



Toward a Theoretical Framework for Green Digital Finance: Bridging FinTech and Sustainability Goals

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Abstract. The advancement of FinTech witnessed by the pressing need for sustainability, has led to the emergence of a new field called Green Digital Finance (GDF). FinTech has the potential to advance the reach of green finance but no theoretical evidence exists to define the techno-sustainable convergence. The study proposes a theoretical and conceptual framework, setting the ground for further research and analysis, on understanding the relationship. literature was retrieved from the Scopus database and google scholar using inclusion criteria as per PRISMA guidelines. The extracted articles were classified into three themes: (i) Rising trends (ii) sustainability compliant innovations (iii) Institutional environment. The literature review revealed integration of relevant theories and identification of four key constructs. A theoretical framework was developed and a conceptual flowchart was designed aligning the constructs.

Findings: (i) FinTech allows marginalized groups to engage in green investment opportunities, (ii) Blockchain provides decentralized records, thereby reducing greenwashing, (iii) AI enable real time tracking of financial transactions and evaluating ESG reporting; however, (iv) there are many challenges associated, such as lack of technological awareness, absence of ethical governance and carbon footprint of some technologies like blockchain mining.

Practical implications: the policymakers should recognise the significance of GDF and work toward enabling policies, also evaluate the existing policies for developing a standardized institutional framework for GDF.

Originality/ value: this paper's novelty lies in developing a theoretical and conceptual framework for GDF forming the grounds for further empirical studies.

Keywords: FinTech, Sustainable Development Goals, Green Digital Finance

1 Introduction

The progress of digital technologies in the financial environment, has resulted in a transformatory shift in the delivery of financial services in the twenty-first century. It is most commonly known as Financial Technology (FinTech), as this change has broken the traditional financial paradigms, by providing innovative, efficient and cus-

tomers-centred solutions. At the same time, the international community faces some critical issues related to sustainability, such as climate change, biodiversity loss, environmental degradation, and social inequality (Baste & Watson, 2022). A combination of these two trends, i.e., digital finance and sustainability marked the beginning of a new concept- Green Digital Finance (GDF). It aims to apply FinTech innovations in the field of finance so as to make environmental sustainability a reality and advance Sustainable Development Goals (SDGs), which is the need of the hour worldwide. GDF can be expressed as the use of digital financial instruments, including blockchain, artificial intelligence (AI), big data analytics, mobile banking, and digital wallets to mobilize and manage financial resources in a manner that helps us to be climate resilient (Hossain et al., 2024). It helps in minimizing carbon footprints of economic activities and promotes inclusive economic development. The main objective is to redesign financial systems, to support: - low carbon investments, green infrastructure, renewable energy and other sustainability-based projects. With the agility and scalability of FinTech, being implemented in the context of strategic requirements of sustainable development GDF can become a- “game changer” in the creation of the financial architecture of a sustainable future. However, although gaining relevance, GDF is comparatively underexplored and disintegrated area, where there is no mutual conclusions regarding the conceptual frame, functional features, or theoretical basis.

However, in practice majority of the literature is comprised of descriptive case studies, policy briefs, or studying the impact of individual technologies, but honestly, doesn't have an integrated and unified theoretical framework which links FinTech capabilities to environmental and social impacts (Amnas et al., 2023; Bansal et al., 2025; Tello-Gamarra et al., 2022). Isn't it worrying in the light of a time where there are global climate concerns? At this time of urgency, Financial systems should be playing a pivotal role in achieving global climate goals, especially, that of the Paris Agreement and the United Nations Sustainable Developmental Goals (SDGs). Actually, the necessity to reduce carbon emission globally, along with the ongoing digital transformation, has compelled us to consider in what ways the financial innovations can be used for developing a greener economy. However, the theoretical studies of this field are still in their infancy. Therefore, there is a need to find answers to certain questions, to understand more deeply the concept of GDF. This paper addresses the following questions: how can FinTech help in the swift disbursement of green finance? How can SDGs be achieved through digital financial systems? And how do regulatory frameworks, investor behaviour, and institutional structures contribute towards developing GDF? A multidisciplinary literature review needs to be conducted to find answers to the above-mentioned questions by drawing insights from innovation systems theory, ecological economics, institutional theory, digital transformation theory and stakeholder theory. This paper aims to contribute towards bridging the gap between FinTech and sustainability by developing a theoretical framework of GDF. Also, the traditional financial models were lagging behind due to non-alignment with sustainability objectives (Sheikh et al., 2025). At this stage, the GDF brings about the much needed change by aiming to reduce environmental concerns and promoting financial inclusion (Attia, 2024).

Moreover, FinTech facilitates the disbursement of sustainable finance by enhancing access and providing equal opportunities to unbanked and underserved categories.

Online financial services are of considerable importance in expanding access by removing middlemen and curtailing transactional costs. This promotes financial inclusion, which is a critical aspect of sustainable development. (Grzybowski et al., 2023) illustrated the situation in Africa, where mobile money services have benefited millions of unbanked users by generating greater access to green finance. Increased access to digital finance enables investors to make greener and climate-resilient investment decisions.

