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## FIN TECH, FINANCIAL INCLUSION, AND ENVIRONMENTAL SUSTAINABILITY: A TRIPLE BOTTOM LINE APPROACH

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### Abstract

The global financial landscape has been profoundly influenced by the rapid expansion of financial technology (FinTech), which has facilitated the development of innovative financial services and improved financial inclusion. Simultaneously, the growing prominence of environmental concerns has motivated policymakers and financial institutions to adopt sustainable practices. The Triple Bottom Line (TBL) concept, which prioritises economic, social, and environmental performance, offers a valuable framework for analysing the interconnected roles of FinTech, financial inclusion, and environmental sustainability. This research investigates how FinTech innovations promote inclusive financial systems and align with environmental sustainability objectives. The article assesses the opportunities and challenges of FinTech-driven sustainability initiatives, examines emerging trends, and discusses the policy implications for the development of sustainable digital financial ecosystems. The findings emphasise that FinTech has the potential to significantly advance financial inclusion, promote green finance, and support sustainable economic development when it is adopted responsibly and accompanied by appropriate regulatory frameworks.

**Keywords:** FinTech, Financial Inclusion, Environmental Sustainability, Triple Bottom Line, Green Finance, Digital Finance.

## Introduction

In recent years, rapid technological advancements have radically altered the global financial landscape, leading to the emergence of innovative financial services collectively known as financial technology (FinTech). Peer-to-peer lending platforms, blockchain technologies, digital investment services, mobile banking, and online payment systems are all included in the broad definition of FinTech. These innovations have substantially enhanced the efficiency, accessibility, and affordability of financial services worldwide (Arner et al., 2016). Consequently, FinTech has emerged as a critical factor in transforming the financial sector and advancing economic growth.

FinTech's capacity to improve financial inclusion is one of its most noteworthy contributions. Financial inclusion is the term used to describe the availability and accessibility of affordable financial services, including savings accounts, credit facilities, insurance products, and payment systems, to all segments of society, with a particular emphasis on marginalised and underserved populations (Singer et al., 2018). Due to regulatory barriers, high operational costs, and inadequate infrastructure, traditional banking institutions frequently fail to penetrate rural and low-income communities in numerous developing nations. As a result, FinTech has been widely acknowledged as a critical tool for reducing poverty and fostering inclusive economic growth.

In this context, digital financial technologies have the potential to significantly advance environmental sustainability. FinTech platforms can facilitate green investments, enhance transparency in environmental financing, reduce paper-based financial transactions, and enable the more efficient allocation of financial resources toward sustainable initiatives (Dorfleitner et al., 2017).

FinTech, financial inclusion, and environmental sustainability are interconnected, and the Triple Bottom Line (TBL) framework offers a valuable conceptual perspective for examining this relation. Elkington (1997) introduced the Triple Bottom Line concept, which emphasises the necessity of balanced performance across three critical dimensions: economic prosperity, social equity, and environmental protection for sustainable development. Using this framework, researchers can gain a more comprehensive understanding of how technological advancements in the financial sector contribute to ecological sustainability, social inclusion, and economic growth. While FinTech offers substantial opportunities to promote sustainable and inclusive development, it also poses specific challenges. If not adequately addressed, the potential advantages of FinTech may be limited by factors such as regulatory uncertainty, cybersecurity risks, digital inequality, and the environmental impact of digital infrastructure (Ozili, 2018). Consequently, it is imperative to have a thorough understanding of the interplay among environmental sustainability, financial inclusion, and FinTech to facilitate responsible technological innovation and develop effective policy frameworks.

In this context, the current study investigates the role of FinTech in promoting financial inclusion and environmental sustainability by employing the Triple Bottom Line approach. The study aims to advance the existing literature on sustainable digital finance and underscore the potential of FinTech to promote inclusive, environmentally responsible economic development by examining emerging trends and their policy implications.

## Review of Literature

The financial sector has undergone major changes due to the rise of Financial Technology (FinTech), which uses digital technologies to provide financial services more efficiently, affordably, and accessibly. Researchers such as Douglas W. Arner, Janos Barberis, and Ross P. Buckley argued that FinTech emerged strongly after the global financial crisis and transformed traditional banking through innovations like mobile banking, blockchain, and online payment systems. These technologies expanded access to financial services beyond conventional banking channels. Financial inclusion has become an important goal for sustainable economic development. Studies by Singer et al. (2018) showed that digital financial technologies, especially mobile banking and digital payments, have significantly increased access to formal financial services for low-income and underserved populations, particularly in developing countries. Similarly, Ozili (2018) highlighted that FinTech reduces barriers such as high transaction costs, limited geographic access, and complex documentation, thereby promoting inclusive economic participation.

