

WHITE PAPER

DIGITAL TOOLS AND SOLUTIONS FOR RESILIENCE FINANCE A CARIBBEAN CONTEXT

DECEMBER 2024

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ABOUT SCALE FOR RESILIENCE

Scale for Resilience is an innovative initiative dedicated to enhancing climate resilience and driving sustainable growth across the Caribbean, Latin America and regions of Africa. A partnership between YAPU Solutions, GAWA Capital, and the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT), the initiative seeks to make 3 million farmers more resilient to climate change by 2035.

Through knowledge creation, capacity building, and expanded access to finance, Scale for Resilience empowers financial institutions, including Microfinance Institutions and Credit Unions, to integrate climate risk management tools and provide tailored financial products that support climate adaptation and resilience.

In collaboration with partners like IDB Lab and Global Affairs Canada, Scale for Resilience is currently rolling an initiative in the Caribbean, EcoMicro x Scale for Resilience, which works to enhance the resilience finance ecosystem and network in the region. The goal is to create a collaborative network and community of practice among EcoMicro Caribbean partner financial institutions (PFIs). For more information about Scale for Resilience and its work to advance climate resilience in the Caribbean, visit:

<https://www.scaleforresilience.global/>

TABLE OF CONTENTS

1

EXECUTIVE
SUMMARY

2

INTRODUCTION

3

THE CASE FOR DIGITAL
TRANSFORMATION FOR
RESILIENCE FINANCE

4

INTEGRATION INTO
DAILY PROCESSES

5

EXAMPLE OF TOOLS
ENABLING RESILIENCE
FINANCE

6

CONCLUSION

7

ACKNOWLEDGEMENTS

8

REFERENCES
AND ADDITIONAL
RESOURCES

EXECUTIVE SUMMARY



“*Digitization is no longer optional but a critical enabler for resilience finance*”

The Caribbean region, comprised of small-island developing states, faces unparalleled vulnerabilities due to climate change. Severe weather events, rising sea levels, and socio-economic dependencies exacerbate these risks, threatening livelihoods and ecosystems. To address these challenges, climate resilience and adaptation finance have become critical priorities, demanding innovative approaches to investment and capacity building.

The global focus on adaptation and resilience finance has gained momentum, underscored by the commitments made during COP28 and COP29. These agreements, including the New Quantified Goal on Climate Finance (NCQG), aim to mobilize significant capital for climate adaptation in developing countries. Caribbean Financial Service Providers (FSPs) stand at the forefront of this shift, with opportunities to channel these resources into impactful local initiatives.

However, regulatory pressures, increasing climate disclosure requirements, and the need for alignment with national climate policies present new challenges. By adopting digital tools, FSPs can navigate these complexities, ensuring transparency and optimizing resource deployment.

This white paper highlights the transformative potential of digitization in advancing resilience finance, emphasizing its role in improving transparency, scalability, and impact measurement. By leveraging digital tools, FSPs can enhance their operational efficiency, reduce costs, and empower vulnerable populations to adopt climate-resilient practices.

This publication provides:

- 1 An overview of the global trends and local relevance of resilience finance, particularly for Caribbean FSPs
- 2 A deep dive into the benefits of and operational pathways for the digitizing resilience finance
- 3 A discussion of digitization and data requirements for resilience finance
- 4 Regional case studies and examples of digital solutions for resilience finance in the Caribbean

Digitization is no longer optional but a critical enabler for resilience finance. As the Caribbean region faces mounting climate risks, adopting innovative digital solutions will empower FSPs to meet these challenges head-on and make sustainable and impactful climate adaptation investments.



INTRODUCTION

The Caribbean region is highly vulnerable to the impacts of climate change due to its geographical location and socio-economic dependencies. Being made up almost entirely of small-island developing states (SIDS), the region has already begun to experience more frequent and severe weather events, including hurricanes, droughts, and unpredictable rainfall patterns¹.

Furthermore, rising sea temperatures and ocean acidification increases coastal vulnerability of a region already affected by extreme weather events. These climatic changes have direct and devastating effects on the economy, productive capacity, and quality-of-life of the region's residents.

In response to these challenges, climate resilience has emerged as a critical priority in the development agenda of many, if not all, Caribbean states. Climate resilience involves enhancing the capacity of all stakeholders within the financial value chain to adapt to the adverse effects of climate change and to harness resulting opportunities. It requires the financing as well as the adoption of sustainable and regenerative practices that not only protect natural resources but also improve productivity in the face of changing climate conditions. This approach also involves investing in innovative technologies, resilient infrastructure, and knowledge systems that enable value chain actors to anticipate and respond to climate risks.

One of the key pathways to building climate resilience is through increased financial flows into climate-resilient practices to increase the adaptive capacity of key economic sectors and their agents. However, simply throwing money at the problem will not lead to effective results. To ensure that capital is being accessed, deployed, and monitored in the most effective way, utilizing digital tools and technologies is key. Digitizing operations and the adoption of digital tools for climate impact assessment and management increases the productive capacity of funds being deployed for climate finance (Andres et al., 2024).

OBJECTIVES AND STRUCTURE OF THE PUBLICATION

In this white paper, we explore the role of climate data as well as digital tools and solutions in supporting the introduction and scaling of adaptation and resilience finance in the Caribbean. While climate change keeps accelerating, affecting ever more people and especially the most vulnerable, adaptation and resilience finance still falls short of providing the necessary funding for a transition towards the financing of resilient (and carbon neutral) economies globally. Often, the sheer complexity makes the operatio-

nalization of well established practices and methodologies impossible – especially for small and medium FSPs.

To that end, focus is put on operational processes of FSPs, such as risk assessment and management, portfolio monitoring and loan evaluation, as well as financial and environmental impact disclosure, among others.

In consequence, the aim of this publication is to provide readers with:

(a) a brief overview of the current state of and necessity for resilience and adaptation finance as well as a short introduction to digital inclusive finance;

(b) an exploration of the benefits of the digital transformation in financial operations to enable resilience finance;

(c) an outline of the common requirements faced by digitization processes;

(d) a concise introduction of three digital climate risk assessment tools for FSPs to highlight the trends and tendencies on this new service industry;

(e) concrete snapshot examples from the Caribbean region on the adoption of digital tools for climate finance.

Drawing on expert insights from Scale for Resilience technology partners, this publication will provide a comprehensive resource for inclusive FSPs, policy-makers, and relevant stakeholders within the inclusive financial value chain. It emphasizes the benefits of digitizing operations and processes and identifies requirements to consider throughout the implementation of a digitization strategy and the introduction of digital tools.

The next section will firstly lay out the necessity of, and opportunities for, climate resilience and adaptation finance, as well as introducing digitization trends in inclusive finance generally. Section three outlines the benefits digital resilience finance offers for FSPs along different operational procedures, as well as the capacity and data mix requirements for creating customer-centric digital products. This paper will culminate in an overview of some representative digital solution providers in the area of inclusive adaptation and resilience finance. Throughout this publication, several EcoMicro partner financial institutions' digitization strate-

¹The summer of 2024 was predicted to be one of the worst hurricane seasons on record, with hurricane Beryl holding the record for the strongest hurricane ever recorded in June, the strongest hurricane that's ever struck the southernmost Caribbean Windward Islands, and the earliest category 4 & 5 hurricane ever (Pfleiderer, Martyr & Schleussner, 2024).

gy and experiences with digital tools and solutions will be showcased in case study boxes.

