

Leveraging Fintech for Sustainable Development in Emerging Economies – A Policy Perspective

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Abstract: *Technological advancements in the provision of financial services are transforming the economic landscape by providing opportunities for financial institutions, corporate sector, and consumers. Financial technologies (fintech) offer broader economic development and inclusive growth and facilitate international payments and remittances. Fintech applications, such as mobile wallets and crowdfunding that are hugely successful, especially in developing countries such as India, are examples of how simple technologies can enhance financial inclusion through the decentralized provision of payments, borrowings, and risk management. However, these innovations also create challenges for regulators. The emerging fintech models raise concerns on investor protection, adequacy of existing regulations and potential threats to financial stability, leading to questions on the policies and institutional framework required to tap into the benefits of these technologies securely. In this paper, we look at the landscape of fintech companies and their suitability for financing sustainable development. The paper also examines the policy and institutional frameworks required for the effective utilization of fintech for sustainable development. Fintech has the potential to involve the private sector to finance sustainable development and hence the paper would be of interest to policymakers, particularly in developing countries, as many struggles to bridge gaps in financing their sustainable development goals (SDGs).*

Keywords: *blockchain, fintech, sustainable development, sustainable finance*

I. INTRODUCTION

Estimates indicate that an annual investment of US\$5-7 trillion, representing 7-10% of the global GDP, is required to achieve the sustainable development goals (SDGs) as outlined in the Paris Agreement [1][2]. The SDGs cover 17 social and economic goals, including poverty alleviation, zero hunger, making clean energy affordable, reducing social inequalities, sustainable production and consumption, and responding to climate change. It is important to realize these goals as they are built on the Paris Agreement's key objective of restricting the rise in average global temperature to 20°C over the pre-industrial era. A large proportion of this investment is necessitated in high-carbon sectors such as agriculture, infrastructure, energy, transportation, health and climate change adaptation efforts. According to the OECD, the current investments towards meeting SDGs stand at one-third of the required amount[3]. In developing countries, the required investment stands at US\$26 trillion by 2030, i.e. US\$1.7 trillion annually in order to ensure climate change

adaptation[4]. Achieving these goals would require the active involvement of the private sector, especially in developing countries, as the government funds are already stretched thin to meet the welfare needs. The Paris Agreement which includes a commitment to channelize funds from developed countries towards "low greenhouse gas emissions and climate-resistant development" in developing countries, has shifted the focus of policymakers in ensuring capital flow[5]. Emerging models in raising green finance and impact investment have the potential to involve private sector for a low-carbon transformation of the economy while focusing on providing essential services (such as sanitation, food, water, power and transportation), poverty alleviation and economic growth.

In this context, emerging financial technologies (Fintech) such as blockchain, internet of things and analytics offer the potential to raise capital for sustainable development at cheaper costs. These technologies are of interest for policymakers, especially in the developing economies, as it could lead to sustainable growth and achievement of SDGs. Fintech is broadly defined as the "combination of financial services and innovative technologies"[6]. In this paper, we borrow the definition of green finance from Lindeberg who uses the term to include "flow of funds to finance sustainable development projects, environmental products and policies that encourage the development of a more sustainable economy" [7]. This paper focuses on the combination of new technologies such as blockchain and internet of things, which, when combined with traditional financial services, could direct the flow of capital towards sustainable projects.

The primary objective of this paper is to understand the existing applications of fintech for sustainable development. It also outlines the implications of the introduction of fintech in developing countries and provides recommendations on policy considerations required to safely harness fintech for transitioning their economies to low-carbon and climate-resilient, thereby achieving the SDG targets. The paper is structured in five sections, the next section covers the review of existing literature followed by a detailed description of the research methodology used for analysis in section 3, section 4 covers the discussion followed by implications, and we conclude in section 5.

II. LITERATURE REVIEW

According to literature, fintech has evolved from being "technologies used and applied in the financial services sector, chiefly used by financial institutions themselves on the back end of their businesses" to "technologies that are

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disrupting traditional financial services, including mobile payments, money transfers, loans, fundraising, and asset management” [8][9].

