Financial Risk and Management Reviews
2025 Vol. 11, No. 1, pp. 37-71
ISSN(e): 2411-6408
ISSN(p): 2412-3404
DOI: 10.18488/89.v11i1.4076

Greenwashing within the context of financial technology and sustainable development: Conceptual frameworks and theoretical perspectives

Tipon Tanchangya[1+]
Asif Raihan[2]
Md Rakib Mia[3]
Ummah Tafsirun[4]
Kamron Naher[5]
Naimul Islam[6]
Fahad Rashid[7]
Shoaibur Rahman Sarker[8]

[1]*Department of Finance, University of Chittagong, Chittagong 4331, Bangladesh.*
Email: tipon.tcg.edu@gmail.com
[2]*Institute of Climate Change, Universiti Kebangsaan Malaysia, Bangi 43600, Malaysia.*
Email: asifraihan666@gmail.com
[3]*Department of Business Administration, Ahsanullah University of Science and Technology, Dhaka -1212 Bangladesh.*
Email: mdrakibmia087@gmail.com
[4]*Department of Business Administration, Noakhali Science & Technology University, Noakhali-3814, Bangladesh.*
Email: ummah.tafsirun@gmail.com
[5]*Department of Business, Presidency University, Dhaka-1212, Bangladesh.*
Email: naherk@pu.edu.bd
[6]*Department of Accounting, Finance and Economics, University of Greenwich, London SE10 9LS, UK.*
Email: naimmgtdu75@gmail.com
[7]*Centre for Islamic Finance, University of Bolton, Bolton BL3 5AB, UK.*
Email: fr7bbs@bolton.ac.uk
[8]*School of Business and Law, Northumbria University, 110-114 Middlesex Street, E1 7HT, London, UK.*
Email: shoaibur.fin.du@gmail.com


(+ Corresponding author)

Article History
Received: 2 December 2024
Revised: 6 January 2025
Accepted: 27 January 205
Published: 31 January 2025

Keywords
Conceptual framework
Financial technology
Greenwashing
Sustainable development goals
Theoretical background.

ABSTRACT

The study aims to explore the greenwashing phenomenon in the context of FinTech and sustainable development and analyze the conceptual frameworks and theoretical perspectives that connect greenwashing, FinTech, and sustainable development. A qualitative approach was employed in this research, which was primarily based on secondary data. The findings show that FinTech significantly contributes to sustainability by promoting environmental conservation, economic growth, and financial inclusion across various SDG domains. Additionally, the theoretical perspectives examine key theories (stakeholder theory, legitimacy theory, signaling theory, and institutional theory) and highlight how greenwashing practices might influence the FinTech sector. Furthermore, this study draws attention to the potential economic, social, and environmental impact of greenwashing on FinTech. Finally, the study offers valuable insights for strategy formulation to prevent companies from making misleading environmental claims. Above all, the present study makes a substantial contribution to the ongoing debate regarding the links between greenwashing, FinTech, and sustainable development.

Contribution/Originality: This research integrates greenwashing within the FinTech solutions and sustainable development goals (SDGs). The research fulfils the literature gap of conceptual framework and theoretical perspective to prevent greenwashing. This study offers insights into the way to associate FinTech and SDGs as well as preserving moral practices.

1. INTRODUCTION

1.1. Background and Role of FinTech in Sustainable Development

Nowadays, an increasing number of new challenges impact financial management. This is due to the increasing digital transformation and the growing concerns of customers about environmental sustainability and respect in the products they purchase (Chueca Vergara & Ferruz Agudo, 2021). Traditional banks, FinTech, FinTech startups, and fully digital banks have all helped fuel the expansion of the financial products and services available in the modern economy (Klimontowicz, 2023). The banking industry is at the forefront of the financial technology (FinTech) revolution that is reshaping the industry and providing financial institutions with numerous advantages through the use of smartphones, AI, the Internet of Things (IoT), and blockchains (Dwivedi, Alabdooli, & Dwivedi, 2021; Tanchangya et al., 2024b). The new digital realm has presented traditional banking institutions with substantial challenges, forcing them to adjust their operating models. The emergence and growth of FinTech have significantly impacted the financial industry.

Research on the effects of financial technology on long-term sustainability is an emerging area. It is believed that the offerings of FinTech can be pushed to use to accelerate social development and aid in the attainment of the Sustainable Development Goals (SDGs) (Dwivedi et al., 2021; Klimontowicz, 2023). In addition, there is no doubting the evident social, environmental, and ecological advantages of this technology's implementation, which is driving investment in energy and environmental initiatives, renewable energy usage, and green infrastructure development (Deng, Huang, & Cheng, 2019). Furthermore, a more accessible, secure, and inexpensive financial system can be achieved through the use of FinTech, which, along with better service quality, can lead to a more stable, diverse, and user-friendly financial environment (Moro-Visconti, Cruz Rambaud, & López Pascual, 2020; Tanchangya, Raihan, Rahman, Ridwan, & Islam, 2024a). FinTech has made it easier for financial sectors to handle risks by incorporating new technologies with financial innovations like big data analysis and cloud computing. FinTech aims to speed up the integration of real and financial economies, creating more decentralised opportunities for sustainable growth (Castilla-Rubio, Robins, & Zadek, 2016). FinTech has the potential to accelerate the adoption of green finance, a method of investing that ensures both economic and environmental sustainability (Yang, 2020). Thereby, FinTech stands out as the most "revolutionary" technology in the financial services industry because it uses technology such as Artificial Intelligence (AI) and machine learning. These technologies facilitate data collection to determine customers' ESG ratings and encourage the funding of renewable energy projects that generate social, environmental, and ecological benefits (Chen, Siddik, Zheng, Masukujjaman, & Bekhzod, 2022; Rahman, Tanchangya, Rahman, Aktar, & Majumder, 2024; Zhou, Tang, & Zhang, 2020). FinTech contributes to SDGs by promoting financial inclusion and directing resources towards sustainable uses, providing access to diverse products and services to meet customer needs sustainably (Chueca Vergara & Ferruz Agudo, 2021; Dwivedi et al., 2021).

1.2. Definition and Relevance of Greenwashing in FinTech Sector

The need to battle climate change and reach sustainable development goals is becoming increasingly apparent as fintech grows in popularity. Ecological or environmentally friendly goods are in high demand as people seek to live more sustainably in response to the growing wave of environmental consciousness about the dangers of climate change. Pressure from customers, investors, and government agencies is increasing on firms to be more transparent about the environmental effects of their operations (Chueca Vergara & Ferruz Agudo, 2021). But with this development comes a growing concern: the proliferation of greenwashing practices in the business sector. Companies engage in "greenwashing" as a deceptive marketing strategy to attract environmentally conscious investors and consumers (Pimonenko, Bilan, Horák, Starchenko, & Gajda, 2020; Raihan et al., 2024).

Companies' misleading or false advertising techniques that falsely represent their environmental obligations are referred to as "greenwashing" (De Freitas Netto, Sobral, Ribeiro, & Soares, 2020; Delmas & Burbano, 2011).

Without real commitment or influence, it is the advertisement of sustainable financial products or services that undermines initiatives for sustainability (Seele & Gatti, 2017). This refers to a pattern of fraudulent behaviour that makes a product or company seem more environmentally friendly than it actually is, with the intent to deceive customers into buying it. This type of marketing misleads consumers by describing a product's environmental features in a way that is difficult to understand by making ecological claims that are not backed by evidence or by making exaggerated claims about the product's environmental features while concealing or omitting relevant facts (Chueca Vergara & Ferruz Agudo, 2021; Rahman, Rahman, Tanchangya, & Esquivias, 2023).

People around the world are becoming more aware of the misleading or outright false environmental claims that businesses, non-governmental organizations (NGOs), and even governments make when they communicate about their plans to deal with environmental and climate problems. Organizations can exploit such claims to boost their reputations, customer and employee relationships, or short-term profitability. However, they are unlikely to implement the real changes that are needed to quickly lessen their harmful effects on the environment (Nemes et al., 2022). Greenwashing is still prevalent even if people are becoming more aware of it. When viewed from the lens of fintech, an area where new, sustainability-focused financial products have been made easier to create and market because of the combination of technology and finance, this issue takes on further significance. There have been cases where fintech companies have positioned their investing platform as eco-friendly, promising to reinvest in green projects and sustainable companies. Investments made by companies could be greenwashed if they don't conduct impact assessments or comply with established environmental guidelines.

1.3. Objectives and Structure of the Study

The objectives of this study are to investigate greenwashing and its effects on FinTech and sustainable development and to analyze the conceptual frameworks and theoretical perspectives that underpin the relationship between fintech, sustainability, and greenwashing. In section 2, conceptual framework is discussed. Section 3, 4, 5 and 6 discussed on theoretical perspective, greenwashing Impact on FinTech, case studies, strategies to reduce greenwashing respectively. Finally, conclusion is shown in section 7.

2. CONCEPTUAL FRAMEWORK

2.1. Conceptual Framework for Understanding Greenwashing

2.1.1. Historical Background and Evolution of Greenwashing

This practice of "greenwashing" is not new, and it's not a response to consumer demands for environmental protection. It was actually well-known as early as the mid-1980s (Dahl, 2010). The term "greenwashing" was initially introduced by American environmentalist Jay Westerveld in 1986 to denote the falsified environmental practices that hotels implement in their daily operations. A new term has been coined by combining the words "green" and "bleaching." "Green" means healthy, natural, and environmentally friendly. To use the term "bleaching" to describe the process of "washing away the material with water" For this discussion, greenwashing can be understood to mean the practice of applying a false green colour to an object in order to conceal the actual colour (Wang et al., 2023). On the contrary, Mitchell and Ramey (2011) stated that greenwashing is a hybrid of "green" and "brainwashing," using the second term in reference to environmental issues. Therefore, greenwashing arises when companies try to resolve the conflict between how much they really care about the environment and how much they try to play a role in greenwashing. Scholars characterised greenwashing as a tactic that is founded on disclosure (Cooper, Raman, & Yin, 2018; Lee & Raschke, 2023) and may be affected by external constraints, incentives, or forces that shape the institutional atmosphere where the strategies of falsely reporting green initiatives are made (Li, Li, Seppänen, & Koivumäki, 2023; Seele & Schultz, 2022; Velte, 2022).

Many academic fields have looked into the idea of "greenwashing," and it has also been brought up in discussions among different government agencies and NGOs. Legal studies, production engineering, environmental

studies and management, advertising, ethics, and marketing are just a few of the areas that have contributed to its conceptualization and understanding. Social science has also played a role. Given the multitude of opinions, it's not surprising that there is no widely agreed-upon definition of greenwashing. Concepts of greenwashing are also constantly changing in response to the issue's growing significance and attention, making it a shifting target in discussions among academics, practitioners, and policymakers (Nemes et al., 2022).

2.1.2. Types and Characteristics of Greenwashing

Greenwashing occurs when a company or organisation misleads its customers about its environmental practices (firm level) or the ecological benefits of its products and services (product/service level) (Delmas & Burbano, 2011). Greenwashing can take various forms. Prior research has mostly focused on two main categories of greenwashing: claim and execution greenwashing.

So far, most studies have been conducted regarding product or service-level claims of greenwashing. This is when companies make an environmental claim about a product or service that isn't true by using textual justifications that directly or indirectly highlight how beneficial it is for the environment (De Freitas Netto et al., 2020). Other kinds of claims, all taken from existing (Nemes et al., 2022) studies, are also used in greenwashing. a) Selective disclosure claims: based on a small number of characteristics, divert attention away from the broader environmental effect of the company. b) Empty claims: when company policies or claims either overstate their accomplishments or do not deliver on their commitments. c) Irrelevant claims: statements about achievements that are either inconsequential or compelled by law or rivals. d) Lies: statements are completely false. e) Just not credible: when a potentially harmful or divisive action, policy, or product is portrayed as having environment-friendly benefits. f) Dubious certifications and labels: the claim has certifications that are easy to counterfeit. g) Political spin: proclaims its commitment to environmental sustainability while actively opposing environmental legislation. h) Vagueness: the idea is not clearly articulated, and hence, the intended significance is ambiguous. i) Jargon: The claim's language and facts are difficult for the consumers to understand and evaluate clearly. j) Misleading symbols: a deceitful impression of the organisation's eco-friendliness is created by the usage of symbols and images.

Further, claim type and claim deceptiveness were the two categories of green claims that Carlson, Grove, and Kangun (1993) proposed. In the first category, there is product orientation, which emphasises the ecological features of the product or service; second, process orientation, which emphasises the ecological features of the production process or technology; third, image orientation, which emphasises the creation and enhancement of an environmentally friendly company reputation, for example, by showing pro-environmental activities and initiatives; fourth, environmental fact, which includes claims including an organisation's allegedly factual statement regarding the environment as a whole; and finally, combination, which includes at least two of these types of approaches. The second category includes: a) vague or ambiguous: claims that are ambiguous, unclear, and not precise; b) omission: claims that lack the information required to evaluate their validity; c) false/outright lie: claims that are misleading or fabricated; d) combination: claims that fall into two or more of the above categories; and e) acceptable: claims that have no false elements.

Executional greenwashing was defined by Parguel, Benoit-Moreau, and Russell (2015) as a new type of greenwashing. This greenwashing tactic avoids making any of the above-mentioned claims to attract consumers. It rather uses imagery depicting natural aspects, such as the green and blue colours or the sounds of the ocean or birds. For example, materials that evoke nature in an execution could be backgrounds depicting mountains, woodlands, or beaches; images of endangered animals like pandas or dolphins; or renewable energy sources like wind or waterfalls (Parguel et al., 2015). Intentional or not, these aspects that portray nature could lead people to believe that the company is environmentally friendly erroneously. These elements can stimulate subconscious

allusions to the environment through nature visuals, consequently sparking ecological inferences subtly (Hartmann & Apaolaza-Ibáñez, 2009; Parguel et al., 2015).

2.1.3. Mechanisms of Greenwashing

Jones (2019) highlights that the act of greenwashing cannot be accurately uncovered through the evaluation of company narratives, whether through quantitative or qualitative methods, in commercials, corporate sustainability reports, or any other form of corporate disclosure. Ultimately, it is impossible to evaluate these narratives for truthfulness because they are highly volatile, and the customer's focus is too automatically diverted. Analyzing how greenwashing functions needs a way of thinking about the systems that allows for a more closely orientated view of how greenwashing acts. An examination of the three levels of analysis—micro (the product), meso (the company), and macro (the industry)—in this conceptual framework for greenwashing would be necessary. Considerations of alternative products, competitors, and industry standards help us make sense of how greenwashing occurs. To broaden the scope of greenwashing, Seele and Gatti (2017) propose including the idea of subjectivity. They claim that the term "greenwashing" is subjective; that is, certain stakeholders might perceive a particular green message as greenwashing, and others may not. Therefore, it emphasizes that greenwashing cannot exist in the absence of accusations. In simpler terms, greenwashing does not occur until a stakeholder group claims so. This further supports the argument of the ambiguous nature of greenwashing, as it is not a black-and-white concept.