While the information conveyed in this paper on digitization processes and digital tools and solutions to increase resilience finance can be integrated and applied to FSPs all over the world, this paper will be putting focus on the Caribbean region, as it was written in the context of the EcoMicro x Scale for Resilience initiative being rolled out in the region from May 2024 to May 2025.

CLIMATE RESILIENCE FINANCE: GLOBAL TRENDS AND LOCAL RELEVANCE

Financing is essential for enabling smallholders and other vulnerable populations to adopt new technologies and digital tools, improve infrastructure, and transition to sustainable practices. However, access to finance remains a major barrier for many. The most vulnerable, in particular, often lack access to the necessary capital to invest in climate adaptation measures, while financial institutions remain hesitant to lend due to perceived risks. This lack of access to tailored financial products impedes the ability of affected populations to build the necessary resilience to safeguard their livelihoods and protect natural ecosystems. However, finance flows for climate adaptation and mitigation efforts are at their highest levels in history (UNFCCC, 2024), presenting a clear opportunity for FSPs to act as financial conduits towards increasing the resilience of their end-client beneficiaries.

THE CURRENT STATE OF RESILIENCE FINANCE: AN UPCOMING OPPORTUNITY FOR CARIBBEAN FSPs

Despite its crucial necessity to mitigate the impacts of climate change for all, building climate resilience and investing in climate adaptation has long taken the backseat of climate priorities, with mitigation projects and efforts usually taking center-stage. However, last year's UN Climate Change Conference, COP28, held in Dubai, UAE, and this year's COP29 held in Baku, Azerbaijan, have demonstrated a paradigm shift in this trend. The focus of COP28 was notably on increasing resilience of countries' vulnerabilities to climate change, while this year's COP29 emphasized the critical role of climate finance for adaptation and resilience measures, addressing one of the key issues raised by stakeholders present at COP28. A major milestone at COP29 was the agreement on the New Quantified Goal on Climate Finance (NCQG), which aims to triple financial flows to developing countries from USD 100 billion to USD 300 billion annually until 2035 and secure up to USD 1.3 trillion annually in private and public climate finance for these regions (UNFCCC, 2024). The NCQG will have momentous impacts on the funds available and being channeled towards climate adaptation and resilience, transforming

the funding landscape of climate finance. Relevant financial stakeholders can expect to see an increased appetite from investors on capital markets to invest in climate projects as a result of the resolutions that were met at COP29. This unprecedented commitment represents a significant opportunity for inclusive Caribbean FSPs to target investor appetite. By accessing increased funding, FSPs will not only be able to increase the resilience of their operations and reduce risk to their portfolio, but most importantly increase funds and financial instruments available to their customers and members, empowering them to adopt climate-resilient practices.

In addition to increased funding and appetite on capital

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markets, evolving regulatory frameworks are shaping upcoming opportunities. Institutional investors based out of North America and Europe, and increasingly within financial markets in the Caribbean¹, face mounting regulatory pressures. Of course, these two are inherently intertwined: as access to funds being made available for climate finance increase, so too does the requirement to put in place proper reporting, monitoring and evaluation mechanisms. Initiatives such as the European Union's Corporate Sustainability Disclosures (European Commission, n.d.), the U.S. Securities Exchange Commission's standardized climate-related disclosures requirements by public companies and private offerings (U.S. Securities and Exchange Commission, 2024), and the widespread adoption of the Taskforce on Climate-Related Disclosures (TCFD) recommendations are set to make corporate climate disclosures mandatory across 40% of the global economy once all pending disclosure rules are made effective (Carter, 2024). These regulatory pressures will cascade to increased climate disclosure necessary for inclusive financial institutions in emerging markets receiving investment, driving the need for greater transparency and climate-focused strategies. Moreover, investment focus and priorities are increasingly being crystallized in these markets through the definition, elaboration and refinement of nationally determined contributions (NDCs), national adaptation plans (NAPs), national climate change policies and the like. These policies often specify the targeted amount of funding to be channeled into relevant sectors of the economy, such as agriculture, tourism, and the service industry, presenting strategic opportunities for both investors and FSPs to align with national resilience objectives.

As the global spotlight on resilience finance intensifies, Caribbean FSPs are well-positioned to capitalize on this momentum. Transitioning to digital, inclusive financial systems will be essential to effectively channel these funds, fulfill

¹ For example, the Eastern Caribbean Central Bank introduced in March 2024 its prudential standards on climate-related and environmental risks (Eastern Caribbean Central Bank, 2024). This standard aims to ensure that licensed financial institutions (LFIs) are better prepared to address risks related to climate change, aligning with international standards from the Basel Committee on Banking Supervision

relevant reporting requirements, and meet the growing demand for climate-adapted solutions.

DIGITIZATION IN INCLUSIVE FINANCE: A BRIEF INTRODUCTION

The necessity for increased resilience in a world characterized by progressing climate change and marked by increasing natural catastrophes is now a well-known fact within the global climate community. Further, digital transformation is also reshaping every aspect of society, introducing innovative ways not only to how we produce, consume and interact, but also to how we invest. However, what remains less acknowledged is the fact that there now exist effective, scalable solutions at hand that can improve climate resilience and scale resilience finance, especially for the most vulnerable populations. A crucial enabler in this endeavor is the strategic use of digital tools to transform the investment process.

The inclusive finance space is no stranger to the digital trend (Dorfleitner et al., 2022). The sector has long been dynamic and adaptive to changing landscapes, integrating new products and services to address financial exclusion effectively and meet the evolving needs of its clientele (Umba et al., 2024). This adaptability has accelerated with the rise of new technologies, leading to a wave of digitization across Micro Finance Institutions (MFIs)². Digitization, in this context, refers to the integration of technological tools into institutional management and operations, as well as the provision of digital financial services tailored to clients' needs (Manyika et al., 2016; Ozili, 2018). In the context of this publication, the focus will lie on the necessities and benefits of the former, that is to say integration of tools into operational processes. This shift is shaping the future of resilience finance, particularly by addressing the inefficiencies and scalability issues associated with manual systems.

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However, for institutions that are not yet fully digital – or only partially so - the prospect of digitizing operations seems like a daunting one. Before embarking in the process of applying technological solutions to its operations, a company, organization or other entity of any nature must first decide between two main possible strategies: **Make or Buy**.

MAKE: the institution can develop their own solutions with pre-established internal resources, complemented and leveraged with external outsourcing resources when necessary. While this approach offers customization, the institution must consider that any platform or system will need constant maintenance (“SysAdmin”) and constant development of new functionalities (“DevOps”) – generating ongoing recurring expenses and investments. Furthermore, if opting for this strategy, the risk of cyber threats cannot be underestimated. Financial institutions must invest in robust cybersecurity systems to ensure both back-end data protection and front-end customer security. Moreover, the human element remains essential - FSPs must take responsibility for ensuring that their systems are user-friendly.

BUY: The institution can buy or lease a system that meets its functional requirements. Depending on whether the software system is purchased or leased (typically as a “Software as a Service”, SaaS), there may be limitations with respect to available functionalities. Nonetheless, the costs of buying or leasing a software are typically much lower than creating a software system in-house, and having the flexibility to switch between providers based on the best available offer/service represents an attractive alternative.