A. Fintech and Blockchain

Blockchain or distributed ledger technologies, one of the most prominent fintech applications, was introduced in 2008 [10]. Blockchain allows creating a distributed database with blocks of data chained to each other through a cryptographic code. This unique structure allows blockchain to be used as a ledger and removes the need for financial intermediaries such as banks, stock markets and insurance agencies, for financial transactions. This ledger can be stored, and validated by anyone with approval to be part of the blockchain [11]. According to Tapscott, blockchain ensures “the integrity of the data exchanged among billions of devices without going through a trusted third party” [12][13]. Crosby explains blockchain as “a distributed database of records or public ledger of all transactions or digital events that have been executed and shared among participating parties. Each transaction in the public ledger is verified by the consensus of a majority of the participants in the system. Moreover, once entered, information can never be erased. The blockchain contains a certain and verifiable record of every single transaction ever made” [14]. Blockchains can be public, i.e. providing open access to anyone, or private with limited access. According to the popular blockchain platform, Ethereum’s founder, Vitalik Buterin, “blockchain offers the potential of a world without middlemen” [15].

The advantage of blockchain is that no single entity owns or controls it. It also provides unprecedented data security as no minority party in the system can alter the data without creating conflicts. This is the reason why blockchains are typically called “trust machines” [16] and Tapscott’s description as “the biggest innovation in computer science - the idea of a distributed database where trust is established through mass collaboration and clever code rather than through a powerful institution that does the authentication and the settlement” [17]. Though blockchain is currently being used for creating innovative currency assets such as bitcoins, there is a growing consensus that blockchains have long-term social and economic implications.

Internet of Things (IoT) and big data are complementing technologies which could be utilized to maximize the impact of blockchain. IoT is the collection of data through sensors attached to objects (e.g. health bands) while big data is used to analyze the large quantity of data collected through IoT. This helps in identifying patterns and trends in the data which are then used to train machines or take business decisions. To this existing system, blockchain can be added to authenticate the data collected through IoT before feeding it into the big data analytics tools [18]. In this paper, we will be looking at these models in detail.

B. Blockchain and sustainable development

With emerging models and use-cases, it is clear that blockchain has the potential for effective implementation of sustainable development goals. E.g. the existing applications of utilizing fintech for sustainable development include distributed renewable energy production and peer-to-peer supply, blockchain for storing healthcare records, verifying the identity of refugees primarily for humanitarian and aid

work. Blockchain is being used to track, record and trace natural assets such as forestry and fisheries. Another prevalent application of blockchain is in creating agriculture traceability where supplies shipped are tied to the farmer’s digital identity in order to improve ethical sourcing [19].

Another application of blockchain is in the financial sector, particularly in developing countries where documents for bank transactions such as identity card and credit reports, are scarce. In such scenarios, digital identity such as biometrics loaded in a blockchain can provide individuals with a secure and portable identity which can be utilized for humanitarian cash transfers, thereby reducing fraudulent claims [20]. Identity in blockchains has the added advantage of utilizing the same for property rights and land titles which can again be loaded in blockchains so that tampering can be avoided. Countries such as Sweden, Rwanda, Ghana and Estonia are already testing the blockchain model of storing property documents. However, it should be noted that the blockchain fails at addressing reliability issues and hence, it is recommended only where the existing systems of data recording are strong.

In this paper, we look at the use cases of fintech in sustainable development to understand the business models that currently exist in this sector. The literature available in this context is diffused as existing papers consider examples as use cases in a particular industry/sector. This paper attempts to bring together the different models existing in leveraging fintech for sustainable development and look into the policy recommendations for their effective implementation. The following section describes the research methodology employed.

III. DATA AND METHODOLOGY

The authors have relied on various journal articles, and reports from multilateral organizations and think-tanks working in the area of sustainable development (IMF, UN, World Bank etc.). The literature on fintech for sustainable development is largely based on qualitative methods. We have followed a case study method to understand the business models existing in leveraging fintech for sustainable development. The data on green bonds used in one of the case examples was obtained from Bloomberg.

IV. DISCUSSION

Before we start discussing the implications of and policy frameworks required for fintech, it is essential to understand the current landscape of fintech across the financial system functions. According to recent market reports, the global fintech market is slated to reach US\$305.7 billion by 2023 [21]. The companies operating in this area are largely focused on the high profitable sub-sectors such as lending and financing, capital market transactions, and personal finance.

According to McKinsey, payments form approximately 43% of the fintech market, followed by lending and financing at 24% [22]. The developing countries with their large unbanked population have been early adopters of fintech services. E.g. M-Pesa is a

peer-to-peer mobile wallet launched by Vodafone in Kenya has grown from just 1 million users in 2007 to 33.4 million users in 2018, a compounded annual growth rate of 37% [23].

Leveraging fintech for sustainable development, usually abbreviated as FT4SD, has had early adopters in multiple fields, especially in developing countries. Some of the use cases are given below:

A. Tracking natural resources

Blockchain applications to track and record natural resources are gaining prominence with its potential extending to tracing resources across boundaries. This tracking application finds potential in forestry, fisheries, minerals and even diamonds. Blakstad and Allen point out that the traceability provided by blockchain can improve the integrity of the supply chain, transparency in identifying the place of origin (for consumers), removing intermediaries through self-executing contracts (and hence lowering cost) and removing the need for third-party audits [24].

