environmental standards have not yet fully achieved their intended impact. The objective of eco-green financing policies is to elevate the level of environmental compliance and action. Green financing, however, has demonstrated effectiveness in addressing environmental crises, as highlighted by Khan et al., (2023). The government's green finance initiatives aim to balance environmental preservation with economic growth, promoting sustainable development with the Global Financial Network playing a critical role in this framework (Zhang et al., 2021). As a significant driver for ecological progress, green financial funds show immense growth potential. These funds not only facilitate the transition to sustainable practices but also strengthen the cooperation between economic objectives and environmental responsibilities, making them an essential component of the sustainable development agenda (Younas et al., 2023). The study addresses several essential questions, including the extent to which the development of green finance and ecological preservation complement one another, how green finance influences shifts in energy use structures (Zhang et al., 2022), and the economic and environmental benefits of green finance (Yang

et al., 2021). One notable impact of green finance is that businesses with high levels of pollution face significant financing costs, as this strategy enforces environmental accountability (Usman et al., 2023).

Table 1: Selected Studies Summaries

Author(s)	Year	Variables	Methodology	Key Findings
Hafiza et al.	2023	Green finance, environmental benefits	Qualitative analysis	Green finance directs resources to eco-friendly businesses and restricts funding for polluting activities.
Ren et al.	2020	Green finance, carbon reduction	Vector Error Correction Model (VECM)	China's green finance policy significantly contributed to carbon reduction, with effects being short-term and asymmetric.
Chaudhary et al.	2023	Green finance, industry vs. business-level analysis	Literature review	Existing research emphasizes industry-level impacts rather than individual business analysis of green finance.
Zhang et al.	2022	Green finance, environmental standards	Qualitative analysis	Stricter environmental standards have not fully achieved the desired impact; eco-green financing aims to elevate environmental compliance.
Khan et al.	2023	Green finance, economic growth, sustainability	Qualitative analysis	Green finance balances environmental preservation with economic growth, playing a significant role in sustainable development.
Zhang et al.	2022	Green finance, energy use structures	Qualitative analysis	Green finance influences energy use structures, promoting shifts towards sustainable energy sources.
Usman et al.	2023	Pollution control, financing costs	Qualitative analysis	High-polluting businesses face significant financing costs due to pollution discharge fees and penalties.
Shi et al.	2022	Green finance, regulatory standards	Qualitative analysis	High-risk companies in eco-friendly programs face financial pressures to comply with environmental regulations.
Udeagha & Muchapondwa	2023	Fintech, green energy adoption	Driscoll-Kraay standard errors	Positive relationship between fintech growth and green energy adoption in 21 OECD countries.
Rahman & Bakar	2018	Fintech, renewable energy	Qualitative analysis	Fintech influences consumer behavior, encouraging investments in renewable energy projects.
Ahmad et al.	2021	Environmental innovation, CO_2 emissions	Structural Vector Autoregressive (SVAR) model	Unfavorable shocks to innovation reduce CO_2 emissions, while favorable innovation shocks increase emissions in OECD economies.
Shahzadi & Zainab	2023	CO_2 emissions, technological innovation	Panel data analysis	Established a positive long-term relationship between CO_2 emissions and technologically detrimental innovations.
Umar et al.	2020	Financial development, innovation, CO_2 emissions	Cointegration and wavelet coherence techniques	Significant interactions between financial development, innovation, and CO_2 emissions over time in 43 countries.
Ali et al.	2021	Environmental innovation, renewable energy	Panel data analysis	Environmental innovation and renewable energy adoption collectively reduce emissions.
Ahmad & Zheng	2021	Environmental innovation, carbon emissions	Cross-sectionally augmented autoregressive distributed lag (CS-ARDL) model	Environmental innovation has a long-term relationship with carbon emissions, influenced by context such as consumption-based and area-based emissions.
Nawaz et al.	2023	Environmental innovation, CO_2 emissions	Panel data analysis	Innovation can reduce or increase CO_2 emissions depending on the economic landscape and policy context.

High-risk companies participating in eco-friendly financial transformation programs face substantial financial pressures to comply with regulatory standards and secure funding, as they are held accountable for negative externalities through pollution discharge fees and penalties (Shi et al., 2022; Awan et al., 2023).

