FinTech: A force multiplier in the response to climate emergency

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Foreword from PwC

From devastating earthquakes in Turkey and Syria which caused USD 34 billion worth of damages to extreme heatwaves in Europe to massive devastations from flash floods in Northern India in 2023 - the world is at a climate tipping point. The financial implications of such climate extremities are at an all-time high as nations across the globe continue to grapple with economic recession, cost of living crisis, energy and natural resource scarcity, and staggering 2023 El-Nino inequalities. The oscillations, which are causing severe heatwaves and droughts in several countries across Europe and Asia, including India are estimated to cost the global economy USD 3 trillion.1 Therefore, now more than ever before, it is crucial to mobilise capital toward decarbonisation efforts. It will take a staggering amount of investments - around USD 6.3 trillion annually to implement supply-side climate solutions.²

Traditional finance has already begun responding to these challenges by increasing funding towards environmentally sustainable projects, such as renewable energy, energy efficiency, low emission technologies, reduction of water consumption in agriculture and waste-to-energy projects, to name a few.

A parallel development in the financial sector is the emergence of FinTech which is emerging as a scalable disruptor of traditional finance in a wide range of applications. From Alenabled instant credit to block-chainenabled trade financing solutions, FinTech solutions are helping various organisations and financial institutions unlock sustainable financing options and make informed decisions on climate resilience and sustainability actions. To fully unlock the power of the financial sector in supporting the global climate transition, it is important to mainstream FinTech into their operations. One can unlock the potential of the financial markets and work towards developing a climateresilient economy by harnessing the power of digital technologies and retooling the financial sector with FinTech-enabled solutions.

FinTech and its potential in addressing climate change

A wide range of climate tech solutions are emerging across multiple verticals that can contribute to resilience building. The use of Al predictions and analytics has proven useful in detecting forest fires, controlling pests in agriculture, and predicting and responding to extreme weather events such as floods, cyclones, and droughts. These hazards can cause significant damage to property, crops, and businesses, leading to increased insurance claims and payouts. Insurance companies are thus benefiting from better predictions of natural hazard events, allowing them to develop more robust insurance schemes, and stronger, more diversified portfolios.

Climate FinTech is enabling local institutions to mobilise disaster postdisaster cash transfers and eventbased insurance payouts. Besides providing financial protection, these products can also incentivise the adoption of resilience-building measures. Insurance companies can offer lower premiums to customers who have mainstreamed climate considerations into their infrastructure design to ensure that it can withstand specific climaterelated risks. This would help in lowering the intensity of the damage in case of an extreme weather event, and also, consequently, the claim amount.

smart FinTech for FIs – banks and nonbanking financial corporations (NBFCs) – is the ability to assess climate-related risks in their portfolios. By identifying specific risks, FIs can develop a more robust approach to risk management and develop more sustainable lending practices. Latest tech-driven innovations such as artificial intelligence (AI), machine learning (ML), distributed ledger technologies (DLT) such as blockchain, and cloud-based softwareas-a-service (SaaS) solutions are being adopted in the financial services sector. Robotic automation platforms (RAP), AI, cloud and data analytics is transforming the way insurance companies do business by seamlessly integrating more automated processes in frontend and back-end operations creating a more seamless customer experience. Al-driven analytics has already made it possible for insurers to offer tailored products, pricing and product life cycle journeys to their customers.

Similarly, banks and other financial institutions (FI) can identify potential cross-sell opportunities pertaining to climate-smart products such as identifying home-owners with high energy bills who would benefit from off-the-grid renewable energy solutions, identifying small business owners who would benefit from CapEx or OpEx loans to make their businesses more energy efficient, and identifying customers with assets in high-risk areas who would benefit from more comprehensive insurance coverage packages.

Furthermore, by leveraging automation in customer service, FIs would be able to quickly respond to customer queries, automate insurance payouts in the event of extreme weather events (e.g., if the insured asset is located in an impacted area) and manage a wealth of other customer data, enabling the FIs to identify and transition spending behaviour to more environmentally resilient and climate conscious choices. Climate FinTech innovations can empower consumers by providing them with tools and information for sustainable financial choices in their retail decisions such as offering carbon footprint calculators to track the carbon emissions from their spending patterns through green credit cards.

Innovations in FinTech are enabling asset managers across the globe to create portfolios that align with climate goals, encouraging impact investing. This would also make measurement, reporting and verification (MRV) processes more efficient and help FIs develop more robust and environmentally positive portfolios. Corporates are now able to assess their carbon offsets and monitor and measure their impact on the planet. Thus, in a rapidly expanding field, climate FinTech has the potential to make an impact on climate resilience and sustainability at a large scale.