Additionally, FinTech tools such as blockchain and AI enable better transparency and accountability in the application of green finance. Bhatt & Emdad (2025) suggest that Blockchain technology can also be used to reduce greenwashing by enabling real-time validation of carbon credits and usage of green bonds. Machine learning algorithms and AI have the capability to calculate the environmental risks and optimize green investment portfolios based on large data sets (Oforgu, 2024). Such tools will assist investors and regulators to make better decisions and enhance the trustworthiness of sustainability reporting. Nevertheless, the establishment of the potential of Green Digital Finance also implies major issues. The question of data privacy, digital literacy, and cybersecurity and technological exclusion are still pressing matters, especially in developing economies (Devidze, 2022). Additionally, the carbon footprint of data centres and energy-consuming blockchain solutions itself makes the question of the net sustainability of digital finance solutions questionable (Al Kez et al., 2022).

Thus, a theoretical approach considering both enablers and constraints of sustainable development through FinTech will help in a greater understanding of the emerging concept of Green Digital Finance in this dire situation of survival. Additionally, the prevailing and emerging regulatory frameworks play a vital role in the implementation of Green Digital Finance. Policies like regulatory sandboxes encourage green innovations by providing a deregulated, controlled environment for experimentation in adherence to specified standards (Hasan et al., 2024). Further, innovations like Central Bank Digital Currencies (CBDCs) in various countries have enabled financial inclusion and enhanced transparency in digital transactions (Hasan et al., 2024; Kontzinos et al., 2025). The potential of these regulatory and institutional frameworks is being recognised by governing bodies of different countries, leading to the formation of the Green Digital Finance Alliance (GDFA). An integrated four-level theoretical framework is proposed by this paper, comprising four dimensions as discussed in the following sections. This study will focus on offering a framework through which scholars, practitioners, and policymakers can predict, examine and regulate at the junction of FinTech and sustainability.

This paper aims to shed light on how FinTech can be harnessed strategically to fund the shift to a low-carbon, inclusive, and resilient global economy by developing a solid theoretical framework. Creation of such a framework is not simply an academic project, but an urgent practical necessity in the age of ecological crisis and digital opportunity. The digital and green agendas can be made to bring in unparalleled synergies, but it

will need clarity of purpose, consistency of action, and devotion to planetary long-term well-being. The following sections of this paper will explore the theoretical basis of the Green Digital Finance, critically assess the existing body of literature and outline the suggested theoretical framework with insights from case examples. The paper will focus on helping to build a better understanding of the potential of digital finance as a driver of sustainable change by grounding the discussion in theory and keeping an eye on the practical implementation of the issue under discussion.

2 Literature Review

Table 1: Literature Review Table

Author	Summary	Focus
Alla Abramova et al. (2024)	This study aims to merge FinTech tools with sustainability to create a digital green finance architecture for the Green Deal, and the creation of a regulatory system where resources are spent to develop climate-resilient financial technologies (Abramova et al., 2024).	• Ecosystem model of green financing is presented. • Political stability and state support are crucial for climate finance expansion.
Peehoo Jain et al. (2024)	This study examines FinTech's role in promoting sustainability and advancing UN's Sustainable Development Goals (SDGs) through financial inclusion, digital payments, and green finance, highlighting FinTech's potential to drive sustainable development with regulatory support and cross-sector collaboration (Jain et al., 2024).	• Financial inclusion enabled through innovative digital platforms. • Enhanced transparency and accountability through blockchain. • Improved risk assessment through InsurTech.

Cristina Chueca Vergara & Luis Ferruz Agudo (2021)	The author analyzes the relationship between FinTech and sustainability through a literature review and case study approach, highlighting the existence of many common aspects between them (Vergara & Agudo, 2021).	• Green Fin-Technologies helps to attain SDGs. • Businesses take help of Fin-Tech to disclose their ESG reports.
Eugenia Macchiavello & Michele Siri (2020)	Technology with sustainability will enable European Union to achieve the UN Sustainable Development Goals (SDGs) (Macchiavello & Siri, 2020).	• FinTech— can help in meeting Sustainable goals • Legal issues related to Fin-Tech needs to be tackled.
Maxwell Chukwudi Udeagha & Edwin Muchapondwa (2023)	BRICS countries heavily depend on non-renewable energy, emitting carbons; Technology with finance together— can reduce their carbon footprints (Udeagha & Muchapondwa, 2023).	• Nations can progress economically with Green Fin-Tech. • Environmentally-ill companies should be limited access to resources.
Mohammad Hasibul Hasan et al. (2024)	This paper examines the role of Fintech in promoting green finance by examining case studies and reviewing emerging technological innovations developed in the light of sustainability (Hasan et al., 2024).	• Lucidity of ESG disclosures can be verified with the help of Fin-Tech. • Fintech enriches financial useability— by widening the access.
Marco Dell'Erba (2021)	The authors believes that GDF: (i)has resulted due to reciprocation between technology and sustainability; (ii) has potential to sustain the environmental (dell'erba, n.d.; Dell'Erba, 2024).	• Regulatory framework and policies, which are innovation-supportive— create sustainable environment.