This green finance framework not only encourages sustainable practices but also shifts the financial burden of environmental impacts onto companies that contribute to ecological degradation. By doing so, green finance not only deters environmentally harmful activities but also promotes investments in cleaner, more sustainable operations, ultimately aligning economic incentives with environmental preservation goals. In the G-20 countries, pollution control is considered a critical approach for mitigating environmental degradation and addressing climate change. Fintech, with its transformative impact on consumer behavior, plays a significant role in shaping spending, saving habits, and decisions related to renewable energy investments. Innovative financial products like NRG-coin, crowdsourced funding for renewable projects, and blockchain-based green energy credits—such as Origin by the Energy Web Foundation—demonstrate how fintech contributes to environmental initiatives (Lisha et al., 2023). This study aims to measure how fintech adoption influences green energy utilization (Rahman et al., 2019; Rahman & Bakar, 2018). For this purpose, a balanced panel of 21 OECD nations, covering data from 2005 to 2018, provides a robust dataset, with the Driscoll-Kraay standard errors offering an effective analytical approach to evaluate the empirical model. The findings indicate a positive relationship between fintech growth and green energy adoption (Udeagha & Muchapondwa, 2023). Research on fintech's environmental impact, specifically through advanced data analytics and artificial intelligence, provides valuable insights into fintech's role in ecological sustainability (Shahid et al., 2023). By driving innovations in green finance, fintech enables consumers to access green funding opportunities, supporting eco-conscious finance businesses. This aligns fintech's growth objectives with environmental sustainability, allowing it to capture market share in a competitive sector while meeting consumers' demands for environmentally responsible options (Nenavath, 2022). Fintech applications hold considerable potential for preventing environmental degradation and promoting ecological integrity (Tao et al., 2022). This study investigates whether growth in the fintech sector contributes to environmental improvements. Given the likelihood of endogeneity in fintech's development, methods like GMM and 2SLS provide reliable results. Croutzet and Dabbous (2021) critically analyze fintech's role in influencing renewable energy adoption in OECD countries, identifying fintech as a driver of increased energy security, reductions in carbon emissions, and responsiveness to oil price volatility (Ilyas et al., 2023). These factors are essential in propelling renewable energy into the spotlight for many economies.

Through an extensive literature review and case studies, Chueca et al., (2021) have assessed the positive environmental impacts of fintech, focusing on advanced technology sectors and specific fintech projects in green investment operations. This examination underscores fintech's advantages in promoting green finance expansion and fostering eco-friendly behaviors, which contribute to the sustainable growth of fintech enterprises (Fatima et al., 2023). By advancing green finance, fintech not only supports sustainability in business practices but also encourages greater environmental awareness among consumers and investors, potentially driving significant long-term improvements in environmental stewardship across industries.

Previous research measuring the impact of environmental innovation has often focused on the relationship between environmental innovation and CO2 emissions. Ahmad et al. (2021) examined this link in OECD economies and observed that unfavorable shocks to innovation reduce CO2 emissions, whereas favorable innovation shocks tend to increase emissions. This study not only advanced the understanding of environmental innovation's dual effects but also analyzed both positive and negative innovation shocks to understand their respective impacts on pollution levels in OECD countries. Shahzadi et al. (2023) and Zainab et al. (2023) further contributed to the literature by establishing a long-term positive relationship between CO2 emissions and economically detrimental technological innovations. Their findings suggest that while economic downturns may lead to reduced emissions due to less intensive economic activity, economic recovery can bring favorable shocks that potentially enhance environmental outcomes and lower emissions. Umar et al. (2020) evaluated the broader economic and causal impacts of innovation and financial development on CO2 emissions from 1971 to 2018 using combined cointegration and wavelet coherence techniques, with economic growth as a control factor. By analyzing data from 43 countries, they found that monetary development, innovation, and CO2 emissions exhibited significant interactions at various time points and frequencies. Their results indicated that innovation could serve as a predictive factor for CO2 emissions, positioning it as a critical variable in assessing environmental outcomes. In another study, Ali et al. (2021) investigated the link between environmental innovation and renewable energy adoption, focusing on how these factors collectively impact emissions (Mukhtar et al., 2023).

Ahmad and Zheng (2021) explored the nuanced effects of environmental innovation within environmental-related technical innovation. By employing the cross-sectionally augmented autoregressive distributed lag model, they argued that while carbon emissions have a long-term relationship with environmental innovation, the nature of this connection is influenced by context, particularly in terms of consumption-based and area-based emissions (Rahman & Bakar, 2019). Rather than considering only the overarching impact of environmental innovation on environmental quality, researchers like Nawaz et al. (2023) examined specific factors that drive CO2 emissions, focusing on the extent to which environmental innovation can foster sustainability. Their approach highlights the multifaceted influence of innovation on environmental outcomes and the necessity of examining various triggers and contextual factors shaping CO2 emissions and environmental quality. These studies emphasize the complex role of environmental innovation in influencing CO2 emissions, pointing to the importance of both the context of innovation and the broader economic landscape. As these findings suggest, environmental innovation holds both the potential to reduce emissions and the capacity to increase them, depending on how it interacts with economic growth, technological advancements, and policy frameworks.