UK leads the way for climate FinTech funding in 2023 YTD (in GBP millions)



Source: New Energy Nexus

Funding (in €m) • 3 • 6 • 14 • 45 • 64

Climate FinTech is rapidly expanding and defining new frontiers of digital transformation, particularly in emerging economies. The anticipated compound annual growth rate (CAGR) for the FinTech sector worldwide is 23%, with a market value of USD 324 billion by 2026.³ Across the world, there are many opportunities and investments driving the FinTech revolution. Emerging economies are creating a favourable environment for FIs to embrace open banking and meet the growing demand for digital applications that are easily accessible.

The Asia-Pacific region is disproportionately impacted by climate extremes and provides tremendous opportunities for the advancement of private and public investments. The Asia Pacific (APAC) region has observed a surge in economic growth in the recent years, however, it has come at a cost. The Asian Development Bank (ADB) estimates that approximately USD 1.7 trillion needs to be invested in the APAC region by 2030 to fund the growth of emerging sectors like infrastructure development in the backdrop of climate change and increasing poverty.⁴ ASEAN could lose 37% of its gross domestic product (GDP) by 2048 in the event of a 3.2°C temperature rise and Indonesia, Malaysia, the Philippines, Singapore and Thailand could lose economic output totaling more than seven times their 2019 GDP by 20505.Numerous island nations are grappling with the mounting threats posed by climate change, which could potentially trigger numerous environment-related calamities and impact both the society and the economy of the nations. Singapore, at the forefront of the climate FinTech revolution, is taking swift action to address these emergencies. In 2022, Singapore launched the Point Carbon Zero Programme, a groundbreaking initiative aimed at spurring innovation, incubation, and scaling of climate FinTech solutions across Asia⁶. This ambitious venture is being carried out in partnership with an eminent tech giant, under the auspices of Monetary Authority of Singapore's Project Greenprint. In May 2022, the Green Digital Finance Alliance (GDFA) and the Swiss Green FinTech Network, with the backing of the Swiss State Secretariat for International Finance (SIF), made history by introducing the world's first-ever green FinTech taxonomy7.

The United Kingdom (UK) is significantly dominating the Climate FinTech ecosystem in Europe which is a leader in climate-tech innovations followed by the United States. A growing number of FinTech start-ups and venture capitalists in the UK are specifically aiming to address ESG concerns in the financial sector. For example, challenges regarding the availability of quality data and transparency to comply with ESG reporting and sustainability frameworks are giving an impetus to Fls to come up with solutions that cater to this need. One of UK's largest sustainability reporting FinTech company has become the technology partner for the UK Government and the City of London-backed Sustainable Development Capital Initiative (SDCI). They are developing a combined monitoring and marketplace platform that could solve challenges related to transparency and trusted data using blockchain technology.⁸ The United Kingdom has also championed carbon offsetting and accounting through initiatives by the Bank of England and an independent financial think tank that conducts in-depth analysis on the impacts of energy transitions on capital markets.9 Besides, the UK Financial Conduct Authority (FCA) has been actively engaged in promoting sustainable finance and integrating climate-related risks in financial regulations. FCA has been encouraging FIs to disclose their climate-related risks and adopt sustainable practices aligned with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

In **Europe**, from a regulatory perspective, the **European Green Deal** sets out a roadmap for Europe to become a climate-neutral economy by 2050, de-carbonising the economy, transitioning to clean energies, and the circular economy. The EU is now considering developing its own Green Bond Standard (EU GBS) as part of the EU Sustainable Finance Action Plan. The International Capital Market Association (ICMA) first published its Green Bond Principles (GBPs) in April 2014.¹⁰ The GBPs aim to support issuers in financing environmentally sound and sustainable projects and recommend that issuers report on the use of green bond proceeds. Since 2014, ICMA has also developed Social Bond Principles, Sustainability Bond Guidelines and Sustainability-Linked Bond Principles.