When stakeholders learn the truth about a greenwasher, the tactic works temporarily, but it damages the company's reputation and takes a long time to recover (Ferrón-Vílchez, Valero-Gil, & Suárez-Perales, 2021). As an added downside, greenwashing can make stakeholders lose faith in a company and their investment plans (Pizzetti, Gatti, & Seele, 2021). Thus, businesses should think about the potential consequences since they can impact the market in unexpected ways. Misleading communications influence the actions and attitudes of stakeholders, which in turn affect the credibility and image of the company; therefore, businesses must embrace a more genuine communication approach while making green claims (Torelli, Balluchi, & Lazzini, 2020).

2.2. Financial Technology

2.2.1. Definition and Scope of FinTech

Fintech (financial technology) is the technology and innovation that aims to deliver competitive financial services through cutting-edge technologies like artificial intelligence, robotics, or blockchain. FinTech is an umbrella term that describes many kinds of applications (mobile banking, online payment processing, automated investment services, and more) and cryptocurrencies. By utilizing modern technology, FinTech aims to provide financial services in the most efficient, cost-effective, and accessible way possible.

FinTech is a broad term that can be applied to almost any sector of the financial services arena or new financial products that have been previously unavailable or not easily accessible. This revolution, driven by technology, is currently changing the landscape of the value proposition of financial services by creating new distinctive models of operations, increasing the accessibility of financial services products, and improving the experience of customers. Statista (2023) stated that the global FinTech market was valued at $127 billion, which shows that the market is still growing steadily. In 2018, the total value reached 66 billion USD, and it predicts that the CAGR will be around an annual growth rate of 24.8% from 2019 to 2025; the worth of the digital twin market will reach $460 billion in 2025. Therefore, FinTech has become a fundamental enabler of the new economy, as is evidenced by its exponential growth.

2.2.2. Key Areas of FinTech

The FinTech sector comprises several key areas, each contributing uniquely to the financial services landscape. These areas include Blockchain, Crowdfunding, Digital Banking, Peer-to-Peer Lending, Mobile Banking Payments, InsureTech, and Robo-Advisors.

Figure 1 presents key fintech solutions and their individual market value and expected growth between 2021 and 2030.

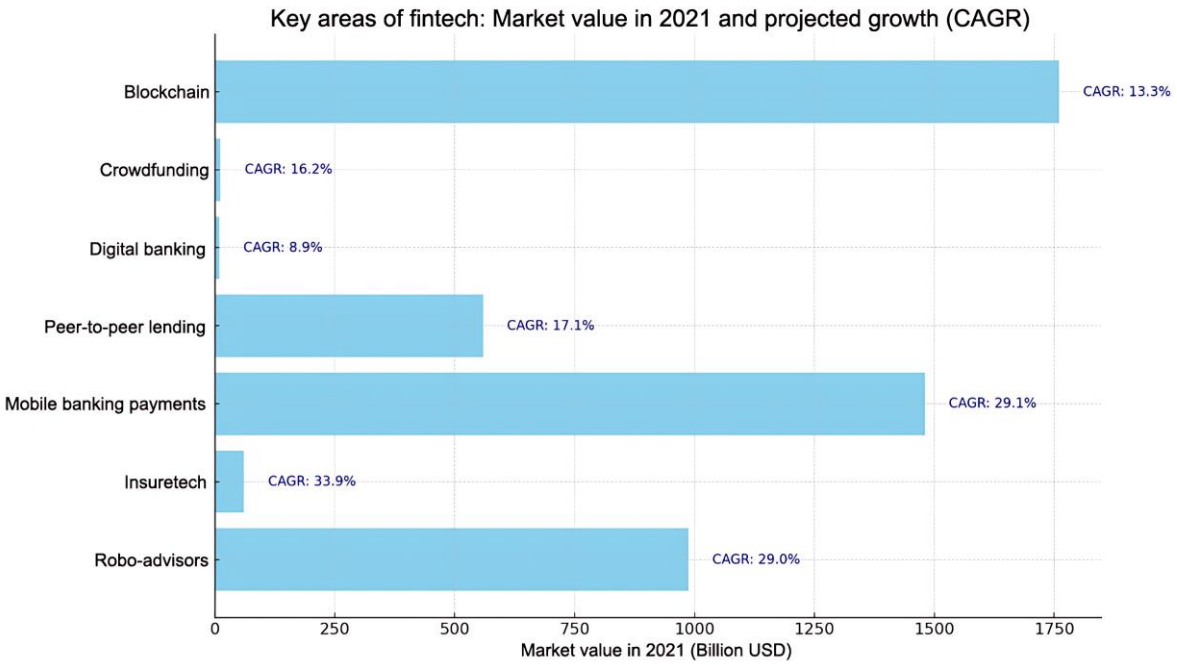

Figure 1. Market value and growth projections of key fintech areas (2021-2030).

- Blockchain: Blockchain technology is one of the most disruptive innovations in FinTech. Information is saved on several computers in a distributed ledger system with a permissive consensus mechanism, providing transparency and security over the data records. The most famous use case for blockchain is in cryptocurrencies like Bitcoin and Ethereum, though it has far more applications beyond digital money. With its ability to ensure safe and transparent transactions, blockchain technology is a game-changer in the fight against fraud in the financial sector. It is not limited to activities such as cross-border payments and trade finance. PwC (2022) anticipates that blockchain will contribute $1.76 trillion in growth across a range of sectors globally, with financial services being a primary beneficiary. These factors have made blockchain the backbone of numerous FinTech advancements, as it eliminates intermediaries and enhances trust, thereby making financial transactions more secure.
- Crowdfunding: Crowdfunding is yet another substantial activity in FinTech. These platforms make it possible to raise capital for a wide range of projects or funding opportunities for both individuals and organisations from many individuals, particularly over the Internet. Crowdfunding has made it easier for startups, small businesses, and individuals to access capital without constantly engaging and relying on the typical financial sector. Platforms like Kickstarter, Indiegogo, and GoFundMe have transformed fundraising by offering direct connections between creators, entrepreneurs, and donors. For example, the global crowdfunding market was worth $12.27 billion in 2021, according to the Cambridge Centre for Alternative Finance (2022) with a prospective future of more people patronising the platform.
- Digital Banking: Digital banking is the term used in the retail industry for servicing using electronic payment systems. It allows customers to conduct transactions and receive various services through mobile apps or websites of registered financial institutions. Digital banking has transformed how customers have traditionally

interacted with banks—it is faster, more convenient, cheaper, and, in many cases, provides better customer service. Another developing concept is neobanks without a physical presence, which have received much attention recently. Examples of these include Chime, N26, and Revolut. Such services these banks provide are online savings accounts, payment transfers, investments, etc., at comparatively lower charges than the large-scale banks. The global size of the digital banking market was estimated to be and is expected to reach $9.4 billion in 2021, and it is estimated to show an 8% CAGR through the following years. 9% from 2022–2030.

- Peer-to-Peer Lending: Peer-to-peer (P2P) lending platforms are those venues where individuals can lend or borrow money directly from or to each other without the involvement of a traditional bank or financial institution. These platforms connect people looking to lend with borrowers, which usually provides better rates for everyone. P2P lending has also emerged as one of the most critical segments of the overall FinTech space, which helps different categories of borrowers who cannot get loans from banks regularly for specific reasons, such as lack of credit history. LendingClub and Prosper are available, and through them, a few billion dollars for different loans have been provided, thus increasing access to credit. Thus, Statista (2023) revealed that the P2P lending market is expected to grow to $558 billion worldwide. Up to 91 billion by 2027, the demand for non-banking institutions will only increase due to the need for new types of credit products.
- Mobile Banking Payments: Mobile banking payments represent a significant portion of the FinTech industry. Users can make financial transactions directly through their smartphones, including everything from moving money to paying bills or even tapping a mobile app at the point of sale in-store. The emergence of mobile payment systems like Apple Pay, Google Wallet, and Alipay has made cash transactions almost extinct, especially in emerging markets with high smartphone penetration. As per Allied Market Research (2022) the global mobile payment market was valued at $1.48 trillion in 2021 and is expected to reach $12.06 trillion by 2030, registering a CAGR of 29.1% from 2022 to 2030.
- InsureTech: InsureTech, a division of FinTech, is at the forefront of transforming the insurance industry. It uses technological means to create new pathways and sometimes acts as an intermediary for economic development. By revolutionising how insurance is distributed, data-driven InsureTech companies significantly enhance the user experience and financial performance of transactions. They also introduce new payment products that are more tailored to specific needs, reshaping the insurance industry. InsurTech innovations include usage-based insurance, on-demand insurance, and peer-to-peer models. Startups such as Lemonade and Root have redefined insurance services with lower premiums, simplicity, and transparency compared to traditional methods. The global InsureTech market is predicted to reach $60.98 billion in 2028 from the projections of Accenture (2023) pushed by the growing utilisation of digital technologies in insurance technology, as reported here.
- Robo-Advisors: Robo-advisors, with their user-centric approach, are self-service applications that provide financial advice and management recommendations based on advanced algorithms with no human intervention. They offer investment strategies tailored to the user's risk profile, budget, and time preferences, making the user feel considered and important. Robo-advisors have made consulting affordable due to their relatively low-cost solutions, which otherwise would have been out of reach for most individuals. This has enabled firms such as Betterment and Wealthfront to emerge as some of the most prominent robo-advisors, managing several billions of dollars. The global robo-advisors market was worth $987 million and is expected to grow at a compound annual growth rate (CAGR) of 18% over the next five years. It was valued at $4 billion in 2021, and its market is projected to rise at a CAGR of 29% between 2022 and 2030 (Research and Markets, 2023).

Following Table 1 presents the key fintech solutions, their definition, market size, and project growth:

Table 1. Key areas of fintech.

Key area	Definition	Market size (2021)	Projected growth
Blockchain	Decentralized ledger technology enabling secure transactions	$6.6 billion	$1.76 trillion by 2030 (PwC, 2022)
Crowdfunding	Online platforms for raising funds from the public	$12.27 billion	Continuous growth (Cambridge Centre for Alternative Finance, 2022)
Digital banking	Banking services provided through digital channels	$9.4 billion	CAGR of 8.9% (2022-2030)
P2P lending	Direct lending and borrowing between individuals	$158.6 billion	$558.91 billion by 2027 (Statista, 2023)
Mobile Payments	Financial transactions conducted via smartphones	$1.48 trillion	$12.06 trillion by 2030 (Allied Market Research, 2022)
InsureTech	Technology-driven innovations in insurance	$60.98 billion by 2028	Growing adoption (Accenture, 2023)
Robo-Advisors	Automated investment management services	$987.4 billion	CAGR of 29% (2022-2030) (Research and Markets, 2023)

2.3. Sustainable Development Goals

2.3.1. Introduction to SDGs

The Sustainable Development Goals (SDGs) are a set of 17 integrated goals meant to be a 'roadmap to a better and more sustainable future for humanity.' The United Nations set these goals out in 2015 and target areas like poverty, inequality, sustainability, the environment, peace, and justice, among others. These goals are intended to be realised by 2030 as part of the 2030 Agenda for Sustainable Development, to which all UN members have committed.

The SDGs are well encapsulated, encompassing development in several areas of human endeavour in social, economic, and environmental realms. They are founded on the principles of equity with the aim of universalism in fulfilling development goals. These 17 specific objectives are characterised by 169 targets and 231 distinct indicators that clarify the steps to be followed in the monitoring process. The following Table 2 summarises the 17 SDGs:

Table 2. Summary of 17 sustainable development goals.

SDG number	Goal	Description
1	No poverty	End poverty in all its forms everywhere.
2	Zero hunger	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
3	Good health and well-being	Ensure healthy lives and promote well-being for all at all ages.
4	Quality education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
5	Gender equality	Achieve gender equality and empower all women and girls.
6	Clean water and sanitation	Ensure availability and sustainable management of water and sanitation for all.
7	Affordable and clean energy	Ensure access to affordable, reliable, sustainable, and modern energy for all.
8	Decent work and economic growth	Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.
9	Industry, innovation, and infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
10	Reduced inequality	Reduce inequality within and among countries.
11	Sustainable cities and	Make cities and human settlements inclusive, safe, resilient, and

SDG number	Goal	Description
	communities	sustainable.
12	Responsible consumption and production	Ensure sustainable consumption and production patterns.
13	Climate action	Take urgent action to combat climate change and its impacts.
14	Life below water	Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.
15	Life on land	Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, and halt biodiversity loss.
16	Peace, justice, and strong institutions	Promote peaceful and inclusive societies, provide access to justice for all, and build effective, accountable institutions.
17	Partnerships for the goals	Strengthen the means of implementation and revitalize the global partnership for sustainable development.

2.3.2. Contribution of FinTech in Achieving SDGs

Financial Technology (FinTech) has played a significant role in implementing the Sustainable Development Goals since it focuses on how technology can be used to develop new solutions to economic challenges, contributing to economic growth, financial inclusion, and promoting environmental conservation. In several areas, such as finance, climate, and the economy, FinTech can help create an impact on the SDGs.

- Financial Inclusion: FinTech drives innovation in the delivery of financial services, which is crucial for eradicating poverty (SDG 1) and creating decent jobs (SDG 8). Due to the use of technology, FinTech firms can reach consumers in areas that traditional financial institutions cannot penetrate, such as rural regions. Mobile banking, digital wallets, and microfinancing are excellent examples of innovative FinTech systems that have helped bring financial services to millions worldwide.

For example, the mobile money service M-Pesa, developed in Kenya, has significantly impacted financial literacy. By 2021, M-Pesa had more than 50 million users in Africa, enabling secure and easy transactions, as well as savings and loans (Safaricom, 2021). This has led to a reduction in poverty levels and economic stability in the region, thereby improving the standard of living for the people. Globally, the World Bank (2020) reported that digital financial services could potentially contribute to a GDP boost of up to 6% in developing economies by 2025, clearly showing the power of FinTech to drive economic growth.

- Climate Action: Another benefit of FinTech is that it can help finance climate change mitigation and adaptation measures and support the shift towards a low-carbon economy. With green bonds, carbon trading, and crowdfunding for renewable energy projects, FinTech innovations enable organisations to source capital for sustainable development.

For instance, green bonds, fixed-income financial instruments designed to finance environmentally sustainable projects, have grown in popularity. The Climate Bonds Initiative (2022) explains that global green bond issuance was recorded at $517.4 billion in 2021, an improvement of 49% from the previous year's figure. Through the issuance and trading of green bonds, FinTech platforms help investors contribute to projects aligned with SDG 13, such as renewable energy, energy efficiency, and efficient transportation.

Furthermore, the study reveals that FinTech can also improve transparency and accountability in carbon markets through the application of blockchain technology. This technology can be used to design ledgers of carbon credits that are resistant to tampering and misinformation about emissions reduction. This can help curb greenwashing, as the public can easily verify the environmental claims made by companies.

- Sustainable Economic Growth: By proactively encouraging the opening of financial markets, participating in, and promoting non-traditional financial innovation, FinTech enables the construction of sustainable and efficient economic structures. By lowering the cost of transactions, enhancing credit availability, and

promoting superior resource mobilisation, FinTech might help build sound physical infrastructure and sustainable industries.