The decision for either option typically depends on the maturity of the market in the area where the introduction of technological solutions is sought. For climate risk management and the monitoring of climate finance, a growing number of solutions providers are emerging, offering diverse, adaptable options, as will be explored in section five. Hence, interested institutions have a wide array of options to choose from that align with their operational needs, strategic goals and financial constraints.

This is not to say that financial institutions, especially MFIs, should fully factor out the human component when going digital. On-the-ground data collection by loan officers and community stakeholders is vital, not only for capturing the nuances of borrowers' realities but also for fostering trust and buy-in from local communities (Taylor et al., 2024). This trust, built through direct human interaction, serves as the foundation for successful adaptation financing. Ground-level information gathering is therefore indispensable, ensuring that the digital tools deployed are adaptable and responsive to local contexts. However, relying exclusively on manual processing of the collected client information introduces inefficiencies and risks (Umba et al., 2024; Dorfleitner et al., 2022; Abera et al., 2024). Human-driven systems are prone to errors, biases, and bottlenecks that can

² Interestingly, Andres et al. note that, often, loan origination and processing is the last procedure to undergo digitization (2024), a trend Scale for Resilience has equally noticed within PFIs.

impede the timely disbursement of funds and the accurate assessment of risks. Furthermore, as climate finance scales up, manual systems struggle to handle the increasing volume and complexity of data required for decision-making (Gräf, 2022).

THE ESSENTIAL SHIFT FROM MANUAL TO DIGITAL

OVERCOMING MANUAL PROCESSING LIMITATIONS

The microfinance sector is increasingly adopting digitization, transforming both operations and service delivery to address financial exclusion and enhance institutional performance (Abera et al., 2024). This shift is particularly relevant in resilience finance, where institutions face the dual challenge of scaling operations to meet growing demand and ensuring measurable environmental impact using up-to-date climate data. Traditionally reliant on manual processes, inclusive FSPs, e.g. MFIs, credit unions, small banks and cooperatives, have struggled with inefficiencies, error-prone workflows, and limited scalability (Umba et al., 2024). Manual systems often centralize decision-making and institutional knowledge within a few individuals or entities, creating “head monopolies” that expose organiza-

tions to operational bottlenecks and knowledge gaps. Such centralization, while streamlining decisions temporarily, hinders adaptability and innovation - two critical elements for building resilience in the face of climate-related challenges (Abera et al., 2024).

Digitization offers MFIs a pathway to overcome these limitations and meet the data-centric demands of resilience finance. For instance, certain digital platforms enable institutions to track climate data, assess risks, and monitor the impacts of resilience-focused investments in real-time. This ensures that funds are used efficiently and transparently, fostering trust and aligning with the increasing regulatory and investor demands for accountability. Further tools such as geospatial mapping, automated impact assessment systems, and mobile applications for data collection enable institutions to gather granular data on client needs, project outcomes, and implement local climate conditions. This data-driven approach supports more targeted interventions, improves resource allocation, and strengthens the adaptive capacity of communities.

More generally, digital solutions also reduce transaction costs and make FSPs more efficient (Mishra & Bisht, 2013; Andres et al., 2024; Lolemo & Pandya, 2023), which, as Vong and Song argue, could lead to lower interest rates for clients and facilitate access to underserved populations, particularly in rural areas most vulnerable to climate impacts (2015).



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Central Finance Facility Advancing Green Financing through Digital Innovation of Credit Unions in Trinidad and Tobago

Central Finance Facility is leveraging digital tools to advance green financing initiatives and enhance the cooperative movement in Trinidad and Tobago.

Introducing Central Finance Facility

Central Finance Facility (CFF) of Trinidad and Tobago serves as the secondary body of the Cooperative Movement in the country, overseeing a network of financial and non-financial cooperatives. With a team of 14 members and total assets amounting to TT\$70 million (US\$10.3 million), CFF supports its cooperatives by providing loans, accepting deposits and shares, and offering mortgage loans through its Home Mortgage Fund.

In recent years, CFF has turned its focus toward enabling the green economy by financing climate-resilient businesses and properties. To achieve this, the organization aims to establish a supportive ecosystem that includes access to program financing, capacity development, and technical assistance for its members.

CFF's Advancements in Digital Resilience Finance

CFF is currently developing a customized digital tool that will transform its credit application and evaluation processes. This tool will strengthen monitoring and reporting capabilities, enabling a more efficient system for financing climate projects.

The digital tool is part of a larger CU Digital Framework, designed to modernize member Credit Unions' operations across Trinidad and Tobago. While still in its framework stage, this plan envisions a seamless integration of digital tools to:

- Enhance member services
- Facilitate operational and organizational reporting
- Increase capacity for promoting green financing initiatives

Once implemented, the tool will digitize workflows, allowing for streamlined loan origination and evaluation processes while maintaining strict compliance with environmental and social governance (ESG) criteria.

Outcomes and Benefits

Though still under development, CFF's digital initiatives promise significant benefits for both the cooperative sector and the broader green economy in T&T. Such benefits include:

- **Improved Efficiency:** Automating manual processes will shorten application turnaround times and improve overall productivity

- **Enhanced Impact Monitoring:** Robust monitoring and reporting features will allow CFF to track the outcomes of its green financing initiatives, ensuring alignment with environmental goals, as well as standards and regulations at the national and international level
- **Access to Financing:** By improving evaluation and reporting, the tool will attract greater interest from external funding agencies and investors, increasing the availability of programmatic financing for cooperatives and their members
- **Support for Smallholders and Vulnerable Groups:** As part of its CU Green Project, CFF aims to provide climate adaptation solutions tailored to the needs of smallholder farmers and vulnerable populations. With increased financing from external investors, CFF will be in a better position to expand their inclusive finance initiatives.

These advancements underline CFF's commitment to fostering a sustainable, resilient, and inclusive financial ecosystem.

Looking Forward

CFF's plans include further upgrade to its digital platform to bolster marketing, operational efficiency, and member engagement. Key next steps involve:

- Expanding the digital tool to support real-time data analysis and decision-making
- Developing tools for capacity building, allowing Credit Unions to better engage with climate projects
- Strengthening external partnerships to secure funding and broaden the impact of green initiatives

Through these efforts, CFF is an exemplary Caribbean case of the transformative potential of digital tools in resilience finance. Creating a stronger, more efficient cooperative movement will enable CFF not only advance its green financing agenda but also empower communities across Trinidad and Tobago to better adapt to the challenges of climate change.

SECTION 3

THE CASE FOR DIGITAL TRANSFORMATION FOR RESILIENCE FINANCE

It hence becomes clear: for climate resilience finance to be efficient and operational, it needs to be digital. From analyzing climate data to predicting extreme weather events and assessing socio-economic impacts, digital tools provide unparalleled opportunities to understand and respond to climate challenges. They enable efficient, transparent, and decentralized decision-making processes that can support governments, financial institutions, and communities in building resilience. By addressing traditional challenges with modern solutions, digitization has the power to transform how communities worldwide, including those in the Caribbean, adapt to a changing climate.