Europe's entrepreneurial environment has also allowed significant penetration of climate FinTech startups with startups achieving unicorn status at a very fast pace. However, though a number of startups are on the rise in the Europe, compared to accelerated pace in the UK, the climate FinTech sector in Europe has raised nearly USD 1 billion in funding, making it the highest-funded region for climate FinTech solutions in 2022.¹¹

The United States has one of the most pronounced innovation cultures in the world. The country is an attractive place for climate FinTech innovation due to a strong FinTech culture, ample capital, and a growing climate-aware population. While the regulatory landscape in the US has been evolving, there has been an increasing recognition of the importance of ESG factors in the investment decisions drawing more capital inflows in ESG funds. Several FinTech startups in the US have developed innovative tools and platforms that cater to investor ESG preferences making it easier for them to invest in these funds. Top banks in the US have recently become members of the Partnership for Carbon Accounting Financials, a coalition consisting of more than 60 organisations that aim to support and maintain the objectives of the Paris Agreement.¹² Pushing for greater transparency and addressing climate-related risks have been the key focal points for these institutions, as evidenced by shareholder resolutions.

Australia, Brazil, Israel, Canada and China also have a flourishing FinTech hub as the investor focus is now shifting toward untapped markets. China is investing heavily in its green energy to meet carbon neutrality ambitions by 2060, however, their greenhouse gas emissions are expected to get worse – peaking by 2030. By encouraging innovation in the green startup sector, China can lead the way in achieving climate goals. A notable Chinese climate FinTech startup which is an online mobile payment platform used by more than a billion people to pay for daily needs, bike rental, wealth management products and services. It has a doublecounting carbon reduction effect and is a key example of innovative environmental protection in the digital era.

In India, there is a growing focus on green financing in the country's financial system. The Reserve Bank of India (RBI) has emphasised the important role the financial sector can play in mobilising resources and allocating them towards green activities and projects. An increasingly popular form of green finance is the 'green deposit'. This is an interest-bearing deposit received by a regulated entity (RE) for a fixed period, with the proceeds earmarked for green financing. Small and medium enterprises (SMEs) are also contributing to the reduction of greenhouse gases (GHGs). FinTech companies are helping SMEs transition to a low-carbon economy through their technology-first approach.





Key challenges in Climate FinTech

The adoption of climate FinTech solutions to address climate challenges comes with challenges such as lack of mainstreaming, funding, trust from investors, regulations, and collaboration between tech driven and traditional companies. Some of the key challenges in the climate FinTech market are:

• Lack of early-stage funding:

There is a lack of early-stage funding for FIs. This lack of capital for research and development (R&D) often leads to a decreased interest among FIs to switch to green financial technology innovations. According to India FinTech Opportunities Review (IFOR) report 2017, 71% of pre-revenue and 81% idea-stage FinTech start-ups noted 'severe difficulty' in raising funds. Additionally, many start-ups are facing a very long fundraising cycle due to which they are finding it difficult to scale up.¹² Early-stage start-ups also face difficulties managing regulatory uncertainties since a majority of them lack an in-house legal and compliance team that can stay abreast with regulatory reforms and changes.

Data access, transparency and quality challenges:

Climate FinTech technologies rely heavily on latest, up-to-date climate data. Obtaining reliable, measurable and real-time data related to climate risks, emissions, sustainability metrics, ESG material topics can also be challenging due to variations in data sources, quality and standardisation. Developing accurate climate risk models and integrating climate-related factors into the financial analysis can pose significant challenges. There is a need for a global framework/taxonomy (similar to what Singapore, South Africa and the EU have already been doing) that provides banks and FIs with a common language that can guide them in identifying the technology innovations for seamless integration and provide them with appropriate methodologies and matrices to price climate risks and measure the impacts of green and sustainable projects.

Market fragmentation:

Since the climate FinTech market is relatively new and diverse, it is fragmented. This makes it challenging for investors and consumers to navigate and identify reliable and effective solutions.

• Scalability and adoption:

The adoption of FinTech services by consumers as well as the target segment for most of the platforms is largely concentrated in metro and tier I and II urban cities. Currently, over 45% of India's population has an online presence out of which around 24% is financially literate. As a significant percentage of the country's population is underbanked, it is difficult to introduce the mindset to move away from cash to digital modes for payment for settlement/online transactions. Overcoming inertia and motivating people to opt for climate-friendly financial products and services present significant challenges. It is also essential to increase awareness of investors and seed funders about sustainable finance options and their potential benefits for the economy thereby ensuring penetration of climate FinTech products and services in different regions.

Data-privacy challenges:

Cybersecurity and data privacy are important challenges for FinTechs as the level of sophistication in cybercrime has increased due to technological advancement. As an increasing percentage of people adopt digital transactions, detection and prevention of cyber frauds has become critical. The onus is on FinTech players (and their partners) to ensure that adequate digital controls are implemented to secure customers' trust.