If we take the example of SDG 9 (Industry, Innovation, and Infrastructure), FinTech has offered the P2P Lending Platform to fund small and medium enterprises (SMEs). SMEs are a significant source of employment and economic growth, especially in the developing world. However, they need help accessing formal sources of financing with collateral or credit histories. Funding Circle and Prosper are two peer-to-peer lending firms that offer a solution to this issue by allowing SMEs to borrow from individual investors, thus obtaining the capital needed for expansion.

FinTech's influence extends to promoting responsible consumption and production, aligning with SDG 12. By providing consumers with tools that offer immediate information about the carbon footprint of products, FinTech empowers them to make informed decisions. Furthermore, FinTech's role in financing businesses that focus on recycling, reuse, and waste minimisation contributes to the development of the circular economy. Table 3 shows some SDGs that can be contributed to with the help of fintech solutions.

Table 3. Contribution of fintech to selected SDGs.

SDG	FinTech contribution	Examples
SDG 1: No poverty	Promotes financial inclusion by providing access to financial services for underserved populations.	M-Pesa, microfinance platforms
SDG 7: Affordable and clean energy	Facilitates investment in renewable energy projects through green bonds and crowdfunding platforms.	Green bonds, renewable energy crowdfunding
SDG 8: Decent work and economic growth	Supports economic growth by providing access to credit for SMEs and enabling more efficient financial transactions.	P2P lending platforms like funding circle
SDG 9: Industry, innovation, and infrastructure	Drives innovation in financial services, reducing transaction costs, and improving resource allocation.	Blockchain technology, InsureTech for resilience
SDG 12: Responsible consumption and production	Enables consumers to make informed choices by providing transparency on the environmental impact of products and services. Supports the circular economy by financing sustainable businesses.	Digital platforms for sustainable consumption
SDG 13: Climate action	Enhances transparency in carbon markets through blockchain technology, and mobilizes capital for climate action through green finance instruments.	Carbon trading platforms, climate bonds

Although FinTech can be a game changer in implementing the SDGs, we need to cautiously examine its associated risks and challenges. The most important fear is that FinTech services may create inequities rather than reduce them. Despite progress on financial inclusion, as in the case of mobile banking services, which allow people who live far from physical branches to access needed services, digital divides remain. This divide is key to ensuring FinTech delivers widespread good.

With the rapid growth of FinTech, there have also been worries raised on greenwashing. If FinTech companies continue to private-label their products and services as sustainable, some are at risk of greenwashing—exaggerating the environmental benefits that they offer. It underscores the importance of investing in strong regulatory frameworks and transparency to prevent FinTech from advancing exclusively fictitious solutions for sustainable development.

3. THEORETICAL PERSPECTIVE

3.1. Stakeholder Theory

3.1.1. Explanation and Relevance to Greenwashing in FinTech

Freeman (1984) developed stakeholder theory. It suggests that the concept of "business" focuses on satisfying the needs of stakeholders rather than just shareholders. A stakeholder is any person or group who has an interest in

or can influence the achievement of an organization's objectives. When evaluating FinTech and sustainable development, the key players involved are customers, employees, shareholders, the government, environmental officers, and other community members.

The usefulness of stakeholder theory in the context of greenwashing in FinTech lies in how the theory helps identify the roles and impacts of stakeholders who are either interested in or affected by greenwashing. Companies in the FinTech sector also make significant efforts to become pioneers of sustainable finance solutions in their daily operations. However, when such firms make false claims about their stewardship of the natural environment, it erodes the trust and legitimacy that are the lifeblood of these organizations.

Greenwashing in FinTech comes in various forms, from covering up a financial product presented as ecologically beneficial without sufficient evidence, to overstating the ecological value of their operations, and failing to disclose the environmental drawbacks of their innovative technologies. Not only does this mislead consumers and investors, but it also leads to severe consequences, including reputational damage, legal actions, and the loss of stakeholder trust. Pimonenko et al. (2020) reported that about 78% of consumers consider environmental responsibility commitments when making their purchases; therefore, a genuine commitment to sustainability is crucial.

3.1.2. Analysis of Stakeholders' Interests and Impacts

Customers: In the current FinTech environment, consumers are expecting more honesty and transparency from the organisations they transact with. According to Accenture (2022) a survey revealed that 62% of consumers are willing to buy goods and services from firms that display or explain their environmental policies. Greenwashing practices mislead customers, leading to consumer doubt, loss of customers, and a decline in market share. For instance, when a FinTech firm promotes financing environmental projects but, in reality, channels the investments to fossil fuel projects, clients may feel deceived and seek other service providers.

- Investors: Investors are another vital stakeholder category influenced by the phenomenon of greenwashing in FinTech. Sustainability reports are helpful to many investors, especially those interested in sustainable investments who prefer accurate sustainability reports. A publication by Morningstar (2023) showed that sustainable funds globally were worth $3.9 trillion in 2022, signaling a high level of investor demand for green financial instruments. The consequences of greenwashing for a FinTech company include: ivestment by investors keen on tracking sustainability issues, loss of share price and challenges in securing future rounds of funding.

Moreover, the dissemination of false information through greenwashing can lead to legal actions against companies. This is evidenced by several large firms that have been sued for greenwashing, highlighting the legal risks associated with misleading sustainability claims.

- Employees: The current generation of employees, particularly younger workers in the FinTech industry, increasingly values the personal and ethical standards of their organizations. A survey report conducted by Deloitte (2021) revealed that 49% of millennials and 44% of Gen Z employees would not join an organization that does not align with their values. Greenwashing results in organizational withdrawal, low organizational commitment, and increased turnover among employees who perceive a discrepancy between the organization's actions and environmental claims.
- Regulators: Various regulatory bodies are tasked with preventing organizations from engaging in greenwashing. Regulations from central bodies, such as the U.S. Securities and Exchange Commission (SEC) or the EU Green Taxonomy, entail severe consequences for guilty FinTech firms. Penalties may include fines, suspension of operations, or corrective measures. For instance, in late 2021, the SEC launched the Climate and ESG Task Force to investigate schemes of ESG-related misconduct, highlighting the regulatory threats associated with greenwashing (U.S. Securities and Exchange Commission (SEC), 2021).

- Environmental Groups and the Community: Environmental groups, such as civil society organizations and environmentalists, play a crucial role in monitoring and policing companies' environmental claims. When companies engage in greenwashing, they risk facing protest actions, negative publicity, and other detrimental effects on their brand image. Furthermore, the deception that does not align with the vision of environmental sustainability poses harmful effects on the environment and society in the future, as climate change and social justice issues are pressing concerns today.

3.2. Legitimacy Theory

3.2.1. Understanding Legitimacy within the FinTech Context

Legitimacy theory originated from the idea that an organization aims to function in a manner that aligns with societal standards to be recognized and accredited. Suchman (1995) defined legitimacy as a generalized assumption that an entity's actions are appropriate or warranted within a framework of established norms, values, beliefs, and definitions. In the context of FinTech, legitimacy is crucial because it determines the level of acceptability of decisions made by FinTech firms by their customers, investors, regulators, and the public.

Reasonably expected, FinTech companies are situated where the financial and technology sectors coexist. Both sectors are highly regulated and supervised entities that must respond to societal expectations. The financial products and services launched by such companies entail legitimacy based on several factors, including companies working in line with societal goals of addressing relevant financial problems, adhering to sustainable development goals, and respecting clients' privacy rights. Such companies will find it easier to establish themselves in the market.

The need to attain legitimacy in the FinTech sector is well-founded, given that trust-building structures are the foundation for adopting financial solutions. In PwC (2021) global survey, 70% of consumers identified credibility as the primary factor when selecting their preferred financial services provider. For new firms operating in a dynamic sector that has yet to be fully developed, achieving and maintaining legitimacy to gain customers' trust, secure investments, and meet regulatory requirements is crucial.

3.2.2. Impact of Greenwashing on Organizational Legitimacy

The threat of greenwashing, which involves a company or organization deliberately providing its stakeholders with false perceptions about its environmentally friendly products or operations, has jeopardized FinTech companies' legitimacy. However, when FinTech firms engage in greenwashing, they risk losing the trust of shareholders, damaging their reputation, and facing the consequences imposed by regulatory authorities, all of which erode their organizational legitimacy.

In this respect, greenwashing threatens legitimacy as it creates a misalignment between a firm's words and actions. For instance, when a FinTech firm claims that its products are environmentally friendly or support sustainability but, in reality, do not contribute to this social cause, or when the firm does not support sustainability initiatives but publicly declares otherwise, stakeholders will view the firm as deceptive. This can create perceptions that are hard to dispel, and organizations and individuals who lose the public's trust do so at a significant cost. According to Seele and Gatti (2017) greenwashing has significant consequences, as public trust is lost, and a company takes a long time to regain it.

However, greenwashing puts a firm under the scrutiny of regulatory authorities and exposes it to costly legal suits, thereby challenging its legitimacy. Various authorities from different countries, including the EU Green Taxonomy and the SEC in the United States, require that organizations and firms not engage in greenwashing but instead disclose accurate and verifiable information regarding their environmental responsibility. For instance, in 2021, the SEC declared that it would increase the scrutiny of ESG disclosures, particularly concerning environmental statements (U.S. Securities and Exchange Commission (SEC), 2021). The penalties for such cases of

greenwashing may include fines, prosecution, restrictions on business activities, and, in worse cases, outright closure, which can ultimately erode legitimacy.

The effect of greenwashing on organizational legitimacy is compounded by increasing concern and activism among customers and shareholders regarding ecological matters. According to Lim, Cheah, Ngo, Chan, and Ting (2023) 66% of global consumers are willing to pay a premium for sustainable products, and 81% expect brands to lead on environmental change. When FinTech companies engage in greenwashing, they risk losing environmentally conscious consumers and are likely to be abandoned by ethical investors. Sustainable investment funds were valued at $35.3 trillion globally in 2022, representing a third of the total AUM of sustainable investments (Global Sustainable Investment Alliance (GSIA), 2022). Shareholders of these funds are highly aware of greenwashing, and as soon as they detect such deception, they withdraw their investments, erasing any legitimacy the company may have had.

However, most importantly, this study reveals that greenwashing puts organizational legitimacy at risk in the current year and in the future. It also limits a company's capacity to adapt and develop its products and services. Since FinTech businesses depend on technology and customers to function, it is critical to maintain a suitable and lawful image. Greenwashing damages this image and fosters skepticism and distrust, which hinders the continuous improvement of new innovations and reduces consumers' and partners' willingness to engage with the company.

3.3. Signaling Theory

3.3.1. Basic Principles of Signaling Theory

Signaling theory can be attributed to Michael Spence, who presented it in 1973. It deals with information asymmetry and how the party with the information, such as the seller or the company, holds information not available to the other party, like the buyer or the stakeholder. According to the theory, this gap is bridged when the informed party sends a signal to communicate qualities or intentions that would otherwise be impossible for the other party to observe. Such signals can take actions, statements, or any other form of communication that helps reduce uncertainty.

When applied to business, signaling theory clearly explains how companies convey information about their value, quality, and intentions to other agents, such as investors, customers, and regulators. The premise upon which it rests is that factors considered "credible" cannot be easily faked or replicated—in other words, they are costly or difficult to mimic. They are, therefore, effective signals of the traits that define a company. For instance, those engaged in environmentally friendly practices when managing their organizations communicate to stakeholders that they are sincere in their stewardship responsibilities. In contrast, favorable or accurate signals can create trust and a positive brand image, while negative or vague signals, such as greenwashing, can harm the business's brand image.

Information asymmetry is best explained by signaling theory, primarily when consumers or investors cannot physically assess the quality or ethical level of specific products from certain firms or companies. In such situations, organizations employ various forms of signaling, like certification labels, third-party endorsements, or sustainability reports, to express their adherence to various values, one of which is environmental sustainability. Connelly, Certo, Ireland, and Reutzel (2011) noted that signaling is pivotal in reducing information asymmetry and developing trust between the firm and its external stakeholders.

3.3.2. Application to Greenwashing Practices in FinTech

Signaling theory is of great significance in the FinTech industry for understanding how companies can communicate their environmental and sustainability information to interested stakeholders. Like most other industries, the FinTech industry operates in a world where stakeholder entities with interests in the sector, including clients and investors, are becoming more conscious of sustainability. This concern creates a powerful

incentive for corporations to establish credibility by demonstrating their commitment to sustainable development strategies, which can be done through advertising, a specific logo, or sustainability reports.

However, when such signals are false or lack objective support in the corresponding actions, they become greenwashing. 'Greenwashing' is a process where an organization makes a product appear more environmentally friendly than it actually is, using fake signs and signals meant to attract environmentally concerned consumers and investors. For instance, a FinTech company may claim that their services are 'green' or 'sustainable,' while the activities, products, or services they provide do not necessarily support the environment. This can involve general and unsubstantiated statements about reducing carbon emissions, generating energy from renewable sources, or sponsoring environmental programs without providing specific or provable information.

When applying signaling theory to greenwashing in FinTech, several problematic aspects can be identified. First, it shows that due to information asymmetry, companies can deliberately transmit misleading or exaggerated signals about their sustainability efforts. For instance, a study by De Freitas Netto et al. (2020) revealed that about a quarter of the sustainability-based claims made by firms across all sectors, including FinTech organizations, were misleading or false. This poses a significant danger to stakeholders, especially those who rely on these signals in their decision-making processes.

Second, weak or false signals discourage trust and introduce pseudo-signaling, which, in theory, aims to reduce uncertainty and increase trust. When greenwashing occurs, FinTech firms not only suffer reputational losses but also undermine the credibility that stakeholders have in the FinTech sector. This is particularly worrisome, given that FinTech firms depend on customer loyalty, underpinned by trust, and investor confidence, which is key to their growth and sustainability. Seele and Gatti (2017) found that consumers are concerned about the impact companies have on the environment, and 64% of them stated that if they are given false information by a company, they will stop buying its products. This means that the impacts of greenwashing can be severe, potentially costing a firm customers, investors, and triggering fines, among other consequences.

However, applying signaling theory in this context, it is understood that the effectiveness of signals means that signals should be costly or difficult for potential rivals to imitate. In the case of greenwashing, however, firms might employ low-cost, easily imitable signals such as window dressing, sloganizing, or making tokenistic promises of 'going green' that do not reflect the true environmental impact. This not only misleads stakeholders but also leads to increasing doubt about corporate announcements on sustainability. This view is also supported by Seele and Gatti (2017) who pointed out that greenwashing contributes to what they refer to as the 'legitimacy gap,' where stakeholders become skeptical of any environmental claims, making it difficult for genuinely green firms to distinguish themselves.

Accordingly, to avoid tarnishing their green image as a signal and suffering the negative consequences associated with greenwashing, FinTech firms should consider signaling theory by offering meaningful, credible, and concrete signals of their sustainability initiatives. This may involve seeking third-party certifications, preparing sustainability reports that include measurable results, and publicly reporting on sustainability ideologies and practices. In this way, companies can improve their legitimacy, gain trust from stakeholders, and build long-term partnerships.