APPLICABILITY OF DIGITAL TOOLS FOR FSP OPERATIONS

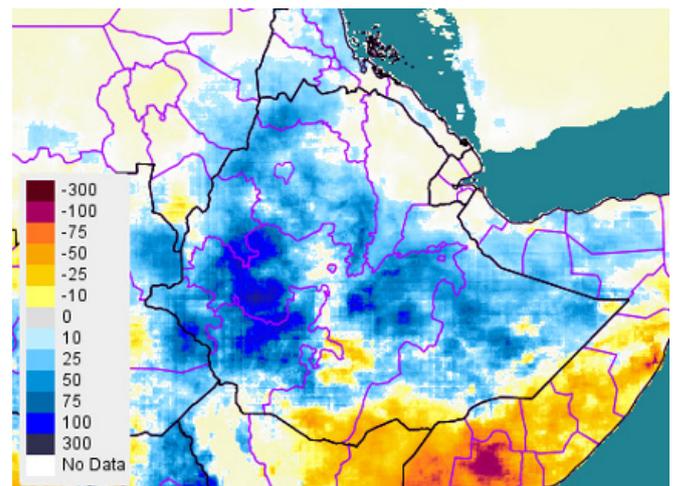
The use of digital tools is essential to facilitate the processing of vast amount of information in day-to-day operations. Traditional methods struggle to handle the scale and complexity of such data, making digital tools indispensable for real-time processing and risk assessment. We simply don't have any other way to process this amount of information in a reliable way (Gräf, 2022). And we have only talked about assessing climate risks and possible coping strategies. These tools facilitate effective climate risk management and help institutions allocate resources to the most vulnerable areas, enhancing resilience. Digital technologies allow institutions to scale operations and better target investments in climate resilience, supporting long-term adaptation goals.

The following sections discuss key operational areas where digital tools can drive significant improvements and enhance resilience finance strategies.

RISK ASSESSMENT INCLUDING CLIMATE AND NATURE RISKS

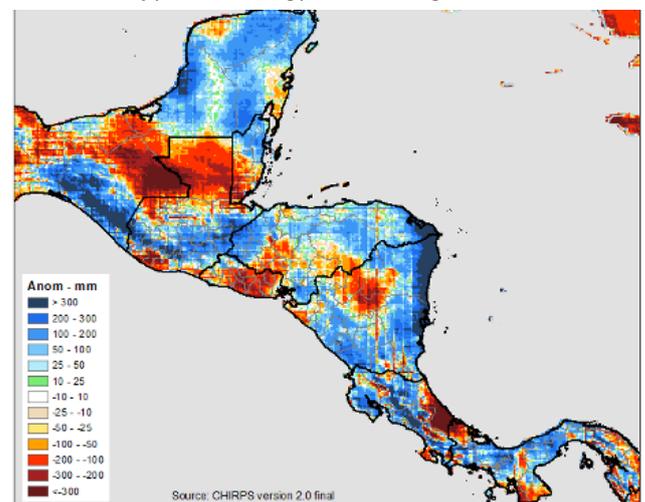
Climate change adaptation, the process leading to climate change resilience, is marked by two characteristics: It is complex to assess the involved risks comprehensively and it always works in a local context, especially when evaluating risks tied to vulnerable sectors such as agriculture, which are highly context-dependent. When calculating these risks associated to climate change and increased natural disasters, on the local micro-level, digital tools and climate modelling software can play their inherent strengths. For example, by utilizing satellite technology and geographic information systems for the facilitation of geo-location and local weather data, combining different databases, structuring data on climate risks in specified locations given economic activities, information can be provided on available investment targets (climate solutions) which help to mitigate the existing climate risks and build up resilience. This enables financial institutions to assess climate risks more comprehensively and accurately. By integrating climate risk

data with economic and socio-environmental information, these tools can provide a more detailed understanding of local vulnerabilities.



CHIRPS / CHIRTS satellite data on rainfall

Seasonal Rainfall Accumulation Anomaly by pentad
2022 season May - Aug
(May pentad 1 thru Aug pentad 6) - Average (2001-2010)



Source: CHIRPS version 2.0 final

Map produced by USGS/EROS

USGS USAID FEWS NET

Digital Transformation for Climate Finance in Belize

Development Finance Corporation (DFC) of Belize is leveraging innovative digital tools to streamline green financing initiatives and improve operational efficiency.

Introducing DFC Belize

Established on September 27, 1963, DFC is the only development bank in Belize. DFC offers a wide range of loans, including micro sector enterprise loans, home loans, student loans, productive sector loans (agriculture, manufacturing, fisheries, etc.), and renewable energy and energy efficiency loans since 2016.

Unlike cash-deposit banks, DFC secures financing from larger regional and international institutions at competitive rates to lend to Belizean citizens, residents, companies, cooperatives, and other entities with Belizean-majority ownership. Since 2021, DFC invested over \$170 million in Belize's economy, supporting its mission to provide innovative development financial solutions which contribute to the resilient and equitable growth of Belize.

DFC'S Advancements in Digital Resilience Finance

Post-COVID-19, DFC reframed its corporate philosophy and defined a new vision to become "a leading development finance institution built around a robust and modern digital infrastructure that leverages strategic alliances, empowers our team members, and exceeds our clients' expectations." This vision marked the beginning of DFC's digital transformation journey, adopting a discovery-driven planning approach with a focus on people and agile methodologies.

With support from the CARICOM Development Fund, DFC developed and implemented its ITC Policy (31 policies) and strategic plan. The Inter-American Development Bank supported DFC in articulating its multi-year digital transformation roadmap. With a grant from the ICDF Taiwan and matching investment from DFC, the corporation modernized its core infrastructure by introducing SDWAN and top-tier equipment, facilitating fiber channels that provide speeds up to 10 Gbps, supporting growth for the next seven years. DFC is now testing its new core management system based on the Creation platform and a new Sage accounting system.

Change leadership emphasized providing the best client service while achieving sustainability by doubling the portfolio within three years without increasing DFC's footprint by more than 20%. The human resources department was rebranded as People Operations Management, focusing on employee engagement and talent management. DFC digitalized this function by introducing NeoPeople, a Belizean HRIS SaaS solution complete with biometric devices, improving collaboration and empowering employees with digital tools.

DFC Belize has made substantial progress in digitizing its credit delivery, credit administration, Environmental and Social Management System (ESMS) and Monitoring, Evaluation, Accountability and Learning Strategies (MEALS) processes through Power Apps, improving data accessibility, reducing paper usage, and boosting operational efficiency. Additionally, Optical Character Recognition technology has been implemented to digitize manual documents, facilitating better data utilization and reporting.

DFC's upcoming Core Management System (CMS) will integrate advanced features such as quantum technology, Machine Learning, and AI. This system enables no-code customization, secure connectivity with other platforms, and seamless integration with the credit delivery, credit administration processes, ESMS and MEALS.

The CMS will automate DFC's lending operations, covering all stages of the loan lifecycle, from origination to administration. Its Customer Relationship Management module also enhances service delivery, while comprehensive reporting capabilities of the system support data-driven decision-making. The CMS' key

functionalities include:

- Loan origination and administration
- Collateral management and disbursement
- Credit delivery and repayment tracking
- Product configuration and business warehouse integration

Advanced reporting tools for robust data analysis to support DFC's Monitoring, Evaluation, Accountability & Learning (MEAL) Policy and Strategy.

Outcomes and Benefits

Since 2021, DFC has significantly impacted various sectors of the Belizean economy, experiencing continued year-over-year growth. The portfolio quality is the best it has been since 2008, with the non-performing loan ratio reducing from 26% post-COVID-19 to single digits. DFC is on pace for its third consecutive profitable year, demonstrating growth that outpaces Belize's GDP through quality, climate-smart investments.