Key tailwinds in Climate FinTech

Climate FinTech solutions are emerging as vital tools in leveraging the power of financial technology to drive positive environmental impact and address critical issues related to climate change. By increasing investor confidence in impact investing, facilitating cross-border lending and money exchanges, trading in carbon credits, and assisting businesses in complying with environmental regulations through more efficient MRV processes, some of the key tailwinds offered by climate FinTech solutions are:

• Payments innovation and cross-border payments:

According to a PwC research, digital payments market in India was estimated to be worth INR 63 trillion in FY21 and is expected to grow at a CAGR of 29% to reach INR 385 trillion by the end of FY26.¹² The credit card space is witnessing the entry of new players from both banks and FinTechs, increase in volume through electronic toll payment, offline payments solutions on UPI and cards will cater to payments requirements in the hinterland and border areas, etc. The growth potential in buy now pay later (BNPL) has also attracted the attention of established FIs like banks and NBFCs.

India has become the largest recipient of foreign inward remittances in recent years. According to the World Bank, India received INR 6 trillion as inward remittances in 2020.¹³ To cater to this growing reliance on foreign remittances, many money transfer operators (MTOs) have provided remittance solutions. Key developments like universal basic internet can ensure rapid digital adoption at the bottom of the pyramid. Various neo-banks are now catering to the specific needs of MSMEs, gig workers, teenagers, and other groups. The global sustainable investment industry is projected to reach USD 53 trillion by 2025. Sustainable investing in India is also expected to witness a growth, with initiatives emerging to support the country's commitment to achieve net zero emissions by 2070.¹⁴ FinTech companies are exploring the ESG space by offering solutions for monitoring, reporting, and quantifying ESG risks and opportunities. Additionally, these companies are utilising technologies such as intelligent process automation (IPA) and distributed ledger technology (DLT) to issue and transact ESG-related bonds and other securities in a cost-effective manner.

• Carbon market solutions:

Climate FinTech solutions are offering financial products that can assess and mitigate climate-related risks for businesses, such as insurance and risk management solutions, green bonds, resilience bonds, etc. There is a growing presence of FinTech solutions in the realm of carbon credit digital exchanges (which could play a role in the future of biodiversity) and e-trading of digital assets backed by natural capital.

• Streamlined MRV processes:

Software-based digital data analytics solutions are gaining prominence for transparency in carbon accounting, emissions calculation, precision ESG data, etc., by providing data security and integrity, cost and time efficiency, mitigating greenwashing amongst corporates and helping companies meet and disclose emissions data under sustainability reporting programmes.







Leveraging FinTech for sustainable financing amid climate emergency

Climate FinTech or green FinTech solutions enable collective action for a low-carbon economy, paving the way for a more sustainable and resilient future. FinTech solutions democratise access to climate financing, empowering climate initiatives of various scales. With the agility and scalability of climate FinTech solutions, climate financing can reach a broader audience, mobilising greater resources to combat climate change and accelerate the transition to a low-carbon economy. Given below are some examples of the relevance of climate FinTech solutions across various sectors and how they can help promising start-ups and their innovative technologies from around the world.



Enhanced banking services:

By integrating advanced technologies and data analytics into their financial products, enhanced banking can impact more sustainable and eco-friendly financial behaviour among its customers. **Digital money** can aid neo-banks in supporting high-impact climate and environmental projects through the development of innovative tools and features. These innovations are gaining popularity in Europe, as evidenced by the success of a green neo-bank start-ups that allows customers to calculate as well as track CO2 emissions from their spending and provide avenues of offsetting it. Such green FinTech solutions offers customers alternative, transparent and ecological savings accounts that contribute to the financing of various environmental initiatives such as ocean de-pollution, afforestation, and renewable energy development with each payment, free of charge.

Payments

As technology evolves, it also opens up new avenues for the payments sector. Payments form the core of any FI and it's becoming imperative for central banks to provide avenues that offer new world functionalities for relevance. Central Bank Digital Currency (CBDC) aims to help central banks facilitate financial services widely. The Reserve Bank of India (RBI) foresees e-Rupee/Indian CBDC as the next-gen payment mode that is seamless, ubiquitous and anonymous, delivering value and a satisfying experience to the customers. e-Rupee can act as a viable alternative to paper currency, which incurs heavy costs for the government. For example, for every INR 100 note, the cost of circulation is estimated to be around 15%-17% of the entire expense in a four-year lifecycle, including printing, distribution and returning due to soilage.¹² As cash circulation increases, it puts pressure on distribution and storage channels, along with the environment, owing to its carbon footprint. A larger amount of cash in circulation means pressure on regulators and governance in terms of printing, distribution and storage, thus posing several risks such as counterfeits, spoilage and security risks. e-Rupee gives central banks better control over usage and distribution of the currency. This was one of the primary motivations for the RBI to launch CBDC. Launching the e-Rupee on 1 December 2022, India has taken one more step towards a digital economy, given the rise in the adoption of mobile and internet-based payments, besides improving the cumbersome crossborder transaction process. Enhancing cross-border payments is a top priority for G20, and CBDCs are emerging as a facilitation tool for the same.