3.4. Institutional Theory

3.4.1. Explanation and Relevance to Greenwashing in FinTech

According to institutional theory, organizational structures, processes, and activities are shaped by the external context, which includes the culture, laws, and norms prevailing in a given society. This theory suggests that organizations engage in institutionalization by adhering to the laws and regulations of the institutional context in which they operate. In the context of FinTech, institutional theory is appropriate as it highlights how companies

may choose to provide greenwashed solutions to clients due to society's increasing sensitivity to environmental factors.

Greenwashing in the FinTech sector can be defined as one of the mixed strategies that reflect the growing institutional pressure on companies to operate sustainably. Especially in a world where environmental issues are becoming more prominent, there is increasing pressure from customers, shareholders, authorities, and other stakeholders to be environmentally conscious. This is particularly important for FinTech companies that deliberately promote themselves as innovative and cutting-edge in their business approach, as they may feel pressured to demonstrate their commitment to sustainability to gain credibility and competitive advantage. However, when sustainability efforts are expensive or difficult to implement, this may lead to false reporting, where organizations appear more environmentally conscious than they are, a practice known as greenwashing.

This behavior stems from a tendency to transform the business without making significant changes to fit institutional standards. For instance, a FinTech firm might market its products as sustainable or carbon-neutral without providing clear evidence to support these claims. Lyon and Maxwell (2011) suggest that this occurs, mainly because no specific rules or international laws define what it means for a firm to be environmentally conscious, allowing firms to stretch the truth.

3.4.2. Institutional Pressures and Responses

External pressures may be set by regulation and legislation, be self-regulatory, stem from customer demand for sustainable products, or result from emerging social norms that FinTech organizations need to meet. These pressures can be categorized into three types: coercive isomorphism, normative isomorphism, and mimetic isomorphism.

Coercive pressures refer to formal social norms and legislation governing how firms achieve environmental performance. Over the last few years, there has been a rising trend in legal policies aimed at eliminating greenwashing. For example, the Sustainable Finance Disclosure Regulation (SFDR) for the European Union requires investment firms and FinTech companies to report how sustainability factors are integrated into investment analysis, recommendations, and financial product provision (European Commission, 2021). Noncompliance with such laws may lead to legal consequences and loss of reputation, forcing companies to either genuinely improve their sustainability profiles or, in some cases, creatively greenwash to meet the letter of the law without incurring the costs associated with the spirit of the law.

External normative and implementing pressure is based on industry norms, professional communities, and the requirements of key customers and investors. As environmental consciousness becomes a policy factor for these stakeholders, FinTech firms are under increased pressure to professionalize their environmental policies. A survey by GlobalData (2022) indicated that 78% of consumers in the global financial services industry expect firms to engage in active environmental sustainability. To satisfy such expectations, some FinTech firms may announce green certifications or participate in sustainability schemes, even if their operations do not fully align with their claims.

Mimetic pressures relate to the pressure organizations experience to imitate the practices of other organizations in the same sector they admire. In the case of FinTech, some may resort to greenwashing to follow rivals they consider leaders in sustainable development. This can lead to a 'window-dressing' strategy, where organizations implement superficial environmental strategies to avoid being seen as the 'odd one out.' However, the danger is that this situation can lead to the standardization of greenwashing practices, blurring the distinction between genuinely environmentally conscious companies and those merely faking sustainable practices.

Finally, various responses from FinTech companies to institutional pressures are possible. While some organizations may genuinely incorporate sustainability into their operations, others may engage in greenwashing as a cheaper way of responding to institutional demands. The challenge for regulators, consumers, and investors is

to find ways to differentiate between these responses and ensure that companies are held accountable for these environmental wake-up calls.

4. GREENWASHING IMPACT ON FINTECH

4.1. Environmental Impact

Greenwashing in the FinTech sector has negative environmental consequences because it contributes to the whitewashing of sustainable efforts and the fight against climate change. Misleading stakeholders about environmental benefits can lead to socio-ecological stagnation, where consumers and investors perceive progress toward sustainability, even when little to no positive environmental change is actually occurring.

The adverse effects of greenwashing are most likely felt because it raises awareness and funds for practices that are not environmentally friendly. For instance, if a FinTech company claims that its products are financing renewable energy projects but, in reality, these projects are negligible or nonexistent, it displaces capital from other impactful environmental initiatives. Global Sustainable Investment Alliance (GSIA) (2022) shows that global sustainable investment amounted to $35 trillion during that period. According to the UN, about $3 trillion was invested in sustainable assets in 2021 alone. However, greenwashing, which involves making a product seem eco-friendly when it is not, also exists, leading to a tendency for a portion of this funding to be channelled to firms that need to prioritize environmental interests, thus undermining sustainability genuinely.

Additionally, greenwashing worsens the state of the environment as companies can continue their harmful environmental practices while falsely claiming to be environmentally friendly. For example, a FinTech company that acknowledges the importance of carbon offset programs may falsely claim their programs are highly effective, thus avoiding more significant changes. This maintains the company's negative impact on the environment and contributes to the declining credibility of sustainable practices within industries.

Greenwashing also discourages environmental innovation because protecting the environment is not the primary motivation for these firms. Some companies choose low-level green strategies that are easily implemented and cheaper than genuinely committing to environmental improvement, thus gaining a competitive edge over true ecological improvement efforts. This can hamper the development of innovative technology and practices that are environmentally friendly, leading to slower progress in environmental sustainability within the FinTech domain.

4.2. Social Impact

The influence of greenwashing in FinTech is social because it affects various aspects of relationships between firms and key stakeholders such as clients, workers, and the public. Trust is an essential aspect of financial services, and the more FinTech companies engage in greenwashing, the more negative implications arise.

The most severe social effect of greenwashing is the potential for the general public to lose trust in organizations. Today's consumers are increasingly conscious of their consumption patterns' impacts on the environment and society. According to a report by Lim et al. (2023) 81% of global consumers believe companies should play a role in improving the environment. When consumers discover a company they engage with is involved in greenwashing, their emotions are likely to be negative, leading them to sever ties with the company, resulting in customer loss and reputational damage. The public loses trust in that company, which may take a long time to regain, which is detrimental to its reputation.

Greenwashing also hurts employee morale and engagement. The values and motives of a company in the FinTech industry influence employee motivation. According a to Deloitte (2021) survey, 49% of millennials and 44% of Gen-Z employees rejected jobs where their employer's values did not align with theirs. When employees discover that their company is less environmentally conscious than it claims to be, this leads to demotivation, lack of commitment, and high turnover rates. This affects the company's organizational culture and hinders the process of attracting and managing human capital.

Lastly, greenwashing can cause consumers, employees, and society to lose faith in efforts to address environmental and social issues by promoting a misleading image. When organisations implement fake or misleading sustainability practices, public doubt often follows. This can prompt society to become sceptical of sustainability disclosures from corporate organisations, leading to setbacks in addressing issues like climate change and social justice.

4.3. Economic Impact

The problems of greenwashing in the framework of FinTech are diverse, as discussed below, and influence not only FinTech companies but also the overall financial system. At an organizational level, greenwashing costs businesses significant fines, lawsuits, and reputational damage and invites strong criticism. While several new standards in ESG disclosures have been emerging globally through accreditation authorities such as the U.S. Securities and Exchange Commission (SEC) and the European Union, companies involved in greenwashing are now more vulnerable to legal consequences, including fines. For instance, in 2021, the SEC Climate and ESG Task Force began cybersecurity probes on firms over greenwashing, exposing the real monetary dangers linked with such practices (U.S. Securities and Exchange Commission (SEC), 2021).

Some ways greenwashing causes business organizations to lose their reputation include customer turnover and decreased market share. A study conducted by the Harvard Business Review in 2022 revealed that businesses indicted for greenwashing suffered an average erosion of brand value of 2%. After a year, the long-term effects on brand identity can affect an organization's sales, profits, and shareholder value.

Further, greenwashing creates a scenario where word-of-mouth communication interferes with market signals, leading to the misallocation of capital. Investors who follow false signals may invest in companies that do not contribute to environmental or social sustainability goals, thereby misallocating resources. This can impact the economy as funds that could be used for sustainable projects are instead directed to these deceptive firms. In a report by Morningstar (2023) global sustainable fund flows reached $3.30 trillion for the first time in 2022. Still, the issue of greenwashing remains prevalent in such investments, leading to increased negative impacts on sustainability.

Lastly, the risk of greenwashing poses a systemic threat to the financial sector as it fosters misleading imagery and complacency towards environmental degradation. With the growing market size in sustainable finance, the industry's credibility is anchored on the truthfulness of sustainability claims made by firms. The failure to practice genuine sustainability in green finance can negatively impact consumer confidence and may lead the market to correct the situation or even experience a crisis. Both outcomes could result in significant economic shocks to individual firms and the overall financial system.

5. CASE STUDIES

5.1. Greenwashing in Digital Banking

By establishing a clear reference framework, green bonds can help reduce the risk of greenwashing and direct funding toward environmentally sustainable projects. The authors also mentioned the difficulties that issuers, investors, and intermediaries face as the green bond market expands (Galletta, Mazzù, Naciti, & Paltrinieri, 2024). A working group has been formed by the International Organisation of Securities Commissions Organisation (IOSCO), which represents 90% of global public market security regulators, to develop climate disclosure indicators for publicly traded corporations. Metrics for climate disclosure are important and necessary to support boards and other stakeholders in evaluating the possibilities, risks, and climate performance of their companies (Grove & Clouse, 2021). Banks engage in greenwashing for several reasons. The need to satisfy ESG standards and show a commitment to sustainable finance is one of the primary causes. Banks may influence their decisions to embrace more environmentally sustainable models by providing funding for the economy. Therefore, to minimise moral

hazard attitudes, banks need to implement control and verification systems to guarantee that the money given to businesses for genuine eco-sustainable operations is used for such objectives (Galletta et al., 2024). In a striking illustration of major banks' greenwashing, compare their targets for climate finance to the overall amount of money they will be funding fossil fuel companies between 2016 and 2020. The top four fossil fuel financing banks in the world, all American banks, plus the British bank Hong Kong and Shanghai Banking Corporation (HSBC), which ranked thirteenth in the study, are reflected in the above list of the five banks' climate finance targets as follows: $316.7 billion is held by JPMorgan Chase, $237.5 billion by Citigroup, $233.3 billion by Wells Fargo, $198.5 billion by Bank of America, and $110.8 billion by HSBC (Grove & Clouse, 2021). The global green bond indices are currently created by Solactive, Barclays, Morgan Stanley Capital International (MSCI), Standard & Poor's, and Bank of America Merrill Lynch. However, the European Union just unveiled the EU Taxonomy, a unified categorisation system for economically viable, ecologically friendly activities. This is one of the most important final phases since it will provide investors with a sense of security, stop greenwashing, lessen market fragmentation, and focus investments where they are most needed (De Lucena Barreiro, 2023). Kenya has worked hard throughout the years to adapt the nation's plans, policies, initiatives, strategies, and programs to combat climate change. Kenya is a signatory to the Kyoto Protocol, the Paris Agreement, and the UN Framework Convention on Climate Change. Kenya is dedicated to its sustainable environment program, even if the government is aware that there aren't enough public resources to support these eco-friendly projects. Banking organisations have been pushed by the Kenya Bankers Association, a governing body for Kenya's commercial banks, to encourage green investments in collaboration with other organisations (Wabwile, 2023).

5.2. Blockchain and Green Claims

Varavallo, Caragnano, Bertone, Vernetti-Prot, and Terzo (2022) offer a green blockchain-based traceability technology that uses less energy and saves money when used in the Fontina Protected Designation of Origin (PDO) cheese supply chain. This platform is a part of the EU-funded "Typicalp" project. The suggested traceability solution is built on top of the Algorand Blockchain, a highly scalable and ecologically friendly consensus mechanism that leverages Pure Proof-of-Stake. Along with the economic and environmental advantages, the traceability platform that was established has allowed for the digitization of the whole production chain. This has resulted in data that is both immutable and readily available in real-time to operators of the Fontina consortium and ultimate consumers. Mercuri, della Corte, and Ricci (2021) carried out research using the CAOS ("Characteristic, Ambience, Organization, Start-up") model on a start-up named Devoleum that operates in the agri-food industry but has not yet been institutionalized. The findings show that the application of blockchain can improve sustainability by enabling information traceability, protection, and non-manipulability—features that are very helpful in the agri-food industry. Additionally, the lack of middlemen in blockchain technology lowers transaction costs and shortens the time needed to stabilize relationships between the business and the environment. Alzoubi and Mishra (2023) found and spoke about 23 BC platforms that make green or environmental claims. The Renewable Energy Certificate Mechanism, BFCF, the Green Digital Finance Alliance, the Crypto Climate Accord, the Clean Energy Buyers Association, ReGal 38183, Treelion, Chimpzee, Green Technology Asia, Tomorrow, GreenTrust, Ecoterra, the BC Climate Institute, the Global BC Business Council Sustainability Working Group, and the Energy Web Foundation are some of the initiatives that are part of this series. Solarcoin, the Renewable Energy Certificate Mechanism, BFCF, the Green Digital Finance Alliance, the Crypto Climate Accord, the Clean Energy Buyers Association, ReGal 38183, Treelion, EFFORCE, Chimpzee, Earth Day, GreenTrust, Ecoterra, the BC Climate Institute, the Global BC Business Council Sustainability Committee, and the Energy the World Wide Web Foundation are a few of these initiatives. Maersk Line, a logistics firm, and International Business Machines (IBM) Corporation, a global information technology corporation, collaborated to build TradeLens, a platform based on the blockchain ecosystem. To create an ecosystem that is connected from beginning to finish and includes all

participants in the global supply chain, including shippers, cargo owners, airports, and carriers, TradeLens is a leading blockchain-based platform ecosystem in the shipping sector (Jovanovic, Kostić, Sebastian, & Sedej, 2022).

5.3. InsurTech and Environmental Promises

InsurTech refers to businesses that use technology innovation to provide insurance services. They can provide a wide range of insurance products, including life, health, rent, and housing insurance. FinTech businesses in the insurance industry employ data analytics to strive for a more direct interaction between the insurer and the consumer (Puschmann, Hoffmann, & Khmarskyi, 2020). Yolo, which stands for You Only Live Once, was established in late 2017 and is the first Italian InsurTech company with an international reach that specialises in digital insurance broking services. It facilitates pay-per-use and on-demand underwriting of products from large insurance companies and serves as a technology facilitator for other parties interested in selling digital insurance solutions because of its unique platform (Puschmann et al., 2020). There are only two InsurTech businesses out of the twenty-two that were found to be FinTechs after a thorough examination of the startups using the five criteria—provider type, interaction type, direct financial processes, indirect financial processes, and SDGs—was conducted. The majority of startups facilitate investment procedures (15), which are followed by cross-process, non-life insurance (2), payments, advice and financing (6), and claims administration (1) in terms of direct financial processes. Just seven firms assist financial processes indirectly through other processes, including living and leisure (e.g., paying for charging an electric car), shopping and logistics, entertainment and communication, transportation, health, and education and work (Puschmann et al., 2020). In addition to being customer-focused, Metromile encourages more responsible driving, which has positive social and environmental effects. The product proved to be quite successful. A few of the main causes include the following: accurate data collection, data-driven processing that proceeds straight through, regular updates to drivers on the timing of significant occurrences, and risk-reduction strategies. The fundamental characteristics that set these models apart from more conventional models are what give them strength; below are some of those qualities that are exclusive to offers and their accompanying technological viability (Jha & Sahoo, 2022).