Case Example 1: An example of this implementation is 'Responsible Gold' which utilizes blockchain-based supply chain platform to certify conflict-free gold by tracking it from the mine to the vault [25]. Gold, similar to diamond, is considered a conflict metal as the proceeds from gold mining are typically used for armed conflicts, human rights violations, child labor and exploitation in underdeveloped countries. Gold refining is also used as an instrument for money-laundering by drug cartels in these countries. The technology developed by California-based Emergent Technologies issues immutable digital certificates of title detailing the players in the supply chain for responsibly sourced gold, named G-coin.

B. Financial inclusion

Majority of the population in developing countries are unable to participate in the financial economy, i.e. open bank accounts, borrowing funds from financial institutions, depositing cash for future needs, due to lack of sufficient identity proofs. Emerging technologies in the digital arena, such as biometrics, digital footprints and portable identity, are options which could replace the lack of official identity. E.g. economic identification, which is the identification of an individual based on his/her past transactions verified and stored in a blockchain, can replace official identity particularly in the case of humanitarian work involving refugees or migrants where the possibility of corruption and fraud are high [26].

Case Example 2: BanQu is an organization working to enable an economic identity through the creation of a personal digital profile in its technology platform. This profile would include personal and financial activities of the individual and is recognized and accepted by financial institutions [27]. The fintech companies working towards fostering financial inclusion operate in multiple arenas beyond providing economic identity. Organizations such as Ripple and Regalli work with refugees and migrants to allow the transfer of money to their families across the globe.

C. Energy Sector

The European region has been pioneering innovation and investment in blockchain technologies and the clean energy sector. According to the available data on the blockchain and

energy sector, over 50 per cent were based in Europe [28]. According to Marke and Silvester, among all the emerging technologies in the fintech arena blockchain has the potential to revolutionize sustainable finance architecture [29]. The idea is echoed in the recent Work Bank report as well, according to which disruptive technologies including blockchain, need to be tapped into to bridge the funding gap for sustainable development post-2020 [30]. The emerging proposals include implementing carbon markets through blockchain and peer-to-peer energy transactions to enhance the efficiency and transparency of energy trading schemes [31]. PwC observes that in case peer-to-peer energy transactions through blockchain become a reality, small-scale solar energy producers or wind turbine plant owners can directly sell the excess energy through applications and the ecosystem to operate would no longer need utility companies, distribution agents or bankers [32]. Instead, this would be replaced with a dispersed structure for energy production, distribution and monitoring where each consumer is empowered to create their contracts and has a real-time update of energy consumption and payment. Though the extent of adoption of peer-to-peer energy transaction is scarce, use-cases exist. A few examples of the use of blockchain in the energy sector are given below.

Case Example 3: Australian PowerLedger is a blockchain-based renewable energy trading platform while according to Norway's Statkraft, with the growing share of renewable energy, blockchain would connect small-scale producers to provide low-cost energy transactions within five years [33].

Case Example 4: In Europe, around 40 energy companies formed Enerchain, a blockchain-based platform for peer-to-peer wholesale energy trading leading to lower operating costs [34]. Other initiatives in the peer-to-peer energy trading market include Alliander in the Netherlands (renewable energy) and Conjoule, a subsidiary of Innogy in Germany [35].

The International Energy Agency agrees that these technologies are in their infancy and would need the support of the regulatory framework for having a disruptive impact [36]. According to a recent research on the adoption of blockchain technologies in the Asia Pacific region, it is observed that the region has the potential to be a "dynamic testing ground for new business models promised by blockchain as the region has high demand for financial inclusion and the need for more efficient, convenient and affordable products and services" [37]. However, due to its recency and potential pitfalls, Governments across Asia including China and India, have banned cryptocurrency exchanges and initial coin offerings (ICOs) across its territory. The governing regulations on these emerging technologies, particularly in developing countries, remain unclear

D. Impact finance

With growing ESG (environment, social and governance) focus of institutional investors and pension funds, the investors demand transparency in the application of their

funds to ensure that it is used for financing activities linked to the investor's goals. In the current set up, tracking investments for pension funds or retail investors is difficult. In this context, fintech solutions could help investors track relevant data about companies' ESG impacts. The data, packaged in user-friendly interfaces, could then be used for comparing different investment options which will enable the investor to maximize his ESG goals. The focus on impact finance has triggered start-ups in impact investing, portfolio management and social capital markets.