Climate FinTech solutions are also revolutionising payments by incorporating environmental considerations into the financial ecosystem. The way people spend their money is closely linked to carbon emissions. It is important to note that purchasing patterns influence product development. Some climate FinTech platforms offer **carbon-offsetting features** where a portion of every transaction gets directed towards environmentfriendly projects. To make informed choices, consumers who are becoming more aware therefore need access to helpful tools to track their contribution to the environment.

Optimising lending

Digitisation of lending structures using FinTech solutions has eased the structuring of debt financing deals for easy access to climate investments. Facilitating investment and initiating projects often require debt financing as a crucial component, especially for governments with limited access to financing adaptation and mitigation action. While small and medium enterprises (SMEs) have traditionally depended on banks for credit, individual investors are increasingly providing credit to SMEs through peer-to-business (P2B) platforms. FinTech companies have created platforms that have started directly linking retail investors to SME borrowers. Many SMEs lack collateral, and banks are less willing to provide long-term unsecured loans due to stricter regulations and higher capital requirements. FinTech offers small businesses an alternative way to obtain long-term financing without collateral. The digitisation of this crucial financial process has been highly disruptive yet beneficial. FinTech applications such as P2B, P2P lending, AI, and blockchain have proven their value by providing better access to debt capital and improving the credit analysis, structuring, counter-party verification, loan issuance, and regulation processes.¹⁵

One of the main instruments used in multi-lateral development banks (MDBs) financing for development projects with a climate agenda is debt climate financing. The use of FinTech platforms by MDBs and other international FIs for the structuring of loans to climatevulnerable countries, and green and social bonds for implementation of long-term on-ground projects with environmental and social objectives. There was a total of USD 30 billion issuances for green and sustainable bonds in Latin America and the Caribbean, most of them focused on international investors.¹⁶ In 2018, the World Bank launched 'bond-l', the first bond in the world to be created, allocated, transferred and managed using distributed ledger technology. Over a period of two years, the bond managed to raise AUD 110 million, with major Australian banks and state treasuries among the investors.¹⁷ The use of blockchain technologies can provide market regulators with the macro-oversight of green bond management and prevent incidents of fraud in impact reporting and money laundering. Similarly, publicly available block-chain-based crowdfunding platforms are like a digital marketplace to connect investors with project owners with higher transparency and efficiency in disaster aids and relief operations. There have been also few cases of financing big longterm projects through such platforms.

Technology in sustainable finance

The Internet of things (IoT) devices connected to a blockchain network can help in capturing real-time data. For example, using an IoT device can verify the power output of a renewable power generation facility. This information could then be automatically uploaded to the green bonds used to fund it. This process can ensure that the data captured is genuine and improve the investors' ability to trust the greenness of their assets. Similar IoT devices could be used to measure air quality around a city and either penalize or reward the city via interest rate changes on its municipal bonds (sustainable bonds raised by the municipalities) if it fails to achieve promised improvements.

Issuers could use this technology to certify that goods purchased for green bond-funded projects come from suppliers that have been independently verified as sustainable. This will enhance the **traceability and auditability of sustainable sources across the value chain**.

Digital currency integration

Digital currency can also be programmed to be spent only on certain things. The Digital Currency Forum in Japan has created **digital currency tokens** that can only purchase electricity that has blockchain certification to prove that it was produced sustainably.¹⁸ If the same logic is extended to green financing, it might be possible to hypothecate the proceeds of green bonds to ensure they are spent on specific projects. Green bond proceeds can come with a token that will be spent in a manner defined by the issuer's ESG framework.¹⁹ This technology can also be used to make it easier for investors to track and assess the impact of their portfolio.

As with many post-disaster or emergency aid payments, there is a risk of corruption or the misuse of funds. Development banks combat this risk with oversight and scrutiny of the projects. Hypothecated loan proceeds can reduce spending on illegal activities, similar to electricity and green bond proceeds. The PM Cares Fund, an initiative of the Government of India, uses digital payments platforms for easy transfer of relief funds during emergency situations for disaster recovery and response activities.²⁰ Additionally, to ensure that climate funds are used effectively there are blockchain technologies which can be used to enhance the transparency and traceability of the relief funds deployment in developmental works or the intended purpose.