5.4. Mobile Payment Platforms and Green Credentials

NFC, which enables quick and safe exchange of information between electronic devices, is one of the most well-known mobile payment systems of engagement paradigms. Numerous Near Field Communication (NFC) payment platforms exist globally, including Apple Pay, Cityzi, Google Wallet, OsaifuKeitai, SoftCard, UnionPay, Visa Paywave, and MasterCard's Mobile PayPass. In today's fast-paced and transaction-heavy industries, such as transportation systems, contactless techniques are effectively implemented (Penttilä, Siira, & Tihinen, 2016). A Finnish business called IDcontrol specialises in structural or physical identification. To improve a company's security, IDcontrol offers visitor management, access control, and ID tools. In the PACE business case, IDcontrol sent the credential—access privileges in this case—to the client's phones by air delivery. Key management is a huge task, particularly for hotels but also for cottage rentals. All-access system administration may be essentially automated if the system can provide access privileges directly to the customers' phones, allowing the unlocking of certain locks during the allotted time (Penttilä et al., 2016). Apple has often stated in its Environmental and Responsibility Reports that all of the energy used in its data centres and corporate offices globally is derived from renewable sources, accounting for over 90% of the energy used in the US (Monyei & Jenkins, 2018). The Chinese e-commerce behemoth Tencent Group and Asset Bright Company, which is listed on the Thai stock exchange, have partnered to enable WeChat payments that may potentially increase Chinese visitors' spending in Thailand. Additional files have been submitted to the BOT by Asset Bright and The Drop. WeChat invites local vendors to apply to become one of its 3,000–5,000 target suppliers.

Since WeChat is the most popular mobile application among the Chinese, merchants who are interested in accepting money from this payment service must have a bank account. Additionally, clients are Thai Chinese tourists who must get in touch with Asset Bright to confirm their identification. The payment mechanism functions similarly to that of credit CARDS, which retailers may obtain the next day (Feng, 2020). A well-defined plan is necessary to maintain competitiveness and enhance sustainability as client demands change. The essential element of Fintech services that allows users to buy using smartphones is mobile wallets. Though much study hasn't been done in this area, the use of mobile wallets in retail and e-commerce has begun to rise. Smartphones are an essential banking channel due to their simple accessibility and substantial value to clients, made possible by wireless connections and the growth of the Internet. M-banking capitalises on the growing trend of smartphone use and drives the need for mobile wallet services among social consumers and retailers (Hopalı, Vayvay, Kalender, Turhan, & Aysuna, 2022).

5.5. Robo-Advisors and Sustainable Investment

Robo-advisors are online investing services that are entirely automated and available to both institutional and private customers. This service's usage of artificial intelligence and mathematical algorithms for client advice are its distinguishing features. The online service does this in an attempt to mimic and even exceed human service (Au, Klingenberger, Svoboda, & Frère, 2021). The first robo-advisers were introduced by Phoon and Koh (2018). Numerous more robo-advisers have now entered the market, and after 10 years, robo-advisors managed $200 billion in assets globally, and all indications point to continued expansion (Iperen, 2024). The majority of robo-advisors choose and invest in stocks and bonds on their own. There are instances in which a single stock sector is heavily invested in and divided up. The other two businesses invest in less than ten assets, whereas Schwab Intelligent owns about thirty assets. Specifically, when utilising robo-advisors, all three of these organisations invest in international bonds. The three firms' asset allocations differ slightly in that Wealthfront and Schwab Intelligent invest in resources like gold and associated exchange-traded funds (ETFs). Improvement may be viewed as deficient from the standpoint of variety (Park, Ryu, & Shin, 2016). One further feature shared by all three robo-advisors is their investment in US corporate bonds, which carries three different kinds of risk: call risk, liquidity risk, and credit risk. Among corporate bonds, Schwab Intelligent specifically makes investments in high-yield bonds.

High-yield bonds are not often traded since their transaction costs are greater than those of conventional bonds (Park et al., 2016). The registered investment advisors (RIAs) that collaborate with Fidelity, an American holding company that is among the biggest asset management firms globally, and TD Ameritrade Holding Corporation, an American business that established an electronic trading platform, are called FutureAdvisor. The investment assessment tool provided by this RIA is trustworthy. Users can link their current investment accounts to the system at no cost. Based on productivity, diversification of operations, compensation, and taxes, it evaluates the viability of investments. Additionally, advice on modifying the investor's allocation of assets may be offered by this product.

5.6. Peer-to-Peer Lending Platforms and Environmental Impact

The platform often acts as a middleman between the customer and the business owner, charging a commission to one or both trading parties. When it comes to peer-to-peer lodging, for instance, platforms such as Airbnb and Vacation Rentals by Owner (Vrbo) exist; individuals who offer their homes for short-term rentals are known as entrepreneurs, and those who rent from them are known as consumers. When it comes to peer-to-peer car rentals, Getaround and RelayRides are platforms; entrepreneurs are those who offer their vehicles for short-term rentals, and consumers are those who rent from these entrepreneurs. New methods of offering recognisable, "real world" services, such as short-term lodging (Airbnb, Couchsurfing), urban transportation (Lyft, Sidecar, Uber), and

venture capital (Indiegogo, Kickstarter, Rockethub), are commonly included in the emerging peer-to-peer enterprises (Sundararajan, 2014). The founding of two businesses—the US-based Prosper in 2006 and the UK-based Zopa in 2005—is when P2P in finance first emerged. Both made peer-to-peer lending possible, allowing lenders and borrowers to transact with one another directly through a central marketplace instead of going through banks. "eBay for Credit" is how Prosper's co-founder Chris Larsen referred to his company's product (Milne & Parboteeah, 2016). The amount and distribution of the investors' capital in the platform are essentially determined by them. In Australia, the lender often determines other factors such as the amount and interest rate to invest in rather than the particular loans. After that, the platform functions as a matchmaker by matching the money with a borrower. There is some variation in this business model based on the degree of freedom provided to lenders. For example, RateSetter Australia requests the investment amount, length of holding, and preferred interest rate when offering loans in the Green Loan lending market, which covers loans for renewable energy (Lejcak & Wiltshire, 2016). The top peer-to-peer lending platform in Europe for investing in different kinds of loans is called Mintos. The platform's funding volume in the past has been €9.5 billion, and as of November 2023, there were 400 million euros in outstanding loans. In this scenario, Mintos serves as the technological middleman, providing a marketplace platform to create bilateral network effects. Lending institutions that collaborate with the platform represent one side, while investors who are prepared to put money into the suggested loan options represent the other. Lending businesses manage loan origination and debt collection; Mintos does not provide loans to borrowers (Manavoglu, 2023).

5.7. Crowdfunding Platforms and Green Initiatives

Crowdfunding platforms, like Kickstarter and Indiegogo, allow businesses to directly appeal to a vast number of potential investors, many of whom are avid tourists and locals, therefore increasing access to finance for a wider spectrum of individuals. Involvement in the community and shared ownership are encouraged, which might boost customer loyalty and brand support (Baber, Kaluvilla, & Ramkissoon, 2024). Because crowdfunders that employ a keep-it-all financing model can keep all contributions from the crowd, regardless of the campaign's outcome, the Indiegogo platform symbolises a signalling environment with greater uncertainty. Since donations to Indiegogo projects go to entrepreneurs even if they are underfunded, the public may view these initiatives as riskier because of the increased likelihood that the project would not be completed. Because donations are only given to entrepreneurs if they reach their fundraising goals, the Kickstarter platform creates a signalling environment with less ambiguity (Huang, Pickernell, Battisti, & Nguyen, 2022). GoFundMe projects span a wide range of topics, but the largest category, and one-third of all funds donated on the platform in 2017, were medical campaigns. GoFundMe allows users to build and publish campaigns in a matter of minutes. GoFundMe allows users to build and publish campaigns in a matter of minutes. GoFundMe provides ideas for raising money while you're building up your solicitation page. It is highly recommended for campaigners to link to their Facebook profile and promote their campaign on social media so that supporters can confirm who is generating the money. For the campaign's primary body, GoFundMe also suggests using a narrative framework (Klein, Tran, & Riley, 2020). The biggest membership network, Patreon, facilitates the payment of nearly $1 billion to creators yearly and links millions of creators with millions of fans. Since Patreon launched creator-fan memberships in 2013, many new membership sites, like Ko-fi, OnlyFans, and BuyMeaCoffee, have appeared. Due to the popularity of this membership model, already existing social media platforms have begun to include subscriptions into their networks. Examples of these are Twitter SuperFollow, Facebook Subscriptions, and YouTube Memberships, which allow users to pay a monthly subscription fee in exchange for special access (Sanyoura & Anderson, 2022).

6. STRATEGIES TO REDUCE GREENWASHING

6.1. Regulatory Frameworks

Corporate greenwashing has a variety of negative effects on the environment, society, and economy. Sincere environmental efforts are undermined by corporate greenwashing, which erodes public confidence and legitimacy. For firms to support sustainable development, trust must be rebuilt. Since businesses spend more money creating a green image than making significant improvements, greenwashing impedes real progress by taking resources away from real sustainability activities. To successfully prevent greenwashing, governments and regulatory organizations should enhance rules, provide clear criteria for environmental claims, and ensure public reporting to hold firms responsible (Maamir, 2024).

6.1.1. Existing Regulations and their Effectiveness

Ensuring that enterprises and organisations are held responsible for their environmental effect and promoting sustainability requires a relationship between governmental institutions, regulations, and certifications. Governments and regulatory bodies, for example, have the authority to enact laws and rules requiring companies and organisations to adhere to specific sustainability criteria. For instance, a government may mandate that businesses lower their greenhouse gas emissions or adopt environmentally friendly land use techniques (Nygaard, 2023). Mateo-Márquez, González-González, and Zamora-Ramírez (2022) demonstrate that in countries with more extensive regulations about climate change and stricter oversight of organisations' compliance with said regulations, there will be fewer opportunities for companies to engage in greenwashing when disclosing voluntary carbon information. Based on its wide power under Section 5 of the Federal Trade Commission (FTC) Act, the Commission pursued enforcement proceedings against deceptive environmental marketing claims throughout the 1970s and 1980s. Under general policy, the FTC carried out these early enforcement actions gradually, which left the business and consumers feeling frustrated. In response to the rising issue of false environmental claims in marketing, states simultaneously passed their restrictions, which were enforced in state courts by state attorneys general and consumer advocacy organisations. In the end, it became clear from these dispersed initiatives that the FTC needed to publish national guidelines for claims regarding the environment in marketing (Rotman, Gossett, & Goldman, 2020). The Green Guides are a set of interpretative principles designed to help marketers make ethical statements about the environment. They lay forth broad guidelines that apply to environmental claims made in the marketing or public sale of goods or services, whether they are related to products, packaging, or services. These guidelines lead marketers to Rotman et al. (2020):

- When making environmental claims, use the proper qualifiers and disclosures. Transparency ought to be placed "near the qualified claim," "clear and noticeable," and "in straightforward and inadequate type." Advertisers must avoid using distracting elements or making inconsistent claims that might undermine or contradict the disclosure."
- Clearly state if their claim applies to the product as a whole, to a certain part of the goods, or only to the packaging.
- Steer clear of exaggerating environmental qualities or advantages.
- Verify that assertions made in comparison are precise and supported.

Cherry (2013) proposed several options to combat greenwashing and fake corporate social responsibility, such as filing claims under securities fraud laws, pursuing remedies under false advertising laws, establishing private standards through independent groups or other watchdogs, and utilizing the recently formed Bureau of Consumer Financial Protection. Few documented instances have been filed based on the premise of fake CSR for deceptive advertising, and the ones that have usually included particular product labels that claimed the product was "green." For instance, successful lawsuits have been brought against pesticide manufacturers that falsely advertise their

products as safe or eco-friendly. Furthermore, lawsuits have been filed based on the usage of terms like "biodegradable," "recycled," and "recyclable," all of which have tight legal meanings these days.

"Natural gas is clean" and "Natural gas is a backup for renewable energy" are two of the most prevalent assertions about natural gas that fall under the category of "greenwashing" (ClientEarth Communications, 2021). Examining the EU's Taxonomy Regulation and delegated actions is one of the most important legislative processes. July 2020 saw the implementation of the EU's Taxonomy, which entails an analysis of present regulations. Its foundational idea is to make it possible for society to meet the energy and climate goals outlined in the European Green Deal and set for 2030. The European lawmaker believed that these accomplishments could only be made feasible by having a clear grasp of the ideas that go into creating the word "sustainable." This led to the creation of the EU Taxonomy, a uniform classification scheme for sustainable economic endeavours (Zych, Budka, Czarnecka, Kinelski, & Wójcik-Jurkiewicz, 2021). The European Commission has stated that the regulation under consideration seeks to achieve six environmental goals: preventing and controlling pollution, promoting the transition to a circular economy, protecting and restoring biodiversity and ecosystems, adapting to and mitigating the effects of climate change, and sustainable use and protection of water and marine resources. By defining a particular list of ecologically sustainable activities, these goals can be accomplished.

6.1.2. Proposed Regulatory Improvements

- Disregarding the validity of the mounting demands, in addition to positive environmental initiatives and actions like the advancement of renewable energy, the creation of sustainable urban planning (smart cities), or national commitments to cut greenhouse gas emissions within a given period, negative mechanisms like greenwashing are also beginning to emerge (Zych et al., 2021).
- It should be emphasized that preventing greenwashing techniques by giving lawmakers, investors, and private parties precise guidelines on what constitutes sustainable operations is one of the primary goals of this certification system. These endeavours aim to appropriately focus on two things: private investment (for investors and other private players) and maybe governmental subsidies or other types of assistance (for lawmakers).
- It is important to acknowledge that, despite the examination of the regulator's actions through the lens of greenwashing, such regulation, particularly when aimed at influencing private entities' actions, may inadvertently foster the proliferation of greenwashing activities within the market.
- Gatti, Seele, and Rademacher (2019) suggest that a mix of required and voluntary measures might be a better way to stop greenwashing. The new paradigm should encourage innovative and successful corporate social responsibility (CSR) activities while also defining the boundaries and guidelines for their implementation and dissemination, as companies run the danger of breaking the law by overstretching their CSR messaging.
- Amendments do not and ought not to shield corporate actors from liability for making untrue or deceptive claims about how their operations would be affected by climate change, how their company will be affected by it, or about their plans and commitments on climate change (Shanor & Light, 2022).
- Additionally, it would be beneficial if the Green Guides addressed and standardized the kinds of research and methods that are allowed to back up certain assertions. Should a lifecycle evaluation be carried out by the paper business itself, by outside scientists, or by firm staff on behalf of industry associations? Which, if any, statements need to be supported by research that adheres to particular criteria—like being double-blind or randomized controlled trials, for example? Which of these data should be available to scholars, decision-makers, and the general public, and which, if any, must be reported to the FTC (Shanor & Light, 2022)?