Case Example 5: Ethic is a Sydney-based start-up focusing technology-driven portfolio management solutions for their clients investing in social causes while Neogrowth is a lender for the small and medium scale industries in India. Both companies utilize blockchain technology for credit assessment and tracking capital.

E. Green bonds

Green bonds, which are similar to conventional bonds with the only difference that the proceeds are used for funding sustainable projects, have been adopted as a means of raising capital from sustainable projects. European countries and China are leading in tapping green bonds for financing sustainable development and shift to low-carbon energy sources. The growth in green bond issues is shown in Figure 1.

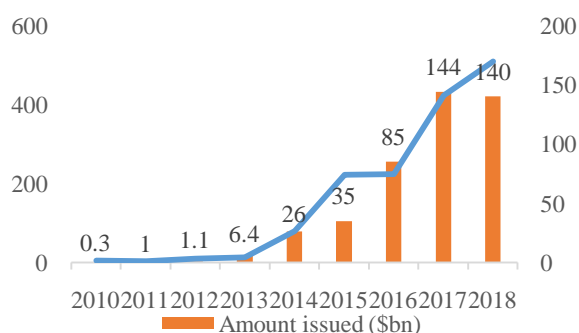


Figure 1. Green bond Issue 2010-18

However, despite its rapid growth, the presence of third-party assurers and second opinion providers, investors are concerned about the transparency in the utilization of funds raised through green bonds for sustainable development. Research indicates that the future growth of green finance is reliant on enhancing transparency in the use of capital raised [38][39][40]. In this context, significant use cases of blockchain have emerged in the green finance arena as shown below.

Case Example 6: Stockholm Green Digital Finance joined hands with the Center for International Climate Research, Norway (CICERO) to create Green Asset Wallet Initiative to enhance transparency in capital market transactions for raising green finance. The wallet allows capital market players to validate the impact reporting of green bonds, thereby monitoring the effective deployment of proceeds in sustainable development. The increased transparency obtained through the platform encourages a better flow of private institutional capital in green projects thereby allowing private participation in funding sustainable development goals [41].

Case Example 7: Another instance of application of blockchain technology in climate finance is the Climate Chain Coalition, a group of organizations including Carbon Disclosure Project (CDP), International Emissions Trading Association (IETA) etc. which have come forward to “support the application of distributed ledger technologies including blockchain and related digital solutions to address climate change” (Climate Chain Coalition, 2018).

In addition to its applications in the green bond market, blockchain technologies also enable crowdfunding and dynamic funding mechanisms which ensure enhanced participation from private finance markets (Thomason, et al., 2018). The developing countries, particularly in Asia, have been early adopters of green bond for funding sustainable development. The use of blockchain to enhance the transparency of the use of proceeds raised through green bonds would enhance investor interest in green bond issues.

The emerging technologies such as IoT, Blockchain and analytics offer the opportunity to develop an economic and financial market model which allows capital allocation to build a decentralized, inclusive and sustainable society. These technologies have the potential to lower overall system costs, improve reliability required for financial inclusion and property ownership, and increase access to essential services such as sustainable forms of energy. Having said that, these technologies are in their nascent state of both development and adoption, and hence their future trajectories are difficult to predict. Similar to any technology in its infancy, blockchain also has its set of issues. The excess resource consumption in the case of blockchain because of identical data stored in multiple systems makes the technology inefficient both in terms of energy usage as well as data space required. However, the primary concern in blockchain has less to do with inefficiency and more to do with governance issues with critics labelling it as “one of the most overhyped technologies ever”. Some of these critics such as Roubini and Byre agree that the technology has “far-reaching implications if it is combined with secure, remote automation of financial and machine processes” (Roubini & Byrne, 2018).

V. POLICY RECOMMENDATIONS& RESULTS

Though the use-cases indicate that blockchain can support financial inclusion, efficiency and transparency for sustainable growth, it also raises potential risks to consumers, investors, regulators and more broadly to the financial stability and integrity of countries. Concerns are also raised about the adequacy of the existing regulatory framework and safety nets. Hence, national and international authorities need to anticipate and mitigate possible risks linked to the adoption of fintech. In this context, it is important to maintain a balance between financial innovation and addressing integrity, consumer protection and stability. As countries evaluate the risks and opportunities posed by fintech, the Bali