Impact investing

It is predicted that the value of global ESG assets will surpass USD 53 trillion by 2025. This accounts for more than a third of the projected total assets under management, which is expected to reach USD 140.5 trillion. The demand for investment in decarbonisation has grown immensely, surpassing previous annual growth metrics and solidifying ESG considerations as a mainstream component of investing. This trend is driven by several factors, including regulatory pressure, product proliferation, increasing awareness of climate change, transfer of capital to younger generations, lower fees, and excellent investment returns. Climate change risks can have a significant impact on businesses and assets, leading to credit risks and reputational damage for commercial lenders.

Despite its potential, the financial sector has been slower than other sectors to adopt cloud technology. **Geospatial cloud computing technologies** can help FIs respond quickly to changes in the external environment and gain a better understanding of both financial and non-financial risks without incurring major capital expenditure.

Carbon trading

FinTech is simplifying the carbon market landscape by providing actionable data and increasing transparency. The Taskforce on Scaling Voluntary Carbon Markets (TSVCM), sponsored by the Institute of International Finance, estimates that the demand for carbon credits could increase by a factor of 15 or more by 2030 and by a factor of up to 100 by 2050²². It is estimated that the market for carbon credits could be close USD 250 billion mark by 2030²³. Tokenisation of carbon credits (i.e. assigning a blockchain token) could revolutionise the liquidity of carbon credits and lead to far greater transparency and price discovery for FIs and a far more efficient way for buyers and sellers of carbon credits to find the right credits. An Israel-based FinTech which is a leading provider of capital market trading technology launched a carbon credit marketplace. It supports capital market grade trading in any kind of carbon asset, optimises faster time to market, is regulation friendly/ready, DLT-based (blockchain agnostic) with a customisable user-interface (UI).

FinTech companies now use carbon tracking technology to help businesses understand and offset their carbon emissions. Using open banking software, daily transactions are tracked to calculate emissions, and businesses can offset them by paying a fee, which is then reinvested in carbon offsetting projects. A London-based FinTech carbon trading platform, for instance, connects buyers and sellers of carbon credits through their respective banks. The carbon credits available would be from existing international carbon offset standards bodies. FinTech carbon trading platforms have done pilot transactions with several buyers, sellers, exchanges, and registries. In carbon markets, FinTech startups play a crucial role in the consolidation of carbon emissions as a financial investment asset in a market that is expected to

generate great value as a financial product.

InsureTech

Insurance firms are the largest group of asset owners in the world, with over USD 30 trillion in assets under management (AUM). These firms are uniquely positioned in the financial system to facilitate infrastructure projects and play the role of risk managers, risk carriers and investors. Insurers protect homes and businesses by absorbing financial shocks due to cyclones, fires, and other acute weather events as well as other longer-term, chronic risks such as rising sea levels and drought.

Technological solutions in the insurance industry, known as InsureTech, aim to enhance the efficiency of the insurance process and provide better value to insurers and customers. This ecosystem brings together various industries such as agriculture, health, cybersecurity, transportation, wealth management, and the sharing economy to offer an improved service. InsureTech can help address customer queries, improve the assessment of underwriting risks, and enhance the design of life and health insurance programmes or vehicle insurance schemes. Nowadays, almost every vehicle is equipped with IoTs like GPS trackers or smartphone sensors that can analyse driving behaviour, such as rash driving, violating traffic signals, or parking incorrectly, and predict the probability of an accident or vehicle damage. Insurers can use such data to adjust premium amounts based on the risk potential of the customer. This also encourages preventive maintenance of assets like cars, safe driving habits, and a healthy lifestyle.24 Other applications include risk prevention, fraud detection, automated underwriting, streamlined back-end operations, faster application processes, claims management, and smart contract formulation. Insurance carriers are expected to increasingly adopt technology solutions such as drones and image recognition for crop insurance, AI-led risk assessment for health and life insurance underwriting, digital self-service claims processing, and customised offerings in rural markets. Leveraging technology will be integral for making inroads in the rural insurance market. FinTech innovations can utilise smart contracts on blockchain platforms to automate the insurance payout processes based on pre-determined triggers for the design of parametric insurance financial products. These contracts can be programmed to be executed automatically when the predetermined parameters are met, eliminating the need for traditional claim processes and reducing the time taken for policyholders to receive compensation in times of emergencies.