The role of finance in supporting environmental sustainability has also become increasingly important. Sustainable finance focuses on directing investments toward environmentally responsible activities. Research by Sachs et al. (2019) stressed the importance of financial institutions in funding climate-friendly projects and supporting a low-carbon economy. FinTech platforms can encourage green initiatives such as renewable energy and sustainable agriculture, while technologies like blockchain improve transparency and accountability in environmental financing.

The Triple Bottom Line framework proposed by John Elkington explains the connection between economic growth, social inclusion, and environmental sustainability. In digital finance, this framework shows how FinTech can enhance economic efficiency, improve social inclusion through wider financial access, and support environmental sustainability through green financial solutions.

## Research Gap

Despite the expanding literature on FinTech and financial inclusion, relatively few studies have investigated the interplay among environmental sustainability, FinTech, and financial inclusion within a single analytical framework. The environmental implications of digital financial technologies are relatively underexplored, while most extant research focuses on the economic and social

benefits of FinTech. Additionally, there have been concerns about the environmental impact of digital infrastructure, including the energy consumption of blockchain technologies and data centres. Therefore, there is a substantial research gap in understanding how FinTech can contribute to sustainable development by integrating environmental sustainability and financial inclusion. It is imperative to address this divide in order to foster responsible digital financial innovation and establish effective policy frameworks. The current investigation seeks to address this divide by analysing environmental sustainability, financial inclusion, and FinTech through the lens of the Triple Bottom Line.

## Statement of the Problem

Financial Technology (FinTech) has transformed global financial systems through innovations such as mobile banking, online payments, peer-to-peer lending, and blockchain platforms, making financial services more accessible, efficient, and transparent. It plays a major role in promoting financial inclusion by enabling underserved populations to access formal financial services, which helps reduce poverty, encourage entrepreneurship, and support economic growth. At the same time, growing environmental challenges such as climate change and resource depletion have increased the importance of sustainable finance, which integrates environmental, social, and governance (ESG) factors into financial decision-making to support sustainable development.

Although FinTech and sustainable finance are both increasingly significant, research connecting FinTech with both financial inclusion and environmental sustainability remains limited. Most studies focus mainly on financial efficiency and inclusion, while the environmental impacts of digital financial systems—such as energy consumption, digital infrastructure, and regulatory concerns—are less explored.

The Triple Bottom Line framework developed by John Elkington provides a useful approach for analysing the economic, social, and environmental dimensions of FinTech. However, there is still limited integrated research combining these three aspects. Therefore, understanding how FinTech can simultaneously support financial inclusion and environmental sustainability is essential for building sustainable digital financial ecosystems.

## Significance of the study

As it explores FinTech, financial inclusion, and environmental sustainability within the Triple Bottom Line, this study is important theoretically and practically. The study integrates digital finance, inclusive financial systems, and environmental sustainability into the literature. Only a few studies have examined the combined influence of FinTech and financial inclusion on environmental sustainability. This paper explains how financial sector technological innovation can promote sustainable development using the Triple Bottom Line concept (Elkington, 1997).

This paper suggests FinTech could promote financial inclusion. Digital financial services enable consumers and small businesses to use formal financial systems without access to banking infrastructure. Large parts of developing economies are unbanked or underbanked, underscoring the importance of expanding financial access (Singer et al., 2018). The study shows how FinTech may improve financial inclusion and economic engagement.

The environmental impact of digital infrastructure must be understood to ensure technological advances align with sustainability goals. This analysis can help policymakers and financial regulators establish sustainable digital finance plans. Finance ministers and banks are incorporating environmental concerns into financial policy and encouraging green initiatives.

## Objectives

1. To understand the role of Financial Technology (FinTech) in promoting financial inclusion.
2. To identify the relationship between financial inclusion and environmental sustainability.
3. To evaluate how FinTech contributes to environmental sustainability within the Triple Bottom Line framework.
4. To identify the emerging issues and challenges in fintech, financial inclusion and environmental sustainability.