Zhiang Chen & Ruikun Xing (2025)	The Authors examined how digital innovations impact high-quality economic growth; the novelty of this paper was—considerable variance found between substantial and strategic green innovations (Chen & Xing, 2025).	• Quality economic growth can be speeded up with—green digital-innovations Strategic green innovations have lesser profound effect (shorter period impact), than substantial ones, which impact lasts for a longer period.
Megha Vimal & Rajiv Kumar (2024)	Author believes that Fin-Tech and Sustainability are mutually beneficial, in driving economic growth. This relationship can be made stronger when equipped with ethical standards and global collaborations (Vimal & Kumar, 2024).	• Fintech drives— (i) economic growth, (ii) financial inclusion, (iii) environmental responsibility. • Unified regulatory systems can enable globally-collaborated, sustainable-practices.
Valida Phalalum & Kalyaporn Panmarerng (2026)	The study focuses on sustainable growth among Thai listed firms; the coalition of AI analytics and ESG finance can— (i) improve decision-making, (ii)infuse financial strategies with sustainability goals (Phalalum & Panmarerng, 2026)	• Short term economic profits— may have negative impact on long term sustainability outcomes. • AI boosts ESG disclosure quality
I. V. Shkodina (2024)	Shkodina aims to explore the use of Fintech, such as AI and IoT, in the financial sector for a smooth transition towards sustainable practices; provide financial stability— through risk forecasting and analysis (Shkodina, 2024).	• Transparency in financial system— support sustainable initiatives. • Decentralization in financial system—creates new sustainable investment opportunities.

Md Sharif Hassan et al. (2026)	This study aims to describe the evolution of a new concept at the convergence of Fintech and Sustainable finance by conducting a B-SLR (Hassan et al., 2026).	• Critical research gaps exist related to systemic risk of Fintech. • FinTech risks can negatively impact sustainability. • There is a deficiency of a standardised regulatory framework controlling Green digital finance.
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Table 1 summarizes the initial study of literature to understand the role of FinTech in thriving Sustainability, leading to the emergence of a new concept at its intersection, which drives digital innovations towards achieving environmental and social objectives. The reviewed studies strongly depict FinTech as a promoter of sustainability by means of enhancing financial inclusion, transparent reporting, and AI-driven decision-making. On analysis, one of the themes that appeared from the literature is the convergence of digital technologies into the green finance system. The studies by Abramova et al. (2024), Hasan et al. (2024), and Jain et al. (2024) jointly vote in favour of FinTech as a tool to enhance efficiency and transparency of sustainable finance by improving ESG reporting and widening access to green finance. In fact, financial activities should be engaged in way to achieving sustainability goals. This literature focused on how FinTech enables: improved accountability towards stakeholders through AI-driven analytics—for data-driven decision-making and—enhanced transparency. This theme suggested that: due to the digital expansion, the existing system of Finance can be streamlined—into concocting a more socially responsible, Stakeholder-Centric, technologically progressive financial network.

Another significant theme unrolled from literature, were evidenced by the work of Authors such as: Dell’Erba (2024) and Macchiavello & Siri (2020), who critically analysed the importance of regulatory frameworks, for developing a controlled-environment for the technologically-enabled green finance system to thrive. They also reflected on state-support and innovation-supportive policies. Shkodina, (2024) and Chen & Xing, (2025) talked about the technological innovations system, specifically two points were mentioned: (i) the use of digital innovations like AI and IoT (Internet of Things), for improving financial stability and risk forecasting using data analytics; (ii) high economic growth can be attained with the help of green technological innovations. (Chen & Xing, 2025) also mentioned that—‘strategic innovations’ tend to have a lesser impact than ‘substantial innovations’ on the achievement of long-term sustainable goals. Further, it was added by (Phalalum & Panmarerng, 2026) that AI-based analytical tools (e.g., Temporal Fusion Transformer) can help the internal management of firms to find

ways to compare and analyse how financial performances improve when aligned with ESG standards, encouraging transparent and explicable financial decisions. Another significant contribution of FinTech, towards green finance distribution has been identified by the authors Hasan et al., (2024) and (Vimal & Kumar, 2024), who suggest that FinTech is a leading promoter of financial inclusion; it can widen access to financial services for the underserved population—through digital platforms. It also reduces operational costs of financial services.

However, there are certain risks associated with FinTech, which are technological in nature, if not taken care of, will negatively impact the attainment of sustainability goals. (Hassan et al., 2026) Specifically redirects the research towards the absence of a standardized global regulatory framework and vulnerabilities associated with FinTech, such as cybersecurity risks, digital divide and carbon footprint of technological innovations. These affiliated risks need to be addressed at the earliest to maintain the long-term effectiveness of financial technologies on sustainability.