RegTech solutions

RegTech solutions can help financial institutions measure and assess the impact of climate risk regulations and policies by expanding regulatory reporting and incorporating climate-related disclosures. Regulators can use statistical tools to create hypothetical data sets, generate climate-specific scenarios, and conduct simulations for better stress testing, enhancing climate risk management and governance. RegTech has the potential to streamline and organise various carbon accounting methods, helping both private and public sector stakeholders to comply with evolving sustainability reporting requirements. With the seamless integration of Al/ML and blockchain technologies with IoT devices, satellites and other sensors, RegTech platforms are now innovating automated data gathering facilities.

Table 1: A list of some of the most promising climate FinTech technologies and concepts across global markets				
Sr. No.	Market	Technology and solutions provided	Technology	
1.	Banking	Banks are offering a range of green financing products to support customers in reducing their customer footprint by spending or investing in eco-friendly products and initiatives. A digital challenger bank in the UK, for instance, is offering green savings accounts to customers, loans for eco- friendly home improvements, discounted mortgages for engineering procurement and construction (EPC) and financing options for electronic vehicles (EVs), thereby helping customers shift to a greener and more sustainable lifestyle. Similarly, a German bank that has one of the latest financial service apps is designed with a mobile- first approach and focuses on sustainability and ethical investment practices. It allows German bank account holders and customers to easily contribute to projects aimed at combating climate change and offsetting their CO2 emissions.	Al, mobile app, commission manufacturing, SAAS	
2.	Wealth management	FinTech solutions have been using digital communication channels, robo-advisors as well and portfolio management software for more efficient wealth management practices that can quickly revert to customer queries. Such solutions also provide investment, pension, financial well-being and workplace savings. A FinTech startup, for instance, provides a real, recyclable wooden card that allows customers to plant trees with their steps, reduce their carbon consumption , and earn planet-friendly rewards . Customers can earn a certain percentage on their deposits and choose to donate the rewards to a climate cause or keep it for a rainy day. Another example includes of a global carbon credit transaction network that enables the seamless and transparent exchange of certified carbon credits. It was formed through the collaboration of four global banks. Another California-based wealth management startup builds, owns, and operates a sustainable infrastructure platform to deliver affordable and reliable resource solutions . The company works with sectors such as sustainable power, sustainable mobility, sustainable water and waste and sustainable cities.	Solution as a Service (SaaS) and commission	
3.	Carbon offsetting	FinTech solutions are providing an innovative approach to carbon offsetting. A technology platform, for example, connects companies, climate investors, and carbon projects from across the globe. Their platform provides a one-stop shop for carbon procurement , allowing companies to purchase high-quality carbon credits for their hard-to-abate emissions and maximise their social impact . FinTech solutions are also getting involved in digital trading of natural capital backed digital assets that include the use of technologies such as satellite imageries, IoT, application programme interfaces, asset tokenisation and digital ledger technologies (DLT) for sustainability and impact reporting. Another interesting example is of a FinTech crypto startup that offers to buy and sell carbon offsets on offset exchange , and benefit from discounted transaction fees by holding crypto-currencies .	SAAS, Blockchain, E-commerce	
4.	AgriTech lending	FinTech has been leading the way in enhancing market link-ages and financing solutions for small and marginal farmers. A specialist agricultural bank provides farmers with specialised lending that they need to run their farms and provide savings accounts to any individual or business that wants to back farmers into agriculture. Another example includes a rural FinTech full-stack platform that offers small-holder farmers cheap credit for the purchase of agriculture equipment improving financial inclusion in underserved locations.	Commission	