## Research Methodology

Within the framework of the Triple Bottom Line approach proposed by John Elkington, the current study employs a descriptive research design to investigate the relationship between environmental sustainability, financial inclusion, and Financial Technology (FinTech). Secondary data, compiled from academic books, institutional reports, scholarly journal articles, and publications of international organisations such as the World Bank, International Monetary Fund, and United Nations.

## Theoretical Discussions

### *Growth of FinTech and Digital Financial Services*

The global financial services sector has been substantially transformed by the rapid emergence and growth of Financial Technology (FinTech), driven by advances in information and communication technologies. FinTech refers to the integration of digital technologies into financial services to improve their efficiency, accessibility, and convenience. Blockchain technology, artificial intelligence, peer-to-peer lending systems, mobile banking, and digital payment platforms have significantly altered the delivery and accessibility of financial services.

The widespread adoption of digital technologies, including smartphones, internet connectivity, and cloud computing, is a primary driver of FinTech growth. These technologies have enabled

financial institutions and technology firms to develop innovative financial solutions, enabling individuals and businesses to conduct transactions quickly and efficiently. Electronic wallets, mobile banking applications, and digital payment systems enable users to manage their finances, make payments, and transfer money without ever visiting a physical bank branch.

The growing demand for user-friendly, convenient financial services is another significant factor driving FinTech growth. Individuals may be discouraged from utilising formal financial services due to the complexity of procedures, documentation requirements, and restricted operating hours associated with traditional banking systems. These limitations are resolved by fintech platforms, which offer simplified digital interfaces and 24/7 access to financial services

The growth of FinTech has also driven the emergence of new financial business models and service providers. Traditional banks are facing stiffer competition from technology-driven organisations, including crowdfunding platforms, digital payment platforms, and online lending institutions, in the provision of financial services.

In general, the financial landscape has been substantially altered by the expansion of FinTech, and digital financial services have enhanced the efficiency, accessibility, and inclusivity of financial systems. The incorporation of sophisticated digital technologies into financial services continues to revolutionise how financial transactions are conducted worldwide and drive innovation.

## **FinTech and Financial Inclusion**

Financial technology (FinTech) has emerged as a transformative force in the financial sector, considerably contributing to the global expansion of financial inclusion. FinTech is the term used to describe the utilisation of digital technologies to provide financial services in a more cost-effective, efficient, and accessible manner. Traditional financial systems have been transformed by innovations such as mobile banking, digital payment platforms, peer-to-peer lending, blockchain technology, and online financial services, creating new opportunities for individuals and enterprises to access financial services.

Financial inclusion is the term used to describe the availability and accessibility of affordable financial products and services, such as savings accounts, credit, insurance, and payment services, to all individuals and enterprises, with a particular emphasis on those whom the formal financial sector has historically underserved. Financial inclusion has emerged as a global development priority because access to financial services enables individuals to mitigate financial risks, invest in education or business ventures, and enhance their overall economic well-being.

FinTech is instrumental in promoting financial inclusion by removing the obstacles that frequently prevent individuals from accessing traditional banking services. High transaction costs, complex documentation requirements, limited banking infrastructure in rural areas, and lengthy

distances to bank branches are among the obstacles. Digital financial technologies enable individuals to access financial services through smartphones and internet-based platforms, thereby circumventing geographical and institutional limitations.

FinTech-based solutions, including mobile money services, have significantly enhanced access to financial services for rural households and small businesses across numerous developing economies. Online lending platforms offer entrepreneurs who may not qualify for traditional bank loans alternative sources of credit, while digital payment platforms allow users to transmit and receive money instantly. These technological advancements facilitate economic participation by enabling individuals to save money securely, access credit for productive activities, and engage in digital marketplaces.

The expansion of FinTech also presents certain challenges, despite its potential benefits. In certain regions, the effective use of digital financial technologies may be limited by cybersecurity risks, inadequate internet infrastructure, limited digital literacy, and regulatory uncertainties. Consequently, to ensure that FinTech innovations effectively contribute to inclusive financial development, policymakers must establish supportive regulatory frameworks and encourage digital literacy programs.