6.2. Industry Standards and Certifications

The belief that the organizations responsible for determining whether a certifying organization is appropriate are reliable, competent, and trustworthy in their work is the cornerstone of institutional trust. To ensure that the environmental and social performance they certify is reliable and not dishonest or fraudulent, for example, organizations that provide green certifications rely on institutional trust. Although certifications play a major role in the global sustainability movement, changing market and technology factors may eventually erode institutional trust (Nygaard & Silkoset, 2023).

6.2.1. Role of Industry Bodies in Promoting Transparency

To promote sustainability and make sure that companies and organisations are held accountable for their environmental effect, it is crucial to understand the relationship between governmental institutions, legislation, certifications, and the role of NGOs and activist groups (Nygaard, 2023). The foundation of institutional trust is the conviction that the entities tasked with identifying the suitability of a certification organisation are trustworthy, competent, and dependable in carrying out their duties. As an illustration, organisations that provide green certifications depend on institutional trust to guarantee that the environmental and social performance they certify is trustworthy and not deceptive or fraudulent. While certifications contribute significantly to the global sustainability movement, institutional trust may gradually diminish due to shifting market and technological dynamics (Nygaard & Silkoset, 2023). The primary categories of certification schemes that support sustainability, such as those based on buildings, organisations, and products. Product-based certifications concentrate on assessing the economic, social, and environmental effects of a single product or set of related items. Building sustainability, encompassing the effects of construction and operation on the environment, society, and economy, is the focus of building-based certifications. Buildings may have a substantial influence on people's health and well-being and are important sources of energy consumption and greenhouse gas emissions, which makes these certifications essential. A certification for green buildings called Leadership in Energy and Environmental Design (LEED) is an example of a certification based on a building (Nygaard, 2023). According to Whelan and Kronthal-Sacco (2019) the Fair Trade certification attests to the fact that a product has been manufactured and traded in an ecologically and socially responsible manner and that workers have received fair remuneration. Labelling requirements depending on the proportion of organic materials in a product are also part of the National Organic Program (NOP) rules. The USDA may suspend or cancel organic certificates under the NOP and levy civil fines for violations. In a poll conducted by the Organic Trade Association (OTA), 60% of respondents strongly agreed, according to Angela Jagiello, Associate Director of Conference and Product Development. "A certification process such as the USDA uses to oversee and enforce the labelling of organic foods should also be used to cover (Rotman et al., 2020).

6.2.2. Importance of Certifications and Third-Party Audits

Certification programs influence the creation of new rules and regulations. For instance, the Forest Stewardship Council's (FSC) certification program for sustainable forestry has impacted the creation of legislation and policies about the practice in several nations. These certifications are crucial because they empower companies to enhance their sustainability practices and assist customers in making better decisions about what to buy (Nygaard, 2023). Public consequences are not a sufficient basis for self-regulatory norms such as codes of conduct or private business efforts. Finding ways to encourage compliance is therefore essential. In this regard, as covered in the previous chapter, scholars that study greenwashing add to the discourse by pointing out various strategies and actions (like tripartism, public enforcement of anti-greenwashing laws, and litigation about certification mark infringement) that reduce greenwashing and guarantee more equitable and transparent corporate social responsibility (CSR) communication (Gatti et al., 2019). Leadership in Energy and Environmental Design (LEED) certifies low-energy buildings, makes use of sustainable materials, and benefits the environment and their

occupants. The WELL Building Standard certification for healthy buildings encourages healthy indoor environments by taking into account elements like air quality, lighting, and ergonomics (Nygaard, 2023). The outcomes of public enforcement against greenwashing are superior to those of private enforcement of environmental marks or consumer activities. The most effective defences against the inappropriate use of eco-marks appear to be government agency investigations and certification mark enforcement lawsuits (Gatti et al., 2019). According to research conducted in China based on interviews with senior quality managers, consultants, and auditors, obtaining certification through the use of phoney ISO 9001 certifications and a dubious evaluation methodology is a common practice (Heras-Saizarbitoria, Boiral, & Díaz de Junguitu, 2020). Seele and Gatti (2017) acknowledge that greenwashing is a subjective phenomenon, which is another essential feature of the problem. No matter how much corporate CSR advertising is untrue, greenwashing only occurs, according to the authors, when a message is emphasised as such by NGOs, the press, or other interested parties. Kirchhoff (2000) explored a greenwashing prevention concept based on adding a punishment to the environmental labelling system. The concept needs an impartial third-party labelling authority to function properly, and this authority's existence appears to promote CSR standard compliance and reduce greenwashing. Therefore, a crucial component of greenwashing is a third-party complaint.

6.3. Corporate Governance and Ethical Practices

6.3.1. Best Practices for Corporate Governance

The three main forces that push businesses to participate in greenwashing are individual, internal/organisational, and external. Researchers have shown that gaining credibility with stakeholders—also known as reputational benefits—is a major external driver behind companies' greenwashing practices. Additional external factors include stakeholder pressure from investors, customers, and NGOs, while internal factors include "inertia" and a lack of an ethical culture inside businesses (Shanor & Light, 2022).

The field's adoption of a legal component may reduce suspicion and strengthen ties between institutions and the general public. But it necessitates acknowledging that the debate around CSR is expanding beyond management and corporate communication to include legal, ethical, and political aspects of business (Gatti et al., 2019). Ethical businesses honour their CSR pledges and fulfil their responsibilities. Is it possible to forecast which businesses will give in to the allure of greenwashing? There is a spectrum of CSR levels, suggesting that a company has discretion over the extent of its CSR activities. Businesses that breach the law or use it as a negotiating chip, paying fines or penalties to operate at the edge of what would be considered ultra vires, are at the bottom of these categories (Cherry, 2013). Paulet, Parnaudeau, and Relano (2015) examined the moral conundrums that the banking sector encountered both during and after the financial crisis, as well as the moral standards that ought to underpin the sector. The answers from ethical banks were different in key important ways from those of their conventional rivals. Even though they are both governed by the same authorities and function in the same industry, ethical banks are a distinctly different kind of financial institution. Unlike activities in secondary stock markets, local lending is the main activity of ethical banks. They have been able to weather the recent financial crisis thanks to their banking strategy without having to make many major operational changes. Digital technology has changed the work culture in the banking industry, and many more traditional banks are finding that they have to reinvent their businesses and cultures in order to welcome diversity and inclusion, promote creativity and fresh perspectives, and promote openness and new degrees of customer trust. To ensure that their consumers are adequately protected, banks, as regulated companies, are also required to closely adhere to "responsible lending practices" in line with the present regulatory framework (Prastyanti, Rezi, & Rahayu, 2023). Businesses that put ethics first use eco-friendly practices, make investments in renewable energy sources, and maintain open lines of communication. Environmental practices must be transparent for ethical corporate decision-making to promote trust and educated decision-making. It necessitates taking the long view and taking long-term effects into account. Adherence to environmental rules and

regulations is of paramount importance, as proactive sustainability initiatives exemplify moral behaviour. Greenwashing impedes sustainable growth and moral business decision-making, whereas businesses that put ethics first promote an open and accountable culture (Yoganandham, Kareem, & Khan, 2024).

6.3.2. Encouraging Ethical Behaviour in Fintech Companies

Without question, fintech lending has revolutionised the financial sector by offering accessible and practical loan solutions to both consumers and companies. But in the case of fintech loans, there are some ethical issues, just as in any tech-driven sector. A few significant ethical factors are as follows (Prastyanti et al., 2023):

- Fintech lending platforms obtain and evaluate vast quantities of financial and personal data to determine creditworthiness (Raj & Upadhyay, 2020). Ethical issues surface when this data is not sufficiently protected or is utilised for purposes beyond what it was originally intended. Fintech businesses need to put data security, encryption, and permission first to preserve people's privacy.
- Fintech lenders often use sophisticated algorithms and machine learning models to make lending choices. The moral conundrum is to guarantee that these models are impartial and fair without supporting prejudice based on socioeconomic class, gender, or race (Rovatsos, Mittelstadt, & Koene, 2019). Fintech lenders have to follow responsible lending guidelines in order to stop predatory lending.
- The goal of fintech lending ought to be to advance financial literacy and inclusiveness (Moenjak, Kongprajya, & Monchaitrakul, 2020). Additionally, initiatives to involve underserved populations and guarantee that fintech financing doesn't worsen already-existing disparities should be undertaken.
- Legal and financial risks are decreased by making ethical decisions because they guard against the consequences of unethical behaviour. By honouring contractual obligations and moral convictions, a business can lower its risk of litigation and related expenses, safeguarding its integrity and long-term profitability. By placing ethical principles first when making decisions, businesses may develop a culture of integrity, responsibility, and sustainability and position themselves as ethical leaders in their respective industries (Yoganandham et al., 2024).

6.4. Consumer Awareness and Advocacy

6.4.1. Empowering Consumers through Education

Many businesses utilize the practice of "greenwashing," which involves making false claims about sustainability in an attempt to deceive customers into buying their products, rather than being sustainable. As a result, customer education and awareness became crucial to prevent these deceptive practices used by the companies (Bosch, Obeso, & Palao, 2023). It is crucial to keep up the fight against greenwashing, to give clear information, and to empower customers with information and education. It supports the idea that fast fashion should be sustainable and that there should be a concentrated effort to counteract greenwashing (Mende & Scott, 2013). A key component of raising awareness is consumer education. Encouraging customers to make more sustainable purchase decisions and holding corporations responsible for their green promises may be achieved through the implementation of educational programs, such as master classes and the integration of sustainability education into schools (Bosch et al., 2023). There has been a need for increased consumer education on the identification and avoidance of false environmental claims in order to tackle the issue of greenwashing (Tang, Shen, & Khachatryan, 2018). However, it is uncertain how much it will cost non-financially to educate customers about the issue of greenwashing. Four subnarratives separate businesses with good and bad environmental responsibility records, even if the main narrative of consumer empowerment remains constant. Though not unique to any one group, in our sample one of the two categories of firms uses these subnarratives more frequently and more heavily than the other. More specifically, businesses with bad environmental records tend to emphasize the value of charity and scientific advancement, whereas businesses with good environmental records emphasize the importance of political action and third-party ecolabels (Jones,

2019). Green consumerism promotes environmentally friendly items without sacrificing preferences by giving customers the freedom to make knowledgeable decisions regarding both public and private commodities. This promotes sustainable habits. It was founded in the 1980s and promotes ecologically friendly companies and goods, even if they are more expensive. Some consumers—Gen Y in particular—continue to buy greenwashed items despite their mistrust of green promises because of incomplete information and deceptive marketing. By using greenwashing, businesses run the danger of losing the confidence of consumers and harming their brand's reputation. Businesses should implement clear eco-friendly processes, pursue certification, and effectively convey their environmental efforts if they want to attract environmentally sensitive clients. Important insights may be gained from market research on greenwashing habits, especially about Generation Y (Wang, Walker, & Barabanov, 2020).

6.4.2. Role of Advocacy Groups in Combating Greenwashing

Environmental statements produced by these corporations have been more inflated or inaccurate, according to studies, advocacy organisations, and specialists in the financial sector (Ochoa & Holger, 2020). Bingaman, Kipkoech, and Crowley (2022) implied that customer awareness and charges of greenwashing might hurt a brand by adversely influencing consumers' plans to make purchases. The results of this study should be used by environmental advocacy organisations and industry professionals to guide the development of marketing, public relations, and advertising campaigns aimed at countering greenwashing. To identify the possible dangers of eco-opportunistic conduct, economic actors have tightened their oversight and management of their whole supply chains. Some businesses outsource unsustainable portions of their supply chains to grey or even illegal marketplaces, where it is difficult and costly to control (Ndubisi, Nygaard, & Chunwe, 2020). Establishing a sustainable corporate environment that guarantees future adaptation requires the use of an ESG reporting framework. The increasing need for goods and reliable services might also confound the growing tendency of "greenwashing," which is the use of marketing techniques and narratives to portray a firm, its goods or services, initiatives, or brand as environmentally friendly when they aren't. As more and more people—from investors to employees to visitors—realise the importance of sustainability and the influence that global business has on sustainability and commercial governance, anybody who utilises ESG or sustainability as a mere marketing technique is in danger (Sarda, 2024). To counteract greenwashing, stakeholders—including corporations, non-governmental organisations, and governmental bodies—must collaborate to develop industry standards, exchange best practices, and hold enterprises responsible for their claims. Long-term, systemic changes are necessary for corporate commitment to sustainability, and sustainable practices must be prioritised in key business initiatives. This change improves competitiveness, strengthens organisational resilience, and helps the environment. In summary, resolving the conflict around corporate greenwashing necessitates a thorough strategy including industry cooperation, consumer education, and regulatory intervention. Businesses need to understand that genuine sustainability is a basic duty in the quest of a positive interaction between industry, society, and the environment, not merely a desirable quality (Maamir, 2024). Beyond the surface-level appeal of greenwashing, sustainable development can only be promoted by sincere dedication and coordinated efforts. One major problem that has an impact on social, economic, and environmental growth is corporate greenwashing. It entails businesses fabricating a false sense of environmental accountability, which raises social and environmental dangers. To tackle this issue, regulatory solutions, accountability systems, and consumer education are essential. Cooperation is crucial between companies, customers, and authorities (Maamir, 2024).

7. CONCLUSION

7.1. Summary of Key Findings

The study is conducted to provide theoretical perspectives and conceptual frameworks related to greenwashing in the context of sustainable development and fintech. Its analysis of FinTech's core areas includes a number of these areas, each of which adds something special to the field of financial services. Blockchain, crowdsourcing, digital banking, peer-to-peer lending, mobile banking, payments, insuretech, and robot advisors are some of these fields. The findings show that since FinTech focuses on how technology can be used to develop new solutions to economic challenges, it has played a significant role in implementing the Sustainable Development Goals. FinTech also promotes environmental conservation and growth as well as financial inclusion. FinTech contributes to achieving the SDGs in several domains, including money, the economy, and climate change. FinTech companies can reach customers in places where conventional financial institutions are unable to, including rural areas, thanks to the use of technology. FinTech innovations such as digital wallets, microfinance, and mobile banking have made financial services accessible to millions of people throughout the globe. As a result, the region's economic stability and poverty rates have decreased, raising people's standards of living. FinTech can also facilitate the transition to a low-carbon economy by helping to fund adaptation and mitigation strategies for climate change. FinTech technologies allow organisations to access financing for sustainable development via the use of green bonds, carbon trading, and crowdfunding for renewable energy projects. FinTech helps to build sustainable and effective economic structures by actively supporting the opening of financial markets, engaging in non-traditional financial innovation, and promoting it. FinTech has the potential to contribute to the development of sustainable enterprises and solid physical infrastructure by fostering improved resource mobilisation, improving loan availability, and cutting transaction costs.