Currently in the testing phase, the new system is on track for full implementation by early 2025, enabling the automation of green financing workflows, reducing manual processes and enhancing efficiency. Further notable benefits of DFC's CMS include:

- Streamlined operations and shorter client turnaround times
- Enhanced environmental impact tracking and sustainability reporting
- Automated compliance with DFC's Environmental and Social Management System (ESMS) guidelines, ensuring high standards for green project funding
- Dashboards to monitor gender-related data and climate investments and ultimately its results and impacts
- Automating DFC's MEALS

By embracing digital innovation, DFC is not only strengthening its internal capabilities but also providing an ideal example of how digital tools can enable financing resilience and financial inclusion. The use of these kinds of technologies in a financial context are helping underserved populations in Belize gain access to critical financing for climate-resilient projects, and ultimately contributing to a more equitable and sustainable financial ecosystem and a population more resilient to climate change.

Looking Forward

As part of its Digital Transformation Roadmap, DFC aims to evolve into a fully digital bank. Upcoming innovations include:

- Online portals for automated loan applications and real-time transactions
- Digital payment solutions, such as QR payments
- Development of omnichannel platforms for account access and tailored services
- AI-driven credit scoring and enhanced risk assessment tools
- Near real time monitoring & evaluation to drive iterative project development to maximize impact.

These advancements position DFC as a regional leader in the Caribbean in integrating digital tools for climate finance, demonstrating how FSPs utilization of digital tools can drive communities' resilience in the face of climate change.

BUSINESS INTELLIGENCE AND PLANNING

Another area where digital tools shine is in business intelligence (BI), which is an umbrella term for architectures, tools, databases, applications and methodologies used to analyze data to support business decisions. BI tools provide descriptive and predictive analysis of data with various forms of visualization to reduce the complexity of data analysis (Marikar & Bandara, 2020). These tools allow financial institutions to analyze complex datasets, predict trends, plan for long-term climate resilience, and overall make faster and better decision making and insight generation. For instance, by combining climate risk data with financial data, BI systems help FSPs identify which areas or sectors are most vulnerable to climate impacts, enabling them to target resilience-building efforts more effectively. Marikar & Bandara (2020) pointed out that data-driven decision-making is critical in today's business environment. For resilience finance, it means aligning financial goals with the need for long-term climate adaptation, optimizing resource allocation, and supporting the development of climate-resilient investment strategies.

LOAN EVALUATION AND CLIENT PROFILING

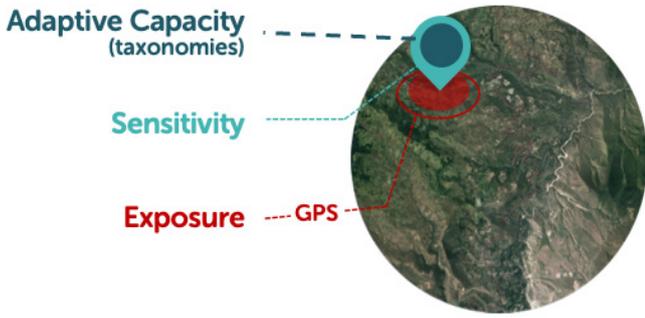
Digital tools have a big role to play in loan evaluation, too. FSPs can better assess the risk profiles of borrowers if they integrate climate risks into credit scoring models. This reasoning is especially true in traditional high-risk sectors that are highly vulnerable to climate change and dependable on climate conditions, like agriculture. Loans to smallholder farmers or coastal businesses can be more accurately evaluated when specific climate risks affecting their area are taken into account. This leads to more targeted financial products that address specific climate challenges, hel-

ping build long-term resilience. For example, if we consider the climate reality of a client who lives in an area highly affected by drought during a certain portion of the year, a financial institution might consider financing the purchase of drought resistant crops or drip irrigation systems. In addition, using real-time data collection platforms like mobile apps during in-person interviews on the needs of a client also make client profiling more efficient, which in turn enables FSPs to better understand local realities (and risks) and adjust their financial offerings accordingly (Solis & Raja, 2021).

PORTFOLIO MANAGEMENT & MONITORING

Once investments are made, it's crucial to track how well they are performing, for the financial health of the institution but also to be in line with reporting requirements. Here again digital tools provide a way to monitor climate resilience projects in real time, offering transparency and ensuring that investments are being used as intended. For example, satellite tools like geospatial mapping and satellite imagery allow financial institutions to see how climate resilience projects are progressing and assess their impact on local communities. Further, using digital platforms to document loan processes and metrics allow for the automatic creation of financial and climate impact reports, that can be disaggregated on gender, solution financed, risk addressed, etc. Generating these types of report statistics would be extremely cumbersome and often lead to human-error, whereas this data-driven approach helps reduce the risk of misallocation and ensures that funds are directed to projects with the highest potential to drive positive, measurable outcomes. As noted by Gräf (2022), such monitoring tools are crucial for tracking the effectiveness of resilience investments and maintaining accountability.





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The resulting data is presented using a simple scoring system—ranging from very low to very high—allowing institutions to easily interpret potential climate threats and integrate them into their decision-making processes. YAPU Solutions is just one example of a climate risk engine, but this kind of data-driven approach is critical for inclusive financial institutions to manage risks and ensure that resilience finance addresses the most relevant needs given the realities of the client.

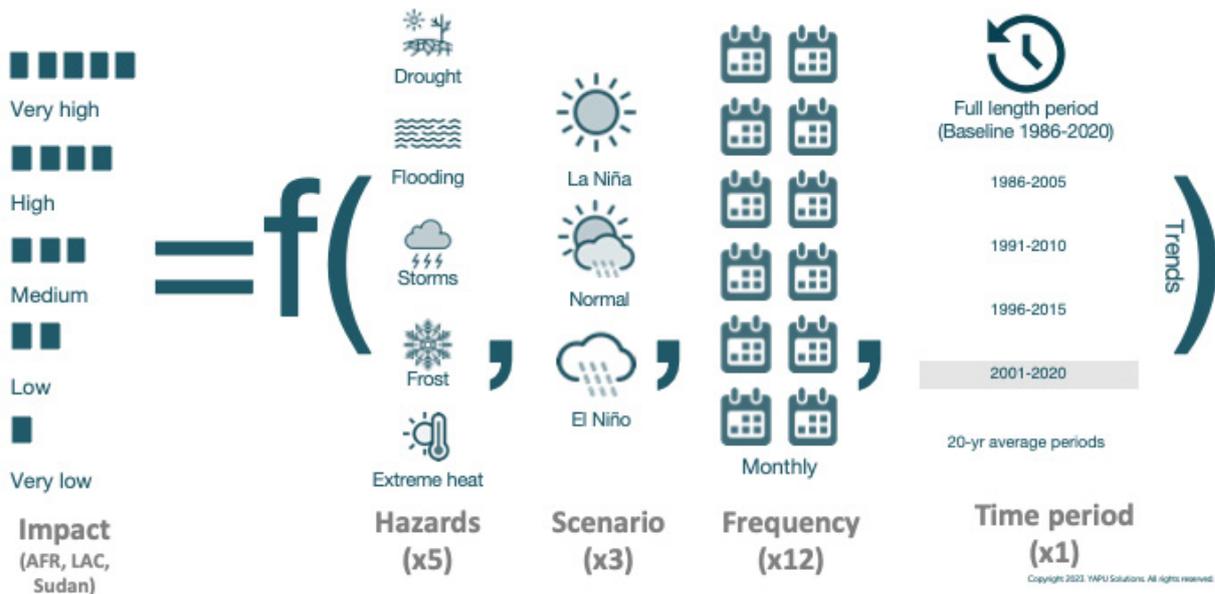
CLIMATE RISK ENGINES

A climate risk engine is a digital tool that integrates climate data and financial information to assess the potential impacts of climate change on investments. By using data on weather patterns, environmental conditions, and economic activities, this engine can predict the future risks facing specific sectors or regions. FSPs can then use this data to prioritize investments in areas that need the most attention and allocate funds where they will have the greatest impact on building resilience. In general, climate risk engines are built on robust methodologies, that they themselves are reliant upon access to current and contextual climate and satellite data. To provide a concrete example, YAPU Solutions, a climate risk digital service provider for financial institutions, uses a systematic approach to measure the potential impact of climate threats. Its methodology incorporates:

- a) 5 different hazards
- b) under three different ENSO cycle scenarios¹
- c) broken down based on historical data and satellite data of the frequency of events over the 12 months of a year
- d) the 20-year moving average of the historical periods of the indices are calculated in different time buckets to ensure proper trend analysis.