Overall, the literature sheds light on the vitality of FinTech in today's financial system, widening the reach of green finance and enabling increased sustainable, informed investment decisions. FinTech has tremendous potential to promote sustainable finance; however, further empirical and conceptual studies are needed to better understand its convergence with Green Finance.

3 Research Methodology

3.1 Research Gap

At the intersection of FinTech innovation and sustainability requirements, Green Digital Finance is a new concept that has a high transformative potential. However, an in-depth study of the available literature reveals substantial research gaps that warrant further academic investigation. To begin with, most of the present studies have been done on “Green Finance” and “FinTech” individually, not putting much emphasis on their integrated study (Abramova et al., 2024). Most studies on “Green Finance” have focused on conventional financial instruments (e.g., green bonds, carbon trading), whereas the existing literature on “FinTech” is more concerned with technological efficiency, inclusion, and innovation, while largely disregarding environmental impact (Jain et al., 2024).

Further, meagerly any integrative research exist on—how digital financial technologies can be particularly utilized in order to drive sustainability outcomes (Jain et al., 2024). Moreover, studies on theoretical framework, explaining the evolvement of “Green Digital Finance”, isn't quite visible in the literature. It is also difficult for researchers to examine and suggest policies, without having references to its theoretical and conceptual background. The substantial number of present studies are: (i) descriptive, and (ii) concentrated in developed countries; creating a gap in the research, providing scope to

study the problems and opportunities in financially emerging countries, — particularly, in the underserved regions.

3.2 Research Objectives

RO1: To generate a conceptual framework on Green Digital Finance at the convergence of FinTech and sustainability finance.

RO2: To create a theoretical framework involving identification of key actors, mechanisms, and contextual factors that drive Green Digital Finance.

RO3: To examine the barriers and opportunities of adoption of Green Digital Finance in emerging economies.

3.3 Methodology

A qualitative and conceptual research methodology was adopted to do justice to the interdisciplinary nature of the study. A comprehensive literature review was done. The Boolean search string: ("FinTech" OR "Digital transformation") AND ("Green finance" OR "sustainable finance" OR "sustainability"), was search through Scopus database. Search was limited to— the field of “economics, econometrics and finance”. The author followed PRISMA guidelines (Page et al., 2021) to exclude the articles which fell out of domain. The process of selection has been depicted in Figure 1. The review included of 25 articles from Scopus.

Additionally, Google Scholar was search—for the period 2020 to 2026 (as this period aligned with the search results of Scopus); using the same set of keywords. This grey literature helped to understand the recent trends, deeply. The selected articles from Scopus and Google Scholar were classified into three prominent themes, — that are discussed under the section “Theoretical Framework” (Table 2). During the literature review process, a theoretical integration evolved. Table 3 summarizes the theories, which were connected through literature, to form a multidimensional framework. This theoretical synthesis shed light— on the FinTech and Green finance amalgamation, to achieve sustainability objectives. Further, a conceptual framework was presented as a flowchart to illustrate the main constructs and their relationships. The conceptual framework explained the dynamic relationships existing among key constructs: FinTech tools (e.g., Blockchain & AI); green finance instruments (e.g., green bonds and carbon credits); regulatory environments; sustainability outcomes. Green Digital Finance initiatives are examined using this theoretical and conceptual framework to gain deeper insights into the prevailing opportunities and constraints to their full-fledged regularisation and adoption. Although empirical analysis was beyond the scope of this paper, case studies of blockchain for carbon credit tracking or mobile payments for the consumption of renewable energy were referenced to support the conceptual model. In general, the approach allows developing a grounded, theory-based foundation of the future empirical study and policy-making in Green Digital Finance.