Moreover, the theoretical perspective shows that stakeholder theory helps identify the roles and effects of stakeholders who are either impacted or interested in greenwashing, which is why it is relevant in the context of FinTech greenwashing. In their day-to-day operations, FinTech companies also put a lot of work into being leaders in sustainable financial solutions. However, the confidence and legitimacy that these companies depend on are undermined when they make exaggerated claims about how well they are stewarding the environment. In the case of legitimacy theory, the validity of the financial goods and services offered by these firms is predicated on several elements, such as their alignment with societal objectives to solve pertinent financial issues, uphold sustainable development goals, and respect customers' right to privacy. It will be simpler for these businesses to get traction in the market. In the FinTech sector, signalling theory plays a critical role in helping businesses convey information about sustainability and the environment to interested parties. Similar to the majority of other businesses, the FinTech sector functions in a global context where stakeholders with vested interests, such as investors and customers, are more mindful of sustainability. External constraints might come from self-regulation, new laws and regulations, consumer demand for sustainable goods, or societal values that FinTech companies must conform to.

In addition, corporate greenwashing has many detrimental repercussions on the economy, society, and environment. Corporate greenwashing damages real environmental initiatives by undermining public trust and credibility. Rebuilding trust is necessary if businesses are to promote sustainable development. Greenwashing impedes actual progress by diverting resources away from genuine sustainability initiatives, as corporations invest more money in projecting a green image than in achieving meaningful changes. Governments and regulatory bodies should strengthen regulations, establish precise standards for environmental claims, and guarantee public reporting to hold companies accountable in order to effectively combat greenwashing (Maamir, 2024). The foundation of institutional trust is the conviction that the entities tasked with evaluating the suitability of a certifying organisation are dependable, capable, and trustworthy in their job. For example, organisations that issue green certifications depend on institutional trust to guarantee that the environmental and social performance they certify is trustworthy and not dishonest or fraudulent. While certifications are crucial to the global sustainability

movement, institutional trust may ultimately be undermined by shifting market conditions and technological advancements (Nygaard & Silkoset, 2023).

7.2. Future Research Directions

7.2.1. Emerging Trends in Fintech and Sustainability

A growing number of emerging issues that impact financial management are appearing these days. These are the results of increased consumer concerns about environmental sustainability and respect in the products and services they buy and use, along with the acceleration of digitalisation. Environmental, social, and governance (ESG) considerations and corporate social responsibility (CSR) are two significant instances of these challenges. In a similar vein, the United Nations' 2030 Agenda for Sustainable Development Goals (SDGs) is crucial to the fight against climate change. Green innovation, as a novel technology paradigm, has promise for lowering resource use and raising resource efficiency. To achieve the carbon peak target by striking a balance between environmental conservation and economic development, green innovation is essential. Building capacity is necessary for regulators to assess whether a bank is operating sustainably. Furthermore, the bulk of institutions lacked sustainability policies, and only a small number of banks produced sustainability reports. Sustainable investment has to be a fundamental principle and guiding concept in any company's day-to-day operations. Adopting sustainable banking practices may lead to the banking sector being sustainable. The regulator must keep an eye on how sustainability is being applied. It is critical to take into account other strategies in this case as well, such as assessments of the strategic implications of poverty, legislation, sustainability, and the environment. Based on their capacities, these instruments need to be employed to evaluate each bank's advancement toward climate finance and sustainable banking. It would be essential to examine various instances of sustainable fintech and identify their shortcomings in order to provide fresh approaches for improvement. Additionally, to implement all of these steps, a strategy must be created for each platform.

7.2.2. Interdisciplinary Approaches

Within the explanation of each subject above, there are several potential areas for further study. Many of these topics are included in the core areas of fintech, which served as the primary focus of our study. Subsequent studies could investigate within-group disparities in non-G7 nations according to a range of classifications, such as political structure, economic standing, performance, and sources (e.g., level of reliance on foreign trade), predominance of specific industry clusters (e.g., manufacturing, services, technology, mining), types of organisations (e.g., state-owned, family enterprises, MNCs, etc.), social stratification, etc. Every one of these would be a multi-layered, nested design study that takes into consideration a range of contextual elements that are included as concentric variables and have an impact on how sustainability discourse and practice evolve in each environment. To establish strategies for reaching a wide agreement on sustainability reporting standards and indicators, it is important to comprehend these disparities. Future researchers can also highlight the challenges and obstacles faced by the different organisations when trying to mitigate greenwashing. Subsequent investigations need to aim to broaden the field of inquiry by including monographs or book chapters, which were not taken into account in this assessment. Additionally, future studies may examine cultural variations in the perception and analysis of greenwashing by extending the analysis to non-English research. We limited the publications we selected for this research to those that included the search phrases in the abstract or title. We may have missed some fascinating instances or conversations by reducing the search in this manner, but the decision was justified by the need to find those articles with a clear emphasis on the subject. Similar terminology and ideas should thus be taken into account when choosing greenwashing-related material to expand the study of greenwashing research.

7.3. Implications

Since the financial sector is responsible for providing the capital required to convert our economy into a more sustainable one, it is essential to the battle against climate change. Traditional providers and, most importantly, fintech businesses provide new financial services related to sustainability to enhance, expand, and automate financial services. Fintech uses techniques like crowdfunding, big data analytics, blockchain technology, and artificial intelligence to demonstrate continuity and consistency with ESG requirements.

As previously said, there are numerous similarities between sustainable finance and fintech. Fintech may increase the sustainability of the financial industry as a whole by promoting green money. After analysing Fintech platforms and greenwashing tactics, it is determined that these platforms still require development to inform and educate users, investors, and consumers about the conduct of the companies they typically do business with as well as the bonds and stocks they purchase. In light of this, this paper offers some helpful guidance and suggests enhancements to maximise the platforms' functionality in terms of consumer protection and information. Using several real-world instances of sustainable fintech, the theoretical framework has been used to demonstrate how to encourage green investment and adopt sustainable practices. To counteract greenwashing, stakeholders—including corporations, non-governmental organisations, and governmental bodies—must collaborate to develop industry standards, exchange best practices, and hold enterprises responsible for their claims. Long-term, systemic changes are necessary for corporate commitment to sustainability, and sustainable practices must be prioritised in key business initiatives. This change improves competitiveness, strengthens organisational resilience, and helps the environment. In summary, resolving the conflict around corporate greenwashing requires a thorough strategy, including industry cooperation, consumer education, and regulatory intervention. Businesses need to understand that true sustainability is a basic duty in the quest of a positive interaction between industry, society, and the environment, not merely a desirable quality. Beyond the surface-level appeal of greenwashing, sustainable development can only be promoted by sincere dedication and coordinated efforts. One major problem that has an impact on social, economic, and environmental growth is corporate greenwashing. It entails businesses fabricating a false sense of environmental accountability, which raises social and environmental dangers. In order to tackle this problem, regulatory solutions, accountability systems, and consumer education are essential. Cooperation is crucial between companies, customers, and authorities.

Funding: This study received no specific financial support.
Institutional Review Board Statement: Not applicable.
Transparency: The authors declare that the manuscript is honest, truthful and transparent, that no important aspects of the study have been omitted and that all deviations from the planned study have been made clear. This study followed all rules of writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Accenture. (2022). *Transparency and trust: The new imperatives for sustainable business.* Retrieved from https://www.accenture.com/sk-sk/insights/technology/uniting-technology-sustainability

Accenture. (2023). *InsureTech growth and trends.* Retrieved from https://www.accenture.com/ca-en/insights/insurance/insurance-industry-outlook

Allied Market Research. (2022). *Mobile payment market by component, type, and region: Global opportunity analysis and industry forecast, 2022–2030.* Retrieved from https://www.alliedmarketresearch.com/mobile-payments-market

Alzoubi, Y. I., & Mishra, A. (2023). Green blockchain–A move towards sustainability. *Journal of Cleaner Production, 430*, 139541. https://doi.org/10.1016/j.jclepro.2023.139541

Au, C.-D., Klingenberger, L., Svoboda, M., & Frère, E. (2021). Business model of sustainable robo-advisors: Empirical insights for practical implementation. *Sustainability, 13*(23), 13009. https://doi.org/10.3390/su132313009

Baber, H., Kaluvilla, B. B., & Ramkissoon, H. (2024). *Crowdfunding and entrepreneurship in tourism and hospitality. In reference module in social sciences (p. B9780443137013001894)*: Elsevier. https://doi.org/10.1016/B978-0-443-13701-3.00189-4.

Bingaman, J., Kipkoech, G., & Crowley, J. P. (2022). Inoculation & greenwashing: Defending against misleading sustainability messaging. *Communication Reports, 35*(3), 135-147. https://doi.org/10.1080/08934215.2022.2048877

Bosch, M., Obeso, E., & Palao, A. (2023). Greenwashing in the fast fashion industry: Greenwashing in the fast fashion industry: The role of consumer education.

Cambridge Centre for Alternative Finance. (2022). *The global crowdfunding market report.* Retrieved from https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/

Carlson, L., Grove, S. J., & Kangun, N. (1993). A content analysis of environmental advertising claims: A matrix method approach. *Journal of Advertising, 22*(3), 27-39. https://doi.org/10.1080/00913367.1993.10673409

Castilla-Rubio, J. C., Robins, N., & Zadek, S. (2016). *Fintech and sustainable development: Assessing the implications.* Retrieved from http://unepinquiry.org/wp-content/uploads/2016/12/Fintech_and_Sustainable_Development_Assessing_the_Implications.pdf

Chen, J., Siddik, A. B., Zheng, G.-W., Masukujjaman, M., & Bekhzod, S. (2022). The effect of green banking practices on banks' environmental performance and green financing: An empirical study. *Energies, 15*(4), 1292. https://doi.org/10.3390/en15041292

Cherry, M. A. (2013). The law and economics of corporate social responsibility and greenwashing. *UC Davis Bus. LJ, 14*, 281.

Chueca Vergara, C., & Ferruz Agudo, L. (2021). Fintech and sustainability: Do they affect each other? *Sustainability, 13*(13), 7012. https://doi.org/10.3390/su13137012

ClientEarth Communications. (2021). *How to spot fossil fuel greenwashing. ClientEarth.* Retrieved from https://www.clientearth.org/latest/latest-updates/stories/how-to-spot-fossil-fuel-greenwashing/

Climate Bonds Initiative. (2022). *Green bond market summary Q4 2021.* Retrieved from https://www.climatebonds.net/resources/reports/green-bond-market-summary-q4-2021

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling theory: A review and assessment. *Journal of Management, 37*(1), 39-67. https://doi.org/10.1177/0149206310388419

Cooper, S. A., Raman, K., & Yin, J. (2018). Halo effect or fallen angel effect? Firm value consequences of greenhouse gas emissions and reputation for corporate social responsibility. *Journal of Accounting and Public Policy, 37*(3), 226-240. https://doi.org/10.1016/j.jaccpubpol.2018.04.003

Dahl, R. (2010). Green washing: Do you know what you're buying? *Environmental Health Perspectives, 118*(6), A246 - A252. https://doi.org/10.1289/ehp.118-a246

De Freitas Netto, S. V., Sobral, M. F. F., Ribeiro, A. R. B., & Soares, G. R. D. L. (2020). Concepts and forms of greenwashing: A systematic review. *Environmental Sciences Europe, 32*, 1-12. https://doi.org/10.1186/s12302-020-0300-3

De Lucena Barreiro, T. C. (2023). An analysis of the green bond regulatory landscape: Opportunities and outlook.

Delmas, M. A., & Burbano, V. C. (2011). The drivers of greenwashing. *California Management Review, 54*(1), 64-87. https://doi.org/10.1525/cmr.2011.54.1.64

Deloitte. (2021). *Millennials and Gen Zs hold the key to the future of work.* Retrieved from https://www.deloitte.com/middle-east/en.html

Deng, X., Huang, Z., & Cheng, X. (2019). FinTech and sustainable development: Evidence from China based on P2P data. *Sustainability, 11*(22), 6434. https://doi.org/10.3390/su11226434

Dwivedi, P., Alabdooli, J. I., & Dwivedi, R. (2021). Role of FinTech adoption for competitiveness and performance of the bank: A study of banking industry in UAE. *International Journal of Global Business and Competitiveness, 16*(2), 130-138. https://doi.org/10.1007/s42943-021-00033-9

European Commission. (2021). *Sustainable finance disclosure regulation (SFDR).* Retrieved from https://finance.ec.europa.eu/sustainable-finance/disclosures/sustainability-related-disclosure-financial-services-sector_en

Feng, L. (2020). *Alipay and WeChat pay comparative study in Bangkok.* Doctoral Dissertation, MA Thesis, Siam University, Thailand.

Ferrón-Vílchez, V., Valero-Gil, J., & Suárez-Perales, I. (2021). How does greenwashing influence managers' decision-making? An experimental approach under stakeholder view. *Corporate Social Responsibility and Environmental Management*, *28*(2), 860-880. https://doi.org/10.1002/csr.2095

Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Boston, MA: Pitman.

Galletta, S., Mazzù, S., Naciti, V., & Paltrinieri, A. (2024). A PRISMA systematic review of greenwashing in the banking industry: A call for action. *Research in International Business and Finance*, *69*, 102262. https://doi.org/10.1016/j.ribaf.2024.102262

Gatti, L., Seele, P., & Rademacher, L. (2019). Grey zone in–greenwash out. A review of greenwashing research and implications for the voluntary-mandatory transition of CSR. *International Journal of Corporate Social Responsibility*, *4*(1), 1-15. https://doi.org/10.1186/s40991-019-0044-9

Global Sustainable Investment Alliance (GSIA). (2022). *Global sustainable investment review 2022*. Retrieved from https://www.gsi-alliance.org/trends/

GlobalData. (2022). *The role of ESG in financial services*. Retrieved from https://www.globaldata.com/store/report/esg-in-financial-services-theme-analysis/

Grove, H., & Clouse, M. (2021). Zero net emissions goals: Challenges for boards. *Corporate Board Role Duties and Composition*, *17*(2), 54-69. https://doi.org/10.22495/cbv17i2art5

Hartmann, P., & Apaolaza-Ibáñez, V. (2009). Green advertising revisited: Conditioning virtual nature experiences. *International Journal of Advertising*, *28*(4), 715-739. https://doi.org/10.2501/S0265048709200837

Heras-Saizarbitoria, I., Boiral, O., & Díaz de Junguitu, A. (2020). Environmental management certification and environmental performance: Greening or greenwashing? *Business Strategy and the Environment*, *29*(6), 2829-2841. https://doi.org/10.1002/bse.2546

Hopalı, E., Vayvay, Ö., Kalender, Z. T., Turhan, D., & Aysuna, C. (2022). How do mobile wallets improve sustainability in payment services? A comprehensive literature review. *Sustainability*, *14*(24), 16541. https://doi.org/10.3390/su142416541

Huang, S., Pickernell, D., Battisti, M., & Nguyen, T. (2022). Signalling entrepreneurs' credibility and project quality for crowdfunding success: Cases from the Kickstarter and Indiegogo environments. *Small Business Economics*, *58*(4), 1801–1821. https://doi.org/10.1007/s11187-021-00477-6

Iperen, V. N. (2024). *A qualitative and quantitative comparison between sustainable and non-sustainable robo advisors*. Bachelor's Thesis, University of Twente.

Jha, R. S., & Sahoo, P. R. (2022). *Technology shaping models of "personalization" in insurance*. Paper presented at the In ICT Systems and Sustainability: Proceedings of ICT4SD 2022 (pp. 237-246). Singapore: Springer Nature Singapore.