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Sr. No.	Market	Technology and solutions provided	Technology		
5.	Insurance	Startups are leading the charge in providing high-resolu- tion weather risk analytics and forecasting to determine the severity and frequency of extreme weather events world- wide. This results in dynamic and forward-looking repre- sentations of atmospheric risk , offering invaluable insights to insurers and asset managers. These industries mainly rely on static historical statistics, which produce less reliable and inadequate climate data. Making parametric flood insurance possible, Tech solutions are being used by a parametric in- surance FinTech start-up which offers an end-to-end flood data solution for designing and triggering global para- metric flood coverage.	NLP, ML, deep tech commission, SAAS, IoT, Big data, Al		
		A data analytics firm helps organisations prepare for the impact of climate change. Its services offer on-demand climate risk ratings and loss estimates, benefiting banks, insurers, asset managers, and governments. A FinTech en- terprise software offers comprehensive climate analytics and ratings for global investments. A startup insurance technology company provides parametric flood insurance to the mass market. Similarly, FinTech solutions are being used by startup insurance companies to integrate big data from Earth observation satellites and predictive analytics to help companies, investors, and entrepreneurs prepare for climate change. It provides an API to help decision-makers manage the financial, economic, and social impact of natural catastrophes.			
6.	Payments	FinTech payments leverage the power of multiple large digital financial platforms allowing users to make payments anytime and anywhere. Green financial platforms are empowering people to make a positive impact on the world through their sustainable investments. Such platform funds projects with positive ecological impact by using interchange fees and rounding up . Unlike traditional investments in fossil fuels, customers can choose to invest in various pillars of ecological transition.	SaaS		
7.	RegTech	FinTech start-ups are providing AI-driven solutions for finance professionals and corporate risk monitoring and compliance. Their solutions simplify ESG due diligence and climate as well as sustainability reporting complexities , in line with international frameworks for corporate and FI action on cli- mate change and sustainability concerns such as the Task Force on Climate-Related Financial Disclosures (TCFD) and Taskforce on Nature-related Financial Disclosures (TNFD) materiality assessments as well as other global sustainability disclosure frameworks and standards .	NLP, ML, big data, AI, commission		
8.	Lending	FinTech lending players have leveraged a combination of different business models, technology and innovative ap- proaches, enabling them to achieve wider coverage within remote areas , and solve infrastructure and risk management challenges that are typically faced by banks while serving un- tapped segments. Within the FinTech lending industry, dif- ferent business models have emerged (e.g., peer-to-peer vs. institutional-to-peer , productive vs consumptive loan providers). Some players even leverage innovative approach- es, such as various online-to-offline (O2O) channels , to provide an alternative means in driving loan origination and disbursements for non-mobile phone users.	Commission, manufac- turing		



The use of climate FinTech offers a hopeful solution for tackling the climate crisis. This paper looked at different innovations through which FinTech can assist in tackling issues related to climate change and move towards a sustainable future along with examples of successful use cases from various countries.

It is imperative for governments, FIs, technology companies, and civil society to collaborate closely to maximise the benefits of climate technology in customising financial products. Together, they must establish an enabling regulatory environment, set standards, and share best practices for integrating climate considerations into financial products and services. Early-stage funding for climate FinTech startups must be accelerated to nurture a pipeline of groundbreaking ideas and innovations. Investors and venture capitalists must actively seek out and support startups that focus on climate-friendly or sustainable solutions. This support can not only drive growth for these startups but also accelerate the adoption of climate FinTech across industries.

Standardised climate FinTech taxonomies can play a crucial role in effectively integrating such solutions into adaptation and mitigation actions through wider transparency, comparability, and clarity of on ground actions being undertaken across different areas. By creating shared definitions and metrices, it will be easier to evaluate and measure climate-related financial products and services. This standardisation will increase the confidence of investors and users creating widespread participation from them in the climate FinTech market. Having clear and standardised taxonomies will create a fair environment for climate FinTech innovators, encouraging more entrepreneurs and startups to enter the market, fostering competition, and driving innovation in climate FinTech solutions.

Furthermore, it is essential for the global community to prioritise financial literacy, increase awareness of climate commitments, and understand climate risks and natural hazards. This will empower individuals and businesses to make informed decisions that align with broader climate goals. As organisations strive to enhance the accessibility of climate FinTech or green FinTech solutions, they must prioritise financial inclusion. By considering the varying perspectives, levels of understanding and requirements of different stakeholders, climate FinTech can offer more inclusive and impactful solutions to address the challenges arising due to climate change across different geographies. As people understand the benefits and have access to these technologies, they are more likely to embrace them leading to broader market adoption and encouraging further innovation. In emerging economies like India, it is crucial for the government to lead efforts in promoting innovative ways of fostering collaborative climate action. This can be further enhanced through digital literacy campaigns that ensure wider adoption of climate FinTech solutions in the market. A techliterate population can foster fertile growth for these collaborations to flourish.

Finally, faster and more reliable connectivity improves the overall user experience with climate FinTech applications. It also enables smoother interactions, quicker transactions, easier lending processes and easyto-navigate user interfaces encouraging greater adoption and retention of emerging FinTech solutions, especially in times of crisis and when a natural disaster occurs. The successful implementation of 5G telecommunications and seamless integration with IoT devices in different countries hinges on improving last-mile connectivity. Doing so will substantially boost accessibility, enhance the user experience, and facilitate data-driven decisionmaking, ultimately leading to greater adoption of climate FinTech solutions in untapped markets.



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