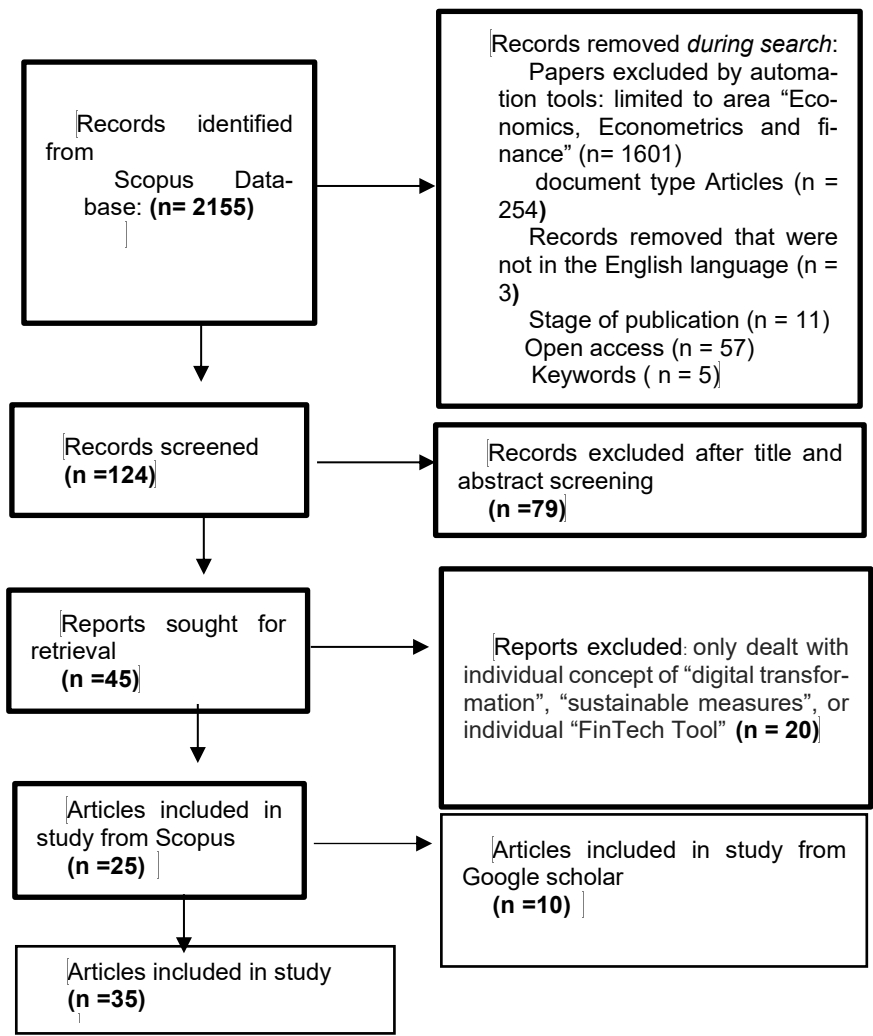


Figure1: PRISMA guidelines for Exclusion Criteria

4 Theoretical Framework

Table 2: Theoretical Framework Development

<i>Theme 1: Emerging Trends in Digital Finance</i>			
Author	Key Findings	Relevant Theory	Key Construct
Griffiths & Baudier, (2023)	Transparency and accountability can be enhanced by involving all stakeholders in blockchain implementation (Griffiths & Baudier, 2023).	Stakeholder Theory	Socio-environmental outcomes
Trotta et al. (2024)	FinTech such as AI and blockchain help in evaluating ESG data and transparency in ESG reporting (Saxena et al., 2022; Shahzad et al., 2023; Trotta et al., 2024)	Digital Transformation Theory	Digital Financial Technologies
Liu et al. (2026)	Digital inclusive finance promotes sustainable investments by providing easy access, and it enhances financial literacy in rural areas (X. Liu et al., 2026)	Ecological economics	Socio-environmental outcomes
Ghose et al. (2025)	FinTech tools such as digital payment systems, digital wallets, mobile banking services and crowdfunding enable affordable access to finance, promoting sustainable development (Ghose et al., 2025)	Innovation Systems Theory	Digital Financial Technologies

<i>Theme 2: Sustainability-compliant Innovations</i>			
Author	Key Findings	Relevant Theory	Key Construct
Ningsi et al. (2025)	Green innovations are eco-friendly, reduce ecological impact, and meet with sustainability standards (Ningsi et al., 2025)	Innovation Systems Theory	Green Finance Instruments
Wan et al., (2023)	Green bonds, green stocks and green credits in particular play a significant role in facilitating allocation of funds to sustainable projects in a largely populated	Ecological economics	Green Finance Instruments

	country like China (Wan et al., 2023)		
Duran & Tierney (2023)	FinTech can reduce ESG disclosure cost by automating the validation and normalisation of ESG data, thereby reducing errors (Duran & Tierney, 2023)	Digital Transformation Theory	Enabling Institutional Environment
Tomas et al. (2025)	Innovation facilitates transformation of green digital initiatives into financial benefits of MSMEs of Latin America (Tomás et al., 2025)	Innovation Systems Theory	Socio-environmental outcomes

<i>Theme 3: Institutional environment</i>			
Author	Key Findings	Relevant Theory	Key Construct
Kashif et al. (2026)	Along with ESG reporting frameworks, regulatory incentives such as tax benefits and subsidies encourage innovations in green financial markets (Kashif et al., 2026)	Institutional Theory	Enabling institutional environment
Bai et al. (2024)	Green taxonomies can help in evaluating sustainable AI practices by comparing models on the basis of their environmental impact (Bai et al., 2024)	Institutional Theory	Enabling institutional environment
Hasan et al. (2024)	Policies like regulatory sandboxes encourage green innovations by providing a deregulated, controlled environment for experimentation in adherence to specified standards (Hasan et al., 2024)	Institutional Theory	Enabling institutional environment

The theoretical framework gives the theories and conceptual paradigms that define the mechanisms, relationships and assumptions behind the Green Digital Finance. It also examines the extracted literature to identify interdisciplinary theories explaining how digital financial innovations may give rise to sustainability outcomes. Table 2 summarizes some of the most influential studies from the reviewed literature classified under

three predetermined themes for analysis. The key findings give more understanding into the study's theoretical relevance, setting the foundation for the theoretical framework.