DIGITAL MONITORING, REPORTING AND VERIFICATION

As the demand for climate-related investments grows, so does the need for robust reporting and compliance frameworks. Digital tools can streamline reporting processes, allowing FSPs to provide investors with clear, verifiable data on the impact of their investments. For example, digital platforms often automate data collection processes and the generation of impact and/or financial reports for the customer as well as the FI using platform metrics. Linking resilience to financing adds another critical element: information on climate risks and how to address them must be transparently available for all local investment decisions. This will allow investors further up the financial value chain to make informed decisions about where to invest and what risks they are taking - but also what impact they can expect in terms of building resilience. This is the only way to eliminate greenwashing, build investor confidence, and channel investment where it will have the intended impact. This kind of transparency is essential for aligning with international standards for climate finance, for example through the Green Bond Principles, and ensuring that the intended resilience outcomes are achieved. Digital monitoring, reporting and verification tools provide the answer and support the development of triple bottom line portfolios.



YAPU Solutions climate risk engine underlying methodology

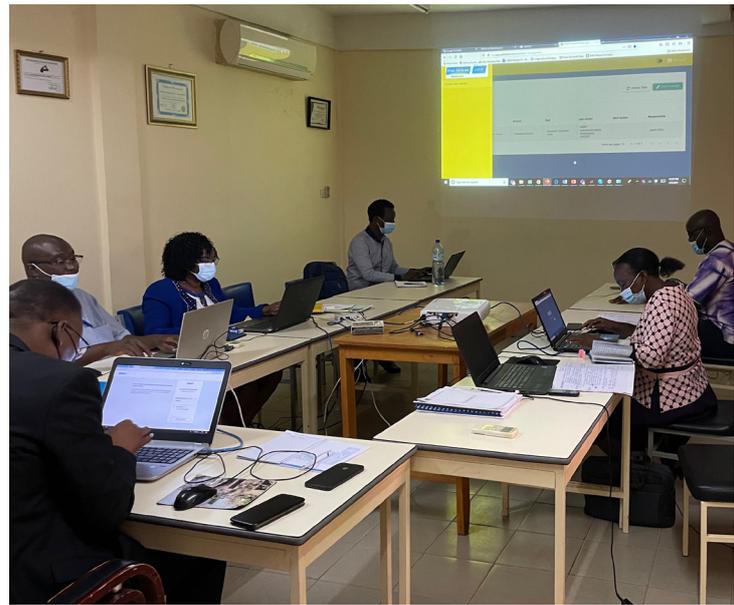
¹ The ENSO cycle is a recurring climate pattern involving changes in the temperature of the waters of the central and eastern tropical Pacific Ocean, which can have a strong influence on weather patterns in different parts of the world (U.S. National Weather Service, n.d.)

CUSTOMER-CENTRIC DESIGN

As established, digital transformation is crucial for reshaping resilience finance. It allows FSPs to operate efficiently while addressing the multifaceted challenges posed by climate change. By implementing digital tools at strategic points in their operations, institutions can improve efficiency, reduce risk, and ensure transparency in climate adaptation financing.

DIGITIZATION REQUIREMENTS

Institutions must not only provide products and services that meet their customers' needs but also integrate climate data into their offerings to ensure long-term sustainability. This requires an approach that is adaptable, data-driven, and contextualized based on the needs of the client and the FI. The focus needs to lie on the operational use of the digital tools, because if the solutions are too burdensome to implement and cumbersome to use, their use by customer-facing staff will be avoided. Hence, customer-centric design in resilience finance involves more than just providing financial products; it includes the creation of services that are responsive to local environmental conditions and client needs, but also to the capacity of financial institutions. As FSPs embrace digital transformation, several key requirements must be addressed to ensure success:



Capacity-building and training on integrated tool is necessary for successful application and use.

1



Capacity Building:

FSPs must invest in training their teams to use digital tools effectively, manage climate data, and leverage technology for resilience finance.

2



Data Quality and Integration

Ensuring the accuracy and integration of data across platforms is essential for effective decision-making.

3



Investment in Infrastructure

Financial institutions need to invest in the right infrastructure, such as cloud storage, mobile platforms, and cybersecurity systems, to support digital tools.

4



Partnerships with Tech Providers

Collaboration with technology providers or purchasing off-the-shelf solutions will be necessary for FSPs to implement digital transformation in resilience finance.

CASE STUDY 3 - TOLEDO TEACHERS CREDIT UNION

Learning from Doing: Digital Innovation at Toledo Teachers Credit Union

Toledo Teachers Credit Union of Belize is implementing lessons learned on the importance of user-centric and adaptable design of digital tools.

Founded in 2000, Toledo Teachers Credit Union (TTCU) operates in the southern regions of Belize, primarily serving rural communities, farmers, MSMEs, and educators. With assets totaling BZ\$27 million (USD\$ 10.4 million) and a loan portfolio exceeding BZ\$20 million (USD\$ 10 million), TTCU is dedicated to financial inclusion and resilience finance for its members. Operating from two branches, the Credit Union has 38 employees, 18 of whom are women, and is committed to addressing the unique challenges of its members, particularly those vulnerable to climate risks.

Addressing Climate Risks with Digital Tools

TTCU embarked on its digital transformation journey with the support of IDB Lab's EcoMicro program, aiming to integrate climate risk assessments into its loan processes. A web-based climate Tool for Assessing Risk and Preparedness (TARP) tool was piloted to analyze landscape topography and identify areas prone to flooding or fires. The tool mapped project coordinates, assigned climate risk scores, and provided critical insights for loan officers to evaluate risks, adjust interest rates, determine collateral requirements, and make more informed lending decisions.

While the tool demonstrated potential in guiding climate risk assessments and financial decisions, technical limitations in its implementation prevented widespread adoption. This experience highlights the importance of user-centric design and adaptability for digital tools in financial institutions.

Lessons Learned and Future Directions

TTCU's pilot project underscores the necessity of implementing digital solutions that are intuitive, functional, and adaptable to

institutional needs. Recognizing these challenges and learning from experiences, TTCU envisions adopting a more sophisticated climate risk management tool which is better suited to their needs as an institution, which will enable them to provide more tailored support its members. Future plans include:

- Developing a comprehensive database to track climate impacts across different regions and seasons.
- Shifting lending strategies based on trends identified through climate data to mitigate risks of crop failure and improve loan performance.
- Providing tailored guidance to farmers on optimizing crop yields and managing climate threats, empowering communities with actionable insights.