Fintech Agenda of IMF and World Bank outlines key issues for policymakers to consider while outlining their approaches [30]. In the international arena, different organizations such as the Bank of International Settlements (BIS) and the International Organization for Securities Commissions (IOSCO) are reviewing the legal and regulatory implications of fintech. A major concern raised in fintech is whether the funds raised would be used for terrorist activities through

money laundering. In this regard, the Financial Action Task Force (FATF) has issued modifications to the existing Anti-money Laundering and Combating the Financing of Terrorism standards to evolving payment methods. With such growing concerns, developing economies including India and China, have taken the extreme position of banning cryptocurrencies and ICO exchanges. However, considering the potential of fintech to create far-reaching social and economic impact, it is essential to embrace these emerging technologies while being cautious of their risks. The recommendations for countries planning to foster fintech for inclusive growth is as follows:

A. Building infrastructure to sustain fintech benefits

To reap the benefits of fintech, the regulatory and institutional framework should enable these new technologies in the provision of financial services. The implementing countries should consider building the digital and financial infrastructure for open, conducive and affordable access. This includes data repositories with capabilities for efficient data collection and processing, communication networks – internet and mobile data, and payment/settlement services. As start-up fintech companies enter the financial services arena dominated by larger players, policymakers should ensure fair access to infrastructure and address concerns of competition and market concentration. From the consumer perspective, fintech offers new ways to raise funds and support growth, provide access to financial services which were unavailable earlier. Hence, fintech should be a part of the national strategy to enhance financial inclusion and digital literacy.

For any financial system, it is important to have a robust infrastructure resilient to disruptions such as cyber-attacks, to build confidence among the participants on the integrity of the data and transactions. Hence, addressing issues such as privacy, cyber security, consumer protection, data ownership and operational risks should be at the forefront while building the digital infrastructure.

B. Need for continuous monitoring

Fintech is a fast-evolving domain, and hence, countries will have to evolve their policies to meet the changing business models. To reap the benefits of fintech while mitigating potential threats, information-sharing and continuous monitoring to identify threats and to improve policies to facilitate the growth of fintech without disrupting the financial system. National policymakers need to safeguard the integrity of the financial system by eliminating criminal abuse through money laundering and funding of terrorism. Though individual country responses to these threats have varied significantly, it is essential to strengthen the anti-money laundering monitoring, particularly with the use of technologies such as regulatory technologies (Regtech) and supervisory technologies (Suptech).

C. Modernizing legal framework

In most of the developing countries, the existing legal framework on fintech is vague, which creates uncertainty about the future growth trajectories of fintech thereby inhibiting new entrants both at the demand and the supply side. Providing legal clarity regarding key aspects of fintech activities is hence essential to gain consumer trust and

reliability. It is a challenge for national authorities to ensure that their legal framework keeps pace with the rapidly growing fintech innovations. The legal framework needs to be made agile to accommodate technological change, particularly in insolvency, resolution, payments, data ownership, and privacy.

D. Fintech and monetary policy transmission

It is the responsibility of the central bank to ensure financial stability, building effective safety nets and ensure effective monetary policy transmissions. National authorities should consider the implication of fintech adoption to central banking services as the emerging technologies could alter the short-term money markets. The central banks heavily rely on the money market transactions to implement their monetary policy changes. Considering the importance placed by central banks and national governments on money market instruments for efficient control of liquidity and inflation, finding alternative routes for implementing monetary policies would be a challenge for central banks.

E. Importance of information sharing

As countries across the globe and international organizations are grappling the implications of fintech in the provision of financial services, it is essential to encourage international cooperation and information-sharing to ensure policies are updated according to emerging opportunities and risks linked to the fintech sector. Sharing experiences and best practices across countries would enable generating global consensus on the regulatory framework required to facilitate the growth of fintech without disrupting the financial ecosystem.

VI. CONCLUSION

Fintech companies offer wide-ranging opportunities, especially for developing countries, such as reducing transaction costs, improving efficiency, reducing information asymmetry, strengthening supervision, enabling international payments and remittances, and most importantly broadening access to financial services for the underserved category. Blockchain is a fast-evolving technology and economies that are capable of keeping pace with it will engage effectively with the fintech community to create business models dependent on complex, decentralized networks for improved social, financial, and technological performance. Blockchain has the potential to reduce the transaction costs of an economy through creative business models. This could reduce the costs involved in channelizing funds required to meet the sustainable development goals (SDGs) and targets mentioned in the Paris Agreement. However, for the model to function efficiently, appropriate policies and regulations need to be built in to enhance investor confidence and reduce the risk of misuse. The policymakers would need to recognize these opportunities to generate funds to build a low-carbon, climate-resilient ecosystem and achieve their sustainable development goals. The future growth trajectory of blockchain relies heavily on the regulatory framework enabling it.

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