Innovation Systems Theory

Core Idea: It is a network of actors who develop, support, or criticise innovations under an institutional environment that regularises the new technology (*Regional Innovation Systems*, 2009).

Relevance: FinTech is a financial innovation developed in an institutional environment where developers, users, and policy makers coexist. Adoption of GDF can be expediated by an Innovation system that encompasses the sustainability goals (Ghose et al., 2025; Ningsi et al., 2025)

Ecological Economics

Core idea: Ecological economics aims at limiting the use of natural resources to maintain the stock levels, along with promoting sustainability (*Resource and Environmental Economics*, 2009).

Relevance: GDF should consider the environmental cost associated with resource exhaustion and must encourage allocation of funds to sustainable projects that would replenish the natural resources instead of exhausting it (J. Liu et al., 2023; Wan et al., 2023).

Institutional Theory

Core Idea: Institution refers to the rules, norms and regulations that shape the creation of any organisation or practice, creating more trust and acceptability in society (Scott, 2014).

Relevance: FinTech solutions that adopt sustainable approach are governed by various sustainable regulatory framework and ESG standards, also benefit from policies promoting and supporting Green Digital Finance (Bai et al., 2024; Hasan et al., 2024; Kashif et al., 2026)

Digital Transformation Theory

Core Idea: Digital transformation delivers high value digital services in consultation with stakeholders and forms new frameworks (Mergel et al., 2019) (*European Commission*, 2017)

Relevance: FinTech facilitates emerging business models such as AI and blockchain helping in evaluating ESG data also carbon credits to access green finance supporting green ventures (Saxena et al., 2022; Shahzad et al., 2023; Trotta et al., 2024)

Stakeholder Theory

Core Idea: Organizations must consider all stakeholders, not just shareholders, in making significant decisions to satisfy their needs, in order to sustain in society (Mahajan et al., 2023).

Relevance: Transparency and accountability can be enhanced by involving all stakeholders in blockchain implementation as it is imperative to include them to build a sustainable financial solution (Griffiths & Baudier, 2023).

Table 3: Summary Table of Theoretical Framework

Theory	Contribution to Green Digital Finance
Innovation Systems	Understanding technology and policy interaction
Ecological Economics	Embedding environmental sustainability in finance
Institutional Theory	Role of regulation and governance
Digital Transformation	Disruption and evolution of financial service models
Stakeholder Theory	Multi-actor engagement for inclusive finance

5 CONCEPTUAL FRAMEWORK

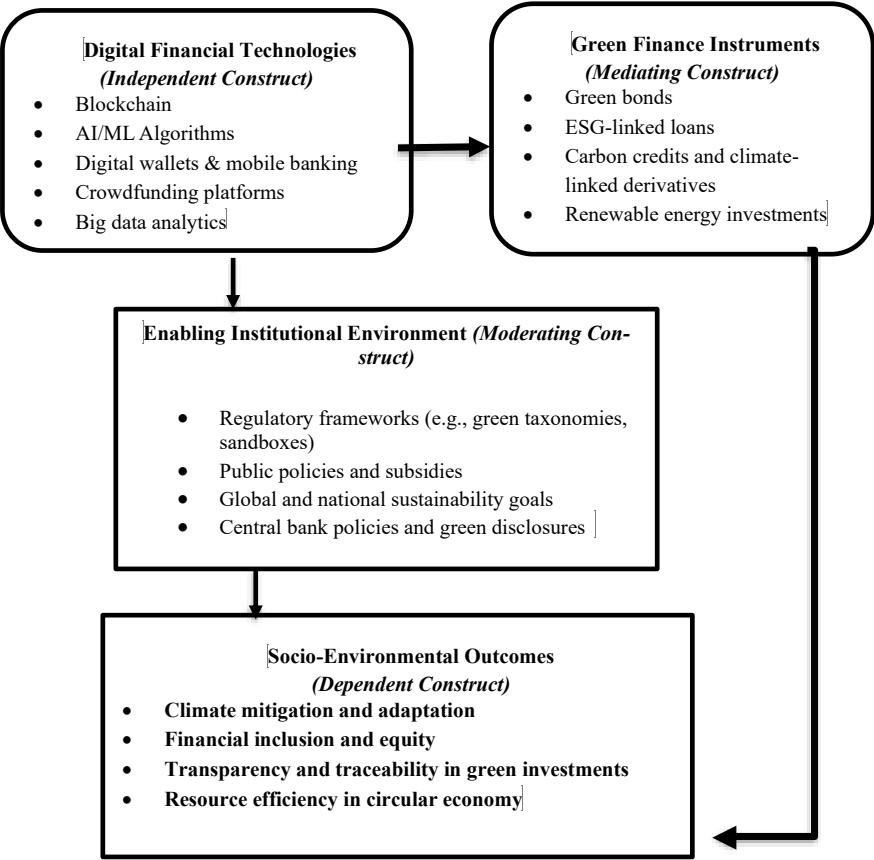


Figure 2: Conceptual Framework

5.1 Interrelation of Constructs

The proposed framework synthesizes the four dimensions as discussed earlier to explain how financial technologies support sustainable development. All of these constructs and their interrelationship is discussed below.