In general, the correlation between FinTech and financial inclusion illustrates the potential of technological innovation to facilitate the development of more inclusive financial systems. FinTech has the potential to significantly contribute to sustainable development and inclusive economic growth by reducing barriers to financial access and enhancing the effectiveness of financial services.

### ***FinTech and Environmental Sustainability***

Growing concerns about climate change, environmental degradation, and resource depletion have underscored the significance of incorporating environmental sustainability into financial systems. Environmental sustainability is the responsible utilisation and management of natural resources to sustain long-term economic development and preserve ecological equilibrium.

This is one of the significant ways in which FinTech contributes to environmental sustainability by fostering the development of green finance. Green finance encompasses financial investments that advance environmentally sustainable initiatives, including renewable energy development, climate change mitigation, sustainable agriculture, and pollution reduction.

FinTech also contributes to environmental sustainability by minimising the environmental impact of conventional financial services. Large physical infrastructure, extensive documentation, and energy-intensive processes are frequently necessary for conventional banking operations. The necessity for paper-based transactions and physical banking infrastructure is substantially diminished by the implementation of digital financial services, including online banking, digital wallets, and electronic payments. This transition to digital platforms helps reduce carbon emissions and resource consumption associated with financial operations.

FinTech's capacity to enhance transparency and accountability in environmental financing is another significant contribution to environmental sustainability. The allocation of funds for environmental initiatives can be monitored and verified through secure, transparent transaction records provided by emerging technologies such as blockchain.

### ***FinTech within the Triple Bottom Line Framework***

The Triple Bottom Line (TBL) framework offers a comprehensive perspective on how financial innovations contribute to sustainable development. John Elkington introduced the concept, contending that organisational performance should not be evaluated solely on financial profitability but should also take into account social and environmental impacts.

#### ***Economic Aspect***

FinTech introduces innovative digital financial services that improve the efficacy and competitiveness of financial systems from an economic perspective. Various technologies, including blockchain, digital payment systems, peer-to-peer lending, and mobile banking, enhance the quickness and accessibility of financial services and reduce transaction costs.

#### ***Social Dimension***

The social dimension of the Triple Bottom Line focuses on enhancing social welfare and improving equitable access to resources and opportunities. FinTech is essential to promoting financial inclusion, which is the availability and accessibility of affordable financial services for all individuals and enterprises. Mobile devices and online platforms facilitate access to banking services, credit facilities, and payment systems for underserved populations through digital financial technologies.

#### ***Dimension of the Environment***

The TBL framework's environmental dimension underscores the significance of fostering environmentally sustainable economic practices and safeguarding natural resources. FinTech plays a multifaceted role in promoting environmental sustainability. The environmental footprint of financial operations is reduced by reducing reliance on physical infrastructure and paper-based transactions through digital financial services. Moreover, FinTech platforms promote green finance initiatives that allocate financial resources to environmentally sustainable projects, including renewable energy development, climate change mitigation, and sustainable agriculture. Financial systems are essential for mobilising investments that advance global sustainability objectives.

#### ***Emerging Issues and Challenges***

The rapid advancement of Financial Technology (FinTech) has had a substantial impact on the delivery of financial services, creating new opportunities to promote sustainable development

and expand financial inclusion. Nevertheless, integrating FinTech with financial inclusion and environmental sustainability continues to pose ongoing challenges and emergent issues, despite these advancements.

### ***Limited Access to Technology and the Digital Divide***

The digital divide, which encompasses disparities in access to digital infrastructure, including smartphones, internet connectivity, and technological resources, is one of the most substantial impediments to FinTech-driven financial inclusion. Despite the rapid expansion of digital financial services in numerous regions of the globe, access to digital infrastructure remains uneven, particularly in rural areas and developing countries.

The capacity of FinTech solutions to reach marginalised populations who could benefit most from financial inclusion initiatives is constrained by the persistence of the digital divide. Consequently, it is imperative to address the digital infrastructure deficit by enhancing telecommunications networks, providing affordable internet services, and ensuring that digital devices are readily accessible to facilitate the adoption of FinTech.

### ***Financial Awareness and Digital Literacy***

The absence of financial cognisance and digital literacy among users is another significant obstacle to the adoption of digital financial services. FinTech platforms require individuals to have a fundamental understanding of online financial transactions, mobile applications, and digital tools. Digital literacy levels are comparatively low in numerous developing economies, particularly among low-income and rural populations. Inadequate financial literacy can also lead to misuse of digital financial services and increased susceptibility to online scams, identity theft, and financial deception.

