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GSMA™

Brief

Digital Pathways to Land Resilience: Mobilising Climate Finance

Land degradation is a global issue that requires substantial financial assistance to respond to its impacts. This brief explores how mobile and digital technology can improve the access and delivery of climate finance to help improve the resilience of land and the populations dependent on it.

This brief was written by the GSMA in collaboration with the Global Mechanism of the UNCCD.

Climate change is one of the most pressing challenges facing the planet. By 2050, global crop yields are estimated to decrease by 10% due to land degradation and climate change, with the worst-affected regions suffering up to a 50% reduction. As a result, world food prices are expected to increase by an estimated 30% [1]. Healthy land resources and flourishing ecosystems are key to achieving the agricultural productivity needed to feed a growing global population. If land degradation continues unabated, this could potentially trigger a reversal from land being a net carbon sink to being a net carbon source.

Although we are all impacted by the effects of climate change, it does not affect us equally. Low- and middle-income countries (LMICs) are particularly vulnerable to climate shocks and stresses and require significant financial support to adapt to the changing climate. Despite increasing global commitments towards climate finance, ensuring that funds effectively reach the areas and communities most in need remains a significant challenge.

Research from the GSMA [2] demonstrates that mobile and digital technology can accelerate climate investment and financing in LMICs, including efforts to address land degradation and support smallholder farmers. Digital solutions can be applied to generate precise carbon data, foster transparency, profile end users, and measure activities contributing to carbon sequestration. The study also explores digitally enabled climate finance models which can enhance financial access for vulnerable communities. Examples include leveraging fintech, green asset financing, and participating in Voluntary Carbon Markets, further illustrated in the following sections.

Defining Climate Finance and Fintech

Climate finance is a broad term used to describe financial flows towards climate adaptation and mitigation initiatives.

Fintech is the integration of technology in financial services to improve customer usage and delivery.

Model One: Reaching the Unbanked through Fintech

Technological solutions such as fintechs [3] can be efficient tools in providing climate finance by delivering financial services, such as loans and insurance, quickly and to a wide reach of customers.

For example, it can be used to facilitate personal advisory services to smallholder farmers on their finances through data management and data sharing tools. Digital technology can also enable end-to-end digital payments through the use of mobile wallets, making it easier to reach vulnerable communities. Mobile money can subsequently facilitate the traceability of climate finance and, in the process, create a credit history and financial profile of its users, including those who have traditionally been excluded from financial services.

Moreover, innovative insurtech models, such as digitally enabled index insurances, have made insurance more accessible and more affordable for smallholder farmers to access financial support by using a pre-determined index such as rainfall levels, cutting out the cost of using traditional insurance claims assessors. They can also deliver claims at a much faster rate through the use of digital payments.

Examples of Digital Technology

Low-tech solutions such as USSD can be used by farmers to access microloans without the need of a smart phone. USSD (Unstructured Supplementary Service Data) is a protocol for mobile phones that can be used with very low bandwidths to send data to all type of mobile phones.

Mobile Money can be used to access services like savings, credit, insurance, remittances and government transfers without the need for a traditional bank account.

Satellite imagery, remote sensing and geographic information systems (GIS) can provide information about the earth's surface. In the agricultural sector this can be used for crop and soil monitoring.

Blockchain and Distributed Ledger Technology (DLT) can be used to enhance the accountability and traceability of climate finance flows.

Internet of Things (IoT), smart devices, and sensors that collect data on soil moisture, weather, and fertilisation levels, helping farmers optimise their irrigation systems and production.

Big data is the availability of large data sets which, together with **Machine Learning and Artificial Intelligence (AI)**, can be used to make informed decisions with environmental-related data.



Spotlight 1: OKO (Mali)

OKO is an automated weather insurance service that aims to secure the income of smallholder farmers against adverse weather events. Farmers receive immediate compensation in the case of extreme weather events such as droughts and floods, using an index insurance model. This helps them become more resilient against a changing climate by offering compensation in the case of bad harvests and can enable them to acquire agricultural inputs for the following season without incurring debt. The solution is also easy to access using a mobile phone. Farmers can register from a mobile device via a USSD channel and pay insurance premiums using mobile money.



Model Two: Digital Technologies for Asset Financing in the Agricultural Sector

Over the next decade, we are predicted to experience an increase in energy prices and costs due to the depletion of fossil fuel reserves and the associated increases in logistics, trade, and agricultural input expenses. Digital technology has the potential to play a key role in addressing these challenges. It can enable vulnerable communities to access alternative energy sources, as well as climate finance, by facilitating asset financing for the agricultural sector.

The Internet of Things (IoT)* is a network of internet-connected objects that can collect and exchange data using embedded sensor technologies.

They can be used in smart farming practices to generate and transmit data about a specific crop, animal or farming practice [4]. It can also be used to collect precise carbon data which helps with participation in the carbon market.

PAYG Solar

Pay-as-you-go (PAYG) solar, combined with mobile money and mobile connectivity, allows customers to pay by installments and companies to remotely control and monitor the solar powered asset.

The combination of IoT devices and pay-as-you-go (PAYG)* in the use of solar-based irrigation systems is an example of where the continued use of an asset can help to build a financial profile and give underserved populations access to financial services through the help of digital technology.

* Read more about IoT from the GSMA [here](#). For more information on PAYG solar from the GSMA, click [here](#).