Digital Financial Technologies

Digital Financial Technologies are the digital innovations in the system of finance that improve its accessibility, efficiency, and transparency in investment decisions. This construct is measured through the adoption of blockchain and AI for transactions, mobile banking and crowdfunding platforms for financial inclusion, and data interpretation through big data analytics (Trotta et al., 2024). Technologies act as an enabling factor that improves the reliability of sustainable finance instruments by reducing transaction cost, enhancing transparency and widening the reach (Ghose et al., 2025; Trotta et al., 2024).

Green Finance Instruments

Green Finance Instruments are the environment friendly financial tools purposefully designed to promote investments in green sustainable projects. Green bonds, green stocks and green credits in particular play an important role in facilitating allocation of funds to sustainable projects (Wan et al., 2023). Thus, this construct mediates the relationship between digital financial technologies and sustainability outcomes.

Enabling Institutional Environment

The regulatory frameworks, policies and regularized ecosystem that enable and supports the implementation of green digital finance constitute its Institutional Environment. Along with ESG reporting frameworks, public policies and green taxonomies, regulatory incentives such as tax benefits and subsidies encourage innovations in green financial markets (Kashif et al., 2026). This construct strengthens the relationship between digital financial technologies and green finance instruments by reducing uncertainty, and encouraging stakeholder participation.

Socio-Environmental Outcomes

Socio-environmental outcomes can be measured through the sustainability impacts of green digital finance initiatives such as financial inclusion, transparency in green investments, and resource efficiency (Griffiths & Baudier, 2023; J. Liu et al., 2023;

Tomás et al., 2025). This construct is the ultimate outcome (dependent) of the framework that demonstrates how technological and financial innovation can support achievement of SDGs (Ojukwu et al., 2024).

6 Fintech In Green Finance

Due to the pressing issues of climate change and the need to shift to a low-carbon economy, Fin-Technology is viewed as an essential facilitator of financial access democratization, greater transparency, and the ability to establish organized ecosystems facilitating sustainable development objectives (SDGs) (Jain et al., 2024). Digital technology in financial system can not only transform how conventional organisation perform but also harmonize the flow of capital with environmental responsibility and bring in a new paradigm of Green Digital Finance. A profound benefit of FinTech to green finance can be seen in the realm of financial inclusion. Infrastructural, geographical or economic barriers continue to keep millions of people in developing economies and emerging economies unbanked or underbanked. FinTechs like mobile banking, digital wallets, and peer-to-peer lending platforms can help decrease these barriers by providing affordable, easy-to-use, and accessible financial services (Adesola Oluwatosin Adelaja et al., 2024). Jain et al. (2024) argue that these types of innovations allow marginalized groups to engage in green investment opportunities such as financing rooftop solar panels to micro-loans to support sustainable farming practices.

Such democratization of finance access facilitates equity as well as increases the overall ability of societies to finance climate-friendly projects. As a case-study, the use of mobile-based savings systems in Africa has enabled rural populations to invest in clean energy items like solar home units, which are a direct contribution to SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action) (Li et al., 2023). In addition to enhanced financial access, FinTech also enables transparency and accountability in disbursement and application of green finance. Real time tracking and reporting of financial transactions are possible with the help of advanced digital tools such as blockchain, Artificial Intelligence (AI) and Data analytics (Hasan et al., 2024; Ojukwu et al., 2024). According to Jain et al. (2024), blockchain provides decentralized records that minimize the risks of greenwashing, to check companies that claim to be environmentally responsible. Blockchain increases stakeholder trust and regulatory compliance by ensuring that the funds that are invested in green projects are optimally used towards sustainable objectives. AI and machine learning also contribute value by evaluating climate risk, forecasting sustainability trends, and maximizing green investment portfolios (Hasan et al., 2024). FinTech also contributes to creating a supportive environment for green finance to drive systemic change.

Abramova et al. (2024) state that to establish an integrated and responsive environment for GDF, different players, including governments, financial institutions, technology providers, consumers, and regulators, should be connected using digital infrastructure.

Financial institutions and regulators can also use FinTech: - (i) to evaluate their ESG standard-compliant reporting and disclosures, (ii) to track utilization of funds, to avoid green washing (Wan et al., 2023). FinTech can bring about a 360-degree change in the field of green finance, mandating to include all stake-holders, in the integrated interface of GDF (Duran & Tierney, 2023).