Adapting and Innovating for Resilience

TTCU's commitment to learning from its initial experience with digital tools highlights the institution's forward-thinking approach and adaptability. This dynamic response also exemplifies how MFIs tend to operate - continuously evolving to meet the needs of their members and responding to challenges with innovative solutions, financial as well as digital. By quickly reassessing and refining its strategy, TTCU is laying the groundwork for integrating advanced climate risk management solutions that align with its mission and operational realities.

As TTCU continues to refine its approach, its experience offers a valuable lesson: the success of digital tools lies in their ability to align with the institution's operational realities and the needs of its members. This iterative approach demonstrates TTCU's business resilience and its dedication to serving as a model for other financial institutions navigating the complexities of digitization and climate finance.



Source: DAI

SECTION 4

INTEGRATION INTO DAILY PROCESSES

Despite its potential to streamline operations and improve service delivery, digitization and the integration of digital tools for resilience finance does come with high upfront costs in time and money.

As Dorfleitner et al. (2022) note, the integration of digital financial solutions often requires significant financial investment for system planning, adaptation, and hiring specialized experts to operate and maintain new technologies. Financial institutions must invest in infrastructure, such as hardware and software, as well as staff training to effectively manage and deploy new systems. For this reason, integrating digital tools into daily operations requires careful planning and an upfront financial and time investment.

STRATEGIC ROADMAP FOR INTEGRATION

FSPs need a strategic roadmap to ensure that new technology enhances their existing processes and drives long-term value so the tool is actually beneficial and utilized by customer-facing staff. The following are key areas for successful integration.

APIS AND MIDDLEWARE FOR SEAMLESS INTEGRATION

When integrating a new tool or system into existing legacy IT systems, you want to, as much as possible, avoid disruption to operations. In other words, for digital tools to work well together, seamless integration is key. This is where APIs (Application Programming Interfaces) and middleware come in. These technologies allow different digital platforms and programming interfaces, such as climate risk assessment tools and financial systems, to communicate with each other. They essentially act as an intermediary between various data sources - think of satellite imagery, weather forecasts, geospatial information, socio-economic datasets, etc. - and end users to deliver standardized, actionable insights. This integration ensures that FSPs can access up-to-date data across various platforms, enabling real-time decision-making and efficient risk management (Bavest, 2024). In the context of resilience finance, this kind of seamless data flow is essential for making informed investment decisions and monitoring climate risks. Opting for integration of a climate risk assessment platform through API means also going for the second strategy outlined in section two: buying the software instead of making it. For this reason, the API should also offer customizable query options to meet the specific institutional needs to the FSP integrating it, and in general should be easy to implement and to use.



MOBILE APPS FOR INFORMATION GATHERING

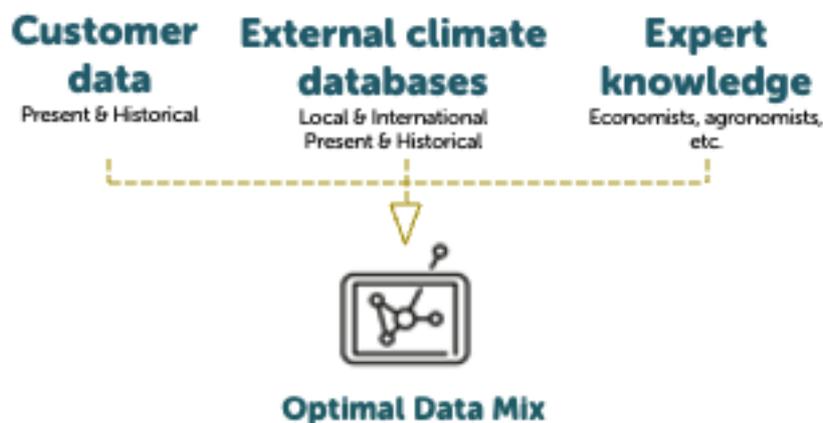
Mobile applications are a practical and powerful way to collect data on the ground, especially in remote or rural areas. These apps enable field agents and clients to submit data in real time, helping FSPs adjust their strategies quickly based on the latest information (Solis & Raja, 2021). This is a clear enabler of financial inclusion, because it makes it all the much easier for loan officer to collect information on communities and stakeholders in vulnerable areas, providing them with more opportunities to access resilience finance. Concretely, this practice isn't as complicated as it sounds - it could be as simple as filling out a digital survey with client information, for example. In the case of resilience finance, information on the geolocation of the client and the economic activity or asset needs to be collected to, in a second step, measure climate exposure based on location, vulnerability to climate threats based on the economic activity, and then recommend solutions based on the production reality and the adaptive capacity of the client vis-à-vis specific climate threats. So, the practice itself of collecting client information is very similar to an analog, non-digital process. However, with the use of mobile apps that store information directly in the cloud, client information can be stored and retrieved more easily, more quickly, and summary statistics can be generated often within seconds, and the risk of losing physical documents containing important client information virtually disappears.

THE OPTIMAL DATA MIX

The types of data necessary for resilience finance include real-time, historical, and predictive data. Each plays a distinct role in shaping financial decisions that address climate risks. Real-time data, such as weather patterns or extreme event forecasts, provides immediate insights for adapting to climate challenges. Historical data helps institutions understand long-term climate trends in order to properly predict and forecast future risks and design long-term resilience strategies. In particular, geospatial data management becomes a crucial aspect of this process. The digital product created must be able to handle and analyze geospatial data to identify regions most at risk and to target resilience interventions effectively. This type of data is integral for creating accurate climate risk profiles and delivering tailored financial products. Because accessing, processing and building methodologies based on this kind of data can be complex and cumbersome, working with a tech service provider is often ideal, because they are also liable to ensure a certain quality standard of their product and data.

Financial institutions must also consider sensitivity data for each asset or economic activity. This includes understanding how specific sectors or assets (e.g., agriculture, infras-

tructure) are vulnerable to climate change. Financial products and investments need to reflect these sensitivities to be truly effective in building resilience. By incorporating sensitivity data into loan evaluations, investment portfolios, and insurance solutions, FSPs can ensure that their offerings address the unique needs of different sectors facing climate risks. To address climate risks effectively, financial institutions also need access to comprehensive climate solutions data. This data includes information about climate mitigation technologies, adaptation strategies, and their effectiveness in real-world conditions. Financial institutions can use this data to design financial products that support scalable climate solutions, like renewable energy projects or sustainable agricultural practices. Climate scoring, which quantifies the potential impact of different solutions, is one way to incorporate this data into decision-making. Predictive modeling powered by AI and machine learning can also significantly enhance the ability of institutions to assess the viability of different climate solutions. These tools can analyze vast datasets to forecast the success of resilience projects and solutions, helping FSPs make more informed, data-driven decisions. In addition, the economics of climate solutions - how much they cost, their return on investment, and their impact on climate resilience - must be integrated into financial models.