### ***The Risks of Data Privacy and Cybersecurity***

The growing reliance on digital financial platforms has prompted substantial concerns about data privacy and cybersecurity. Digital networks, cloud-based technologies, and mobile applications are essential components of FinTech systems. Financial institutions and FinTech companies are attractive targets for cybercriminals due to the large volumes of confidential and transactional data they store. The public's confidence in digital financial systems can be eroded by data breaches and cyber fraud, discouraging users from using FinTech services.

### ***Policy and Regulatory Challenges***

New regulatory challenges have emerged for governments and financial authorities due to the rapid pace of FinTech innovation. The complexities of digital financial platforms may not be adequately addressed by traditional financial regulations, which were primarily designed for

conventional banking institutions. To ensure consumer protection, financial stability, and equitable market competition, regulators must continually adapt their policies as new FinTech business models emerge.

### ***Environmental Issues in the Context of Digital Technologies***

Although FinTech can promote environmentally sustainable financial practices, specific digital technologies also raise concerns about their environmental impact. The rapid expansion of digital financial systems requires a comprehensive digital infrastructure comprising high-performance computing systems, cloud computing facilities, and data centres.

### ***The potential for financial exclusion as a result of technology***

While FinTech is widely acknowledged as a means of enhancing financial inclusion, technology-driven financial systems may inadvertently create new forms of financial exclusion. For those who lack formal identification documents, technological resources, or digital skills, accessing digital financial services can be challenging. Adapting to technology-based financial systems may be more difficult for older populations, rural communities, and economically disadvantaged groups.

### **Findings**

1. FinTech enhances the efficiency, accessibility, and affordability of financial services through digital innovations such as mobile banking, digital payments, online lending, and blockchain.
2. It promotes financial inclusion by reducing traditional banking barriers like distance, cost, and documentation requirements, improving access for underserved populations.
3. It confirms increased financial access in developing economies through digital finance.
4. FinTech supports environmental sustainability by reducing paper usage, lowering dependence on physical banking infrastructure, and enabling green finance investments in renewable energy and sustainable development.
5. It highlights that financial innovation improves transparency, efficiency, and sustainability outcomes.
6. Key challenges include the digital divide, low digital literacy, cybersecurity risks, regulatory uncertainty, and environmental impacts of technologies like blockchain.
7. Structural inequalities in infrastructure and technology limit full access to digital financial services.
8. The study concludes that FinTech has strong potential to advance inclusive and sustainable development, but its effectiveness depends on responsible innovation, strong infrastructure, and supportive regulatory frameworks.

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## Suggestions

The following recommendations are proposed to improve FinTech's role in promoting environmental sustainability and financial inclusion, based on the study.

1. Strengthen digital infrastructure, especially in rural and remote areas, to improve access to FinTech services.
2. Enhance financial and digital literacy through education and awareness programs to promote safe and effective use of digital finance.
3. Develop adaptive regulatory frameworks that support FinTech innovation while ensuring consumer protection, data privacy, and financial stability.
4. Promote green FinTech initiatives to support environmentally sustainable investments and align with sustainability goals.
5. Improve cybersecurity systems to protect digital financial platforms and build user trust.
6. Ensure inclusive FinTech design so platforms are accessible to users with varying levels of digital literacy, including vulnerable groups.

## Conclusion

Relationship between environmental sustainability, financial inclusion, and FinTech from the perspective of the Triple Bottom Line framework developed by John Elkington. The framework underscores the importance of integrating economic growth, social inclusion, and environmental protection to achieve sustainable development. The analysis indicates that FinTech has become a potent instrument for promoting financial inclusion, particularly among marginalised and underserved populations. Traditional barriers to financial access, such as geographical distance, high transaction costs, and complex banking procedures, have been significantly diminished by digital financial services, including mobile banking, digital payment platforms, and online lending systems.

In addition to fostering financial inclusion, FinTech also contributes to environmental sustainability by minimising the environmental impact of financial operations and facilitating green finance initiatives. In summary, FinTech is a transformative force that can advance economic efficiency, social inclusion, and environmental sustainability within the framework of the Triple Bottom Line.

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