However, the benefits of FinTech, are backlashed by some persistent challenges faced, which needs immediate attention. The most common fear is that the digital advancements will increase the technological ignorance, particularly in backward areas (Ghose et al., 2025; X. Liu et al., 2026). This may be due to lack of improved digital-infrastructure, technological-awareness, and most commonly, resistance to change. Another paradoxical aspect of sustainability in digital finance is that the carbon footprint of some Fin-tech such as blockchain mining can be counterproductive to environmental objectives (Devidze, 2022; Soltani, 2024). The essence of sustainable FinTech design should be based on energy efficiency, user accessibility, and ethical governance to overcome these concerns (Soltani, 2024).

7 Discussions

Global climate crisis has made it indispensable for nations— to take rigorous steps, to align their economic actions, in consonance with sustainability goals. The arguments in “favour of” or “against” the importance of Fin-Tech in sustainability-finance is discussed to come to conclusions. Fin-Tech in green finance, equipped with continuous innovations, can help nations in meeting these goals, substantially (Soltani, 2024). However, delineated challenges associated with Fin-Tech innovations (e.g., financial exclusion, carbon footprint, transparency), and— it’s regularization, is yet to be confronted.

The works of (Jain et al., 2024; X. Liu et al., 2026) have hinted at FinTech’s impactful role in widening the access to financial services (though mobile banking, digital platforms, etc) to rural areas; where people still don’t have direct links with banks.

Moreover, there are specific Fin-Technologies (e.g., Blockchain), — that keep check on corporate greenwashing. Blockchain-technology fortifies investor against false claims of corporates. (Jain et al., 2024) helped us to understand, by exemplifying IBM’s food trust case. IBM’s stakeholders were allowed to trace their product’s origin; which led to: (i) reducing wastes, and (ii) increasing transparency. All stakeholders (including Actors, financial institutions, and users), in the realm of GDF, need to supervised, controlled and protected (Bai et al., 2024; Hasan et al., 2024). This supervision awaits an institutional framework. (Abramova et al., 2024) suggests that setting forward a fully-fledged GDF ecosystem, requires an institutional framework, — that will allow inter-regional collaborations worldwide; in meeting sustainable goals.

Having said that, the challenges encompassing GDF, cannot be disregarded. The work of (Hasan et al., 2024; Soltani, 2024) suggests that, the most significant issue in developing countries, is the lack of digital infrastructure. Lack of digital literacy, is another hindrance in the path of GDF.

Moreover, the exorbitant consumption of energy, by Fin-Tech tools (e.g., blockchain and data analytics), heightens the risk of carbon emissions, making climate conditions worse; this discredits the positive impacts of technology in green finance (Broby & Yang, 2025; Soltani, 2024).

Therefore, we assume, that it is obligatory on the part of regulators to keep in check the carbon footprint of technology; and for innovators to make them more climate resilient. This wouldn't be possible without a standardized regulatory framework, as suggested by (Kashif et al., 2026). Developed economies have developed ESG reporting standards (which differ from country to country); emerging economies still fail to adopt one due to no uniformity.

In conclusion, if FinTech is made more reliable and effective, with proper regularization, then it can sustainably channelize green finance, for achieving sustainable goals.

8 Conclusion and Future Discussions

The amalgamation of Digital-Technology, brought in line with sustainability; is stepping into a role to create a more environment-friendly financial system. Finance + Technology = FinTech, has really played a great role by providing smooth and user-friendly experience. Subsequently, it can also benefit the field of green finance, by widening the access and managing the allocation of capital. Blockchain-Tech help user to track that the funds sanctioned, are invested into environment friendly and sustainable goals (Ojukwu et al., 2024). Therefore, one of the eminent achievements of Fin-Tech is to ensure transparency and answerability. Blockchain-Tech evaluates the ESG claims of companies, thereby, prevent fraud against investors and reduce the risks of green washing. At the same time, Data Analytics and AI tools help financial institutions to understand the environment risks and to take better decision (Ojukwu et al., 2024).

Notwithstanding that, the field of GDF still grapples with persistent challenges; which needs quick redressal. Fin-Tech is still not able to reach to rural areas. Some innovations, are not compatible with the environment, due to huge energy consumption. And, there is deficiency of set of rules and regulations, to use data securely.

Future Research Directions

Our comprehensive study is limited to developing a theoretical and conceptual framework, to understand the concept of GDF. Our findings suggest for establishing a regularized environment for GDF; and institutional ecosystem for encouraging sustainability-enabled innovations. Therefore, it is recommended to researchers to: (i) evaluate

present policies and develop a standardized regulatory framework; (ii) carry out evidence-based research, to verify the conceptual framework. Additionally, researchers should study about, what is the impact of digital financial infrastructure into environment across different regions (Ojukwu et al.,2024).

At Last, in Conclusion FinTech has great potential to modify green finance, but its success is depended on proper governance, cooperation and coordination in between stakeholders, which will lead to achieve long term sustainable goal.

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