By using these IoT based systems, smallholder farmers can manage water efficiently (using solar power rather than diesel) and adapt to a changing climate. However, irrigation pumps are costly. Cost barriers can be by-passed with the use of PAYG models where farmers pay in

instalments and eventually own the equipment or return it at the end of the usage period. Additionally, financial service providers can leverage data collected by the IoT system on farmers' activities to generate economic identities, enabling access to financial services such as loans and insurance [5].

Spotlight 2: SunCulture (Kenya)

SunCulture is an agritech solution focusing on solar power operated assets, providing farmers with access to essential services such as water, irrigation and lighting.

Their solution enables farmers to purchase solar powered irrigation pumps on credit using a PAYG, or 'pay-as-you-grow' model. Repayments can be made over an extended period – for example, up to 36 months. Through the use of remote sensors, SunCulture collects data at the application stage and throughout the usage period on the pump's efficiency and solar battery storage. This data can be used to provide advice on how to use the irrigation systems more efficiently.

SunCulture's approach can help farmers increase their crop yields and reduce water usage, enabling them to better adapt to unpredictable rainfall patterns.



Model Three: Facilitating Access to the Voluntary Carbon Markets

Land plays a crucial role in carbon removal. While terrestrial and oceanic sinks have successfully absorbed more than half of the carbon emissions resulting from human activities, the rate of sequestration is currently declining.

Voluntary Carbon Markets hold great potential for supporting land-based carbon sequestration and simultaneously support smallholder farmers financially. This is an important new stream of finance that can create economic opportunities and encourage long-term investment in restoring and

conserving land. While VCMs offer significant promise in the delivery of climate finance, they continue to face challenges.

Voluntary Carbon Markets

Voluntary Carbon Markets (VCM) are markets in which individuals, organisations or companies buy or sell carbon credits voluntary to offset their carbon emissions.

For example, it can be difficult to navigate the market for new buyers, understand the quality of projects and manage risks. There have also been concerns regarding double counting, greenwashing, and a lack of transparency. Digital technology can help to address these challenges by creating market-based digital

platforms that can improve carbon credits' transparency and traceability. Traditionally, sales of carbon credits have been disproportionately made by larger industrial carbon projects, primarily due to high onboarding costs and complex, lengthy verification processes.

Digital market platforms can facilitate the onboarding process, making it easier for smaller projects to access the carbon markets, making way for community-based micro projects such as clean cookstoves or community-based REDD+ projects, which may have more socio-economic or environmental co-benefits.

Digital innovation is also essential when looking at making the VCMs more traceable and transparent by digitising and automating data capture and verification and adding data triangulation. For example, enabling digital monitoring, reporting and verification of carbon credits through the use of a mobile phone can help smallholder farmers participate in the carbon market.

REDD+

The Community-based **REDD+ initiative (CBR+)** was established to enhance the engagement and inclusion of Indigenous Peoples and forest communities in national REDD+ processes, helping channel grassroots experiences and perspectives into national policies to reduce emissions from deforestation and forest degradation.

One such project is the [Rimba Raya Biodiversity Reserve](#) located in Central Kalimantan, Indonesian Borneo. The project, renowned for its collaboration with the indigenous Dayak community, focuses on preserving tropical peat swamp forests, vital carbon sinks. By preventing deforestation and land degradation, Rimba Raya generates certified carbon offsets, which it sells in the Voluntary Carbon Market. Notably, a portion of the revenue is reinvested in local communities, bolstering education, healthcare, and livelihoods.

Spotlight 3: [Ureca](#) (Mongolia/Singapore)

Ureca is a digital carbon marketplace operating out of Mongolia and Singapore. The solution aims to make the voluntary carbon market more accessible to anyone, anywhere around the world. Their platform seeks to make the carbon market more transparent and trustworthy by helping buyers trace carbon credits through a blockchain-based digital monitoring, reporting and verification system. This lets the user know where the credits come from, as well as track the impact of their investment.

Besides the traditional large scale emissions reduction projects, Ureca also includes smaller micro projects aiming to empower local communities in their transition to a low-carbon green economy.



Navigating Challenges in the Integration of Digital Technologies in Climate Finance

As outlined by the three models, mobile and digital technology can play a vital role in supporting land-based climate mitigation, adaptation, and resilience efforts. They enhance accessibility to financial services for individuals outside the traditional financial market and provide crucial data for crop monitoring and linked insurance mechanisms.

Although digital solutions hold promise for accessing and delivering climate finance, many are still in early stages of development. Addressing existing challenges and barriers – such as levels of adoption and cost of a technology, the broader climate finance ecosystem, the role of regulation and the availability of digital infrastructure and data – is essential for unlocking their full potential.

Women are disproportionately affected by the impacts of climate change. Digital solutions have the potential to create credit ratings and financial profiles for women traditionally excluded from the financial system, granting them access to services like loans and insurance.

However, success relies on addressing challenges such as the gender gap in mobile phone ownership and the absence of gender-responsive guidelines in climate finance. It is crucial to consider the specific challenges faced by women and other underserved populations during the design of new solutions, recognising that even advanced technology may not reach the intended population.

Looking ahead, governments and private sector actors can help to overcome some of the barriers by investing in digital infrastructure, expanding mobile broadband coverage to remote areas, and to provide wider and more cost-effective access to mobile technologies.

Policymakers could consider revising regulations, facilitating improved data-sharing, and enabling the development of a broader range of financial services and products. Combined, these measures can help to strengthen the delivery of climate finance, strengthening communities' capacity to adapt and build resilience against the challenges posed by climate change.



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The GSMA ClimateTech programme's flagship report, [Digitally Enabled Climate Finance](#), provides insights on the role of mobile and digital technology in accessing and delivering climate finance in low- and middle income countries.

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