Jones, E. (2019). Rethinking greenwashing: Corporate discourse, unethical practice, and the unmet potential of ethical consumerism. *Sociological Perspectives*, *62*(5), 728-754. https://doi.org/10.1177/0731121419849095

Jovanovic, M., Kostić, N., Sebastian, I. M., & Sedej, T. (2022). Managing a blockchain-based platform ecosystem for industry-wide adoption: The case of TradeLens. *Technological Forecasting and Social Change*, *184*, 121981. https://doi.org/10.1016/j.techfore.2022.121981

Kirchhoff, S. (2000). Green business and blue angels. *Environmental and Resource Economics*, *15*(4), 403-420.

Klein, N. J., Tran, M., & Riley, S. (2020). "Desperately need a car": Analyzing crowdfunding campaigns for car purchases and repairs on Gofundme. com. *Travel Behaviour and Society*, *21*, 247-256. https://doi.org/10.1016/j.tbs.2020.07.004

Klimontowicz, M. (2023). FinTechs contribution to sustainable development. *Annales Universitatis Mariae Curie-Skłodowska, Sectio H Oeconomia*, *57*(4), 103-121. https://doi.org/10.17951/h.2023.57.4.103-121

Lee, M. T., & Raschke, R. L. (2023). Stakeholder legitimacy in firm greening and financial performance: What about greenwashing temptations?☆. *Journal of Business Research*, *155*, 113393. https://doi.org/10.1016/j.jbusres.2022.113393

Lejcak, J., & Wiltshire, B. (2016). Emerging finance in the sharing economy.

Li, W., Li, W., Seppänen, V., & Koivumäki, T. (2023). Effects of greenwashing on financial performance: Moderation through local environmental regulation and media coverage. *Business Strategy and the Environment*, *32*(1), 820-841. https://doi.org/10.1002/bse.3177

Lim, X. J., Cheah, J. H., Ngo, L. V., Chan, K., & Ting, H. (2023). How do crazy rich Asians perceive sustainable luxury? Investigating the determinants of consumers' willingness to pay a premium price. *Journal of Retailing and Consumer Services*, *75*, 103502.

Lyon, T. P., & Maxwell, J. W. (2011). Greenwash: Corporate environmental disclosure under threat of audit. *Journal of Economics & Management Strategy*, *20*(1), 3-41. https://doi.org/10.1111/j.1530-9134.2010.00282.x

Maamir, N. (2024). The effect of nutritional health perceptions on the academic achievement for studente of secondary school A field study on a sample of high school student in Algerian schools. *International Journal of Early Childhood Special Education*, *16*(1), 171–178. https://doi.org/10.48047/intjecse/v16i1.20

Manavoglu, E. M. (2023). The impact of ai adoption maturity on peer-to-peer lending company performances.

Mateo-Márquez, A. J., González-González, J. M., & Zamora-Ramírez, C. (2022). An international empirical study of greenwashing and voluntary carbon disclosure. *Journal of Cleaner Production*, *363*, 132567. https://doi.org/10.1016/j.jclepro.2022.132567

Mende, M., & Scott, M. L. (2013). Status consumption in emerging markets: The role of emotions in shaping consumer behavior. *Journal of International Marketing*, *21*(3), 1-21.

Mercuri, F., della Corte, G., & Ricci, F. (2021). Blockchain technology and sustainable business models: A case study of Devoleum. *Sustainability*, *13*(10), 5619. https://doi.org/10.3390/su13105619

Milne, A., & Parboteeah, P. (2016). The business models and economics of peer-to-peer lending. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2763682

Mitchell, L. D., & Ramey, W. D. (2011). Look how green I am! An individual-level explanation for greenwashing. *Journal of Applied Business and Economics*, *12*(6), 40-45.

Moenjak, T., Kongprajya, A., & Monchaitrakul, C. (2020). *Fintech, financial literacy, and consumer saving and borrowing: The case of Thailand*. ADBI Working Paper Series. No. 1100.

Monyei, C. G., & Jenkins, K. E. (2018). Electrons have no identity: Setting right misrepresentations in google and Apple's clean energy purchasing. *Energy Research & Social Science*, *46*, 48-51. https://doi.org/10.1016/j.erss.2018.06.015

Morningstar. (2023). *Global sustainable fund flows: Q4 2022 in review*. Retrieved from https://www.morningstar.com/lp/global-esg-flows

Moro-Visconti, R., Cruz Rambaud, S., & López Pascual, J. (2020). Sustainability in FinTechs: An explanation through business model scalability and market valuation. *Sustainability*, *12*(24), 10316. https://doi.org/10.3390/su122410316

Ndubisi, N. O., Nygaard, A., & Chunwe, N. G. (2020). Managing sustainability tensions in global supply chains: Specific investments in closed-loop technology vs 'blood metals'. *Production Planning & Control*, *31*(11-12), 1005-1013. https://doi.org/10.1080/09537287.2019.1695921

Nemes, N., Scanlan, S. J., Smith, P., Smith, T., Aronczyk, M., Hill, S., . . . Stabinsky, D. (2022). An integrated framework to assess greenwashing. *Sustainability*, *14*(8), 4431. https://doi.org/10.3390/su14084431

Nygaard, A. (2023). Is sustainable certification's ability to combat greenwashing trustworthy? *Frontiers in Sustainability*, *4*, 1188069. https://doi.org/10.3389/frsus.2023.1188069

Nygaard, A., & Silkoset, R. (2023). Sustainable development and greenwashing: How blockchain technology information can empower green consumers. *Business Strategy and the Environment*, *32*(6), 3801-3813. https://doi.org/10.1002/bse.3338

Ochoa, F., & Holger, D. (2020). How to tell if a 'sustainable'business is 'greenwashing.'. *The Wall Street Journal*.

Parguel, B., Benoit-Moreau, F., & Russell, C. A. (2015). Can evoking nature in advertising mislead consumers? The power of 'executional greenwashing'. *International Journal of Advertising*, *34*(1), 107-134. https://doi.org/10.1080/02650487.2014.996116

Park, J. Y., Ryu, J. P., & Shin, H. J. (2016). Robo advisors for portfolio management. *Advanced Science and Technology Letters*, *141*(1), 104-108. https://doi.org/10.14257/astl.2016.141.21

Paulet, E., Parnaudeau, M., & Relano, F. (2015). Banking with ethics: Strategic moves and structural changes of the banking industry in the aftermath of the subprime mortgage crisis. *Journal of Business Ethics*, *131*(1), 199-207. https://doi.org/10.1007/s10551-014-2274-9

Penttilä, M., Siira, E., & Tihinen, M. (2016). Mobile payment ecosystems in transition. *International Journal of Scientific and Technical Research in Engineering*, *1*(6), 1-15.

Phoon, K. F., & Koh, C. C. F. (2018). Robo-advisors and wealth management. *Journal of Alternative Investments*, *20*(3), 79-94.

Pimonenko, T., Bilan, Y., Horák, J., Starchenko, L., & Gajda, W. (2020). Green brand of companies and greenwashing under sustainable development goals. *Sustainability*, *12*(4), 1679. https://doi.org/10.3390/su12041679

Pizzetti, M., Gatti, L., & Seele, P. (2021). Firms talk, suppliers walk: Analyzing the locus of greenwashing in the blame game and introducing 'vicarious greenwashing'. *Journal of Business Ethics*, *170*(1), 21-38. https://doi.org/10.1007/s10551-019-04406-2

Prastyanti, R. A., Rezi, R., & Rahayu, I. (2023). Ethical fintech is a new way of banking. *Kontigensi: Jurnal Ilmiah Manajemen*, *11*(1), 255-260. https://doi.org/10.56457/jimk.v11i1.353

Puschmann, T., Hoffmann, C. H., & Khmarskyi, V. (2020). How green FinTech can alleviate the impact of climate change—the case of Switzerland. *Sustainability*, *12*(24), 10691. https://doi.org/10.3390/su122410691

PwC. (2021). *The trust imperative: Why trust matters more than ever for financial services*. Retrieved from https://www.pwc.com/gx/en/about/global-annual-review-2022/trust.html

PwC. (2022). *Blockchain: The next innovation to transform financial services*. Retrieved from https://www.pwc.com/gx/en.html

Rahman, M. H., Rahman, J., Tanchangya, T., & Esquivias, M. A. (2023). Green banking initiatives and sustainability: A comparative analysis between Bangladesh and India. *Research in Globalization*, 100184. https://doi.org/10.1016/j.resglo.2023.100184

Rahman, M. H., Tanchangya, T., Rahman, J., Aktar, M. A., & Majumder, S. C. (2024). Corporate social responsibility and green financing behavior in Bangladesh: Towards sustainable tourism. *Innovation and Green Development*, *3*(3), 100133. https://doi.org/10.1016/j.igd.2024.100133

Raihan, A., Atasoy, F. G., Coskun, M. B., Tanchangya, T., Rahman, J., Ridwan, M., . . . Yer, H. (2024). Fintech adoption and sustainable deployment of natural resources: Evidence from mineral management in Brazil. *Resources Policy*, *99*, 105411. https://doi.org/10.1016/j.resourpol.2024.105411

Raj, B., & Upadhyay, V. (2020). *Role of FinTech in accelerating financial inclusion in India*. Paper presented at the In 3rd International Conference on Economics and Finance Organised by the Nepal Rastra Bank at Kathmandu, Nepal During February. pp. 28-29.

Research and Markets. (2023). *Robo-advisors market by type and geography - Forecast and analysis 2022-2030*. Retrieved from https://www.researchandmarkets.com/reports/5543135/robo-advisors-market

Rotman, R. M., Gossett, C. J., & Goldman, H. D. (2020). Greenwashing no more. *Administrative Law Review*, *72*(3), 417-443.

Rovatsos, M., Mittelstadt, B., & Koene, A. (2019). Landscape summary: Bias In algorithmic decision-making: What is bias in algorithmic decision-making, how can we identify it, and how can we mitigate it?

Safaricom. (2021). *M-Pesa 2021 impact report*. Retrieved from https://www.safaricom.co.ke/annualreport_2021/

Sanyoura, L. E., & Anderson, A. (2022). *Quantifying the creator economy: A large-scale analysis of patreon*. Paper presented at the Proceedings of the International AAAI Conference on Web and Social Media, 16, 829–840. https://doi.org/10.1609/icwsm.v16i1.19338.

Sarda, C. S. (2024). ESG: A way to combating Greenwashing and build a more ethical portfolio. *IJRAR-International Journal of Research and Analytical Reviews*, *11*(1), 57-66-57-66.

Seele, P., & Gatti, L. (2017). Greenwashing revisited: In search of a typology and accusation-based definition incorporating legitimacy strategies. *Business Strategy and the Environment*, *26*(2), 239-252. https://doi.org/10.1002/bse.1912

Seele, P., & Schultz, M. D. (2022). From greenwashing to machinewashing: A model and future directions derived from reasoning by analogy. *Journal of Business Ethics*, *178*(4), 1063-1089. https://doi.org/10.1007/s10551-022-05054-9

Shanor, A., & Light, S. E. (2022). Greenwashing and the first amendment. *Columbia Law Review*, *122*(7), 2033-2118.

Statista. (2023). *Global fintech market size 2019-2025*. Retrieved from https://www.statista.com/statistics/502239/global-fintech-market-revenue/

Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review*, *20*(3), 571-610. https://doi.org/10.2307/258788

Sundararajan, A. (2014). Peer-to-peer businesses and the sharing (Collaborative) economy: Overview, economic effects and regulatory issues. *Written Testimony for the Hearing Titled The Power of Connection: Peer to Peer Businesses*, 1-7.

Tanchangya, T., Raihan, A., Chowdhury, S., Islam, M. A., Islam, F., & Chakma, J. (2024b). Practices of green marketing and corporate social responsibility (CSR) to promote sustainable business in emerging country. *Frontiers of Finance*, *2*(2), 7202.

Tanchangya, T., Raihan, A., Rahman, J., Ridwan, M., & Islam, N. (2024a). A bibliometric analysis of the relationship between corporate social responsibility (CSR) and firm performance in Bangladesh. *Frontiers of Finance*, *2*(2), 6287.

Tang, Y., Shen, W., & Khachatryan, H. (2018). The impact of perceived greenwashing on consumers' willingness to pay for environmentally certified wood. *Journal of Cleaner Production*, *177*, 891-902.

Torelli, R., Balluchi, F., & Lazzini, A. (2020). Greenwashing and environmental communication: Effects on stakeholders' perceptions. *Business Strategy and the Environment*, *29*(2), 407-421. https://doi.org/10.1002/bse.2373

U.S. Securities and Exchange Commission (SEC). (2021). *SEC announces enforcement task force focused on climate and ESG issues*. Retrieved from https://www.sec.gov/news/press-release/2021-42

Varavallo, G., Caragnano, G., Bertone, F., Vernetti-Prot, L., & Terzo, O. (2022). Traceability platform based on green blockchain: An application case study in dairy supply chain. *Sustainability*, *14*(6), 3321. https://doi.org/10.3390/su14063321

Velte, P. (2022). Archival research on integrated reporting: A systematic review of main drivers and the impact of integrated reporting on firm value. *Journal of Management and Governance*, *26*(3), 997-1061. https://doi.org/10.1007/s10997-021-09582-w

Wabwile, A. W. (2023). *Effect on climate finance practices for sustainable investment among commercial bank in Kenya*. Doctoral Dissertation, Kca University.

Wang, D., Walker, T., & Barabanov, S. (2020). A psychological approach to regaining consumer trust after greenwashing: The case of Chinese green consumers. *Journal of Consumer Marketing*, *37*(6), 593-603. https://doi.org/10.1108/jcm-06-2019-3257

Wang, W., Ma, D., Wu, F., Sun, M., Xu, S., Hua, Q., & Sun, Z. (2023). Exploring the knowledge structure and hotspot evolution of greenwashing: A visual analysis based on bibliometrics. *Sustainability*, *15*(3), 2290. https://doi.org/10.3390/su15032290

Whelan, T., & Kronthal-Sacco, R. (2019). Actually, consumers do buy sustainable products. *Harvard Business Review*(June 2019), 1-4.

World Bank. (2020). *Fintech*. Retrieved from https://www.worldbank.org/en/topic/fintech

Yang, X. (2020). *FinTech in promoting the development of green finance in China against the background of big data and artificial intelligence*. Paper presented at the In 2020 4th International Seminar on Education Innovation and Economic Management (SEIEM); Francis Academic Press: London, UK.

Yoganandham, G., Kareem, A. A., & Khan, E. M. I. (2024). Unveiling the shadows-corporate greenwashing and its multifaceted impacts on environment, society, and governance-a macro economic theoretical assessment. *Humanities*, *11*(S3), 20-29.

Zhou, X., Tang, X., & Zhang, R. (2020). Impact of green finance on economic development and environmental quality: A study based on provincial panel data from China. *Environmental Science and Pollution Research*, *27*, 19915-19932. https://doi.org/10.1007/s11356-020-08383-2

Zych, G., Budka, B., Czarnecka, M., Kinelski, G., & Wójcik-Jurkiewicz, M. (2021). Concept, developments, and consequences of greenwashing. *European Research Studies*, *24*(4B), 914-922. https://doi.org/10.35808/ersj/2779