3. METHODOLOGY

This research paper provides a systematic review of the literature and incorporates a meta-analysis approach to explore and critically evaluate resources addressing green finance, financial technology (fintech), and environmental innovation in the context of CO2 emissions. It draws from comprehensive studies conducted by Awan et al., (2023) and Awan et al., (2023), in addition to the methodological insights of Lacey, Matheson, and Jesson (2011). As part of the critical examination, the paper reviews prior studies, assessing aspects such as area of focus, bibliographic details, underlying theory, research philosophy (Zikmund et al., 2013), findings, and methodologies. The review primarily focuses on understanding how green finance, fintech, financial inclusion, GDP growth, and environmental innovation collectively influence CO2 emissions. The literature reviewed spans publications from 2016 to 2023, covering a range of topics, from green finance to fintech's role in facilitating environmental sustainability. The selection process was rigorous, ensuring only the most relevant research was included. To identify key studies, a thorough search was performed, reviewing financial and economics journals listed in resources curated by Clarivate Analytics, including the Master Journal List 2017 and the Arts and Humanities Citation Index Report 2016. Database searches were conducted in EBSCO's Business Source Premier, Scopus, and Google Scholar. The study also included an extensive bibliography that focused on themes such as green finance, financial inclusion, fintech, environmental innovation, GDP, and CO2 emissions, referencing significant works published across various journals (Tabassum et al., 2023; Li et al., 2022; Shafique et al., 2021). In constructing the literature selection criteria, the study emphasizes literature focusing on green finance, fintech, financial inclusion, environmental innovation, GDP, and CO2 emissions (Idrees et al., 2023). Non-empirical sources—such as books, commentary, conference summaries, executive abstracts, editorials, reviews, and popular media—were excluded from the review (Hassan et al., 2022; Khan et al., 2022). After carefully analyzing the literature to avoid duplication, around 50 studies were selected for detailed examination. Each paper was analyzed with a focus on the abstract, title, and methodology to confirm relevance to the research aims. This systematic approach allowed for a well-rounded evaluation, ensuring that only research providing substantial insights into the interconnected roles of green finance, fintech, and environmental innovation in shaping CO2 emission outcomes was included.

4. CONCLUSION

A thorough review of existing literature suggests a strong potential causal relationship between green finance, fintech, financial inclusion, GDP, environmental innovation, and CO2 emissions. This relationship highlights the interconnected roles these factors play in influencing environmental sustainability. Green finance and fintech, for instance, are emerging as pivotal tools for mobilizing capital toward environmentally friendly projects, reducing carbon footprints, and fostering innovative approaches to sustainable development. Financial inclusion enables broader access to resources, supporting sustainable growth and enabling low-income communities to engage in eco-friendly practices. Environmental innovation acts as a catalyst for technological advancements that reduce pollution and optimize resource use. The growth of GDP, while traditionally associated with increased CO2 emissions, can, in combination with green finance and environmental innovation, potentially decouple economic growth from environmental degradation. This holistic view underscores the importance of integrating economic, technological, and environmental policies to promote sustainable development effectively. This review resembles a two-sided coin, highlighting both positive and negative influences within the interconnected realms of green finance, fintech, financial inclusion, GDP growth, and environmental innovation. On one side, these elements collectively foster sustainable practices, reduce carbon footprints, and drive environmental innovation, potentially leading to positive outcomes for economic and environmental health. Green finance channels resources into eco-friendly projects, fintech expands financial access while promoting transparency, and environmental innovation brings forth technologies that can mitigate pollution and optimize resource use. On the flip side, however, these factors may also generate challenges, such as increased CO2 emissions associated with rising GDP in the absence of stringent sustainability measures. Interestingly, the dual nature of these influences reveals inherent gaps in the current literature—positive and negative outcomes are often treated in isolation rather than as interconnected dynamics within a single framework. This dual perspective underscores the need for a more integrated approach to understanding how these elements function together, allowing for a richer examination of both the benefits and challenges in achieving sustainable development goals. This paper examines the roles of green finance, fintech, financial inclusion, and environmental innovation in influencing CO2 emissions across the G-20 countries, an area of ongoing discussion and research. Much research has been dedicated to understanding how these factors impact the economy as a whole and whether they offer viable pathways for achieving sustainable development goals. The focus on green finance, in particular, seeks to explore its potential to fund environmentally responsible projects, thus reducing carbon footprints and encouraging sustainable economic practices. Fintech and financial inclusion add further dimensions by expanding access to financial resources and enabling transparent, cost-effective transactions that can support green initiatives. Additionally, environmental innovation emerges as a critical factor in developing new technologies aimed at reducing pollution and conserving resources. The combined examination of these elements in this paper provides a broader view of their collective influence on both the environment and the economy, offering insights into whether these modern financial and technological trends can drive positive environmental change while supporting economic growth.

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