CASE STUDY 4 - COK SODALITY

Harnessing Digital Tools for Resilient Housing in Jamaica

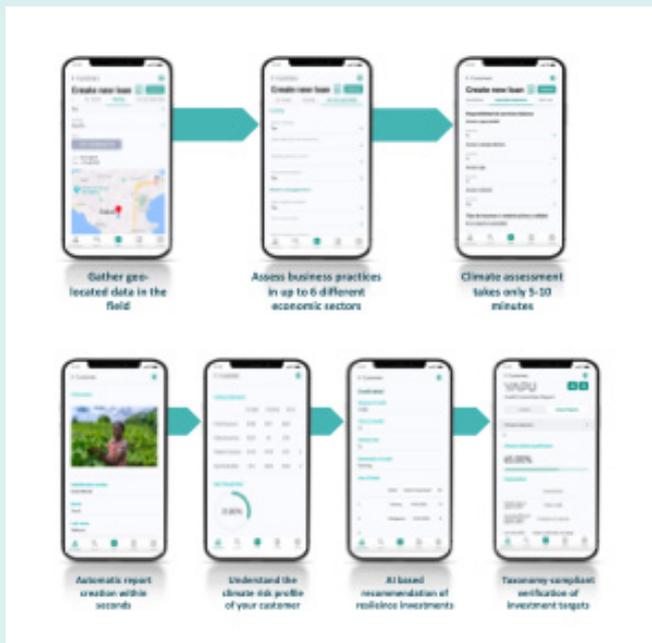
Through the integration of YAPU Solutions' climate risk engine, COK Sodality redefined climate finance for its members and communities.

Introducing COK Sodality

COK Sodality Co-operative Credit Union, founded in 1967, is one of the largest credit unions in the Caribbean. With over 275,000 members, a loan portfolio exceeding USD 58 million, and five branches across Jamaica, the Credit Union provides diverse financial services, including savings, retirement schemes, and loans. A recent merger with Community and Workers of Jamaica Co-operative Credit Union Limited (C&WJ) has further expanded its reach and operational capacity, solidifying its position as a leader in financial inclusion and cooperative finance.

Leveraging Digital Innovation for Climate Finance

To address the increasing climate risks faced by Jamaica, COK Sodality partnered with YAPU Solutions in the scope of IDB Lab's EcoMicro Program to integrate a comprehensive climate risk engine into its operations. This digital tool enhances loan processes by embedding climate considerations into every step of the decision-making lifecycle, from risk assessment to portfolio management.



Digital Integration at the Core of Climate Finance

Climate Risk Engine:

The engine assesses climate risks for loans by leveraging climate, satellite, and socioeconomic data. It includes risk scores for various climate hazards under different scenarios, providing actionable insights for informed lending decisions.

Taxonomy of Climate Solutions:

A robust taxonomy of 55 climate adaptation solutions for the real estate and housing sectors is integrated into the system, enabling targeted financing for resilience investments.

Automated Climate Scoring:

Loan evaluations now include automated climate risk scoring, ensuring alignment with environmental sustainability goals while streamlining the approval process.

Real-Time Data Analysis:

The tool facilitates real-time monitoring of climate risks and project impacts, supporting transparent and data-driven decision-making.



Outcomes and Benefits

The integration of digital tools into COK Sodality's operations delivered significant outcomes:

- **Enhanced Risk Management:** Climate risk scoring enabled the Credit Union to better identify and manage the vulnerabilities of financed assets, reducing exposure to climate-related losses.
- **Empowering Members:** Through climate-specific recommendations and partnerships with local solar providers for EE & RE loans, members received guidance on sustainable investments that enhance their resilience.
- **Portfolio Diversification:** The initiative is expected to grow climate finance to represent 5-10% of COK's outstanding loan portfolio, strengthening its commitment to green finance.

Looking Ahead

COK Sodality plans to expand its digital capabilities further, embedding climate considerations into strategic planning and introducing new financial products for various sectors. Upcoming initiatives include:

- Scaling the taxonomy to incorporate additional climate solutions.
- Developing an adaptation-focused advisory service to provide members with tailored guidance on climate investments.
- Enhancing digital tools to ensure continuous improvement in climate risk management and operational efficiency.

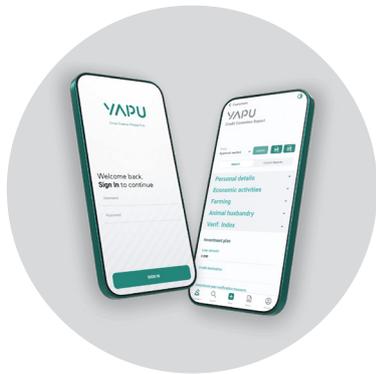
A Model for Digital Climate Finance

COK Sodality's implementation of YAPU Solutions' climate risk engine highlights how digital innovation can transform financial institutions into champions of climate resilience. COK Sodality supported its members in adapting to climate change by integrating a digital climate risk engine and set an example for the Jamaican financial sector.

SECTION 5

EXAMPLE OF TOOLS ENABLING RESILIENCE FINANCE

As outlined in section 2.3 “Digitization in Inclusive Finance: A brief introduction,” Financial Service Providers have the option to either develop digital solutions independently, with or without external assistance, or to utilize pre-existing solutions offered by specialized service providers. In some cases, a hybrid approach may be adopted where certain functionalities are developed within existing legacy systems, while others are outsourced. Regardless of the approach, it is crucial to establish a detailed requirements catalog and a road map for implementing and introducing the functionalities. This will enable a comprehensive budget analysis, using methods such as Internal Rate of Return (IRR) or Return on Investment (RoI), to assess the financial implications. If the chosen road map includes contracting specific service providers, it is important to select from the available solutions in the market. The sector of specialized service providers is rapidly evolving, offering a variety of options. To provide an initial orientation and suggest concrete options, we present selected examples in this section. This information stems from a comprehensive market scoping by the International Finance Corporation (IFC) of the World Bank Group. While primarily targeting climate risk management for agricultural loan portfolios, the set of solution providers identified includes a broad range of offerings that extend to other types of loan portfolios as well. While many of these solutions may not seem to be specifically active in the Caribbean, with only SatSure having a presence in Jamaica according to the report, we encourage readers from the region to reach out directly to the providers. This is because their operational scope might have expanded, or they might have additional offerings not fully captured here. For example, YAPU already has solutions tailored for Cuba, the Dominican Republic, and Jamaica, and could introduce them to other Caribbean countries.



YAPU Solutions



Agroclimatica



ClimateX



Mantle Labs



Smart finance. People first.

<https://www.yapu.solutions/>

SaaS solutions for financial service providers and investors to provide resilience finance for the most vulnerable populations in the global South

Headquarters
Berlin, Germany

Office/Representation in:
Colombia, Ecuador, Rwanda

Regional Scope
Latin America, the Caribbean, Africa (soon: India, SEA)

Provider Type
Climate Intelligence Provider
FI Workflow digitization, Portfolio certification and stress testing

CLIMATE RISK TOOLS AND SERVICES

RESILIENCE FINANCE RELEVANCE

Identify climate risks and opportunities, such as concrete adaptation and resilience solutions

BUSINESS MODEL OVERVIEW

YAPU offers climate and nature risk assessment at climate as well as at loan portfolio level for activities in six economic sectors. Geared primarily at financial institutions, these also have the option to integrate their (digital) processes with external partners, such as off-takers (agro) or input providers

CLIMATE RISK ANALYTICS

YAPU follows the TCFD recommendations' structure and identifies for each subject (e.g. client or loan) the a) exposure, b) sensitivity and c) adaptive capacity vis-a-vis specific climate threats.

For each economic sector and climate threat a set of solutions are defined that are available in a local context and organized in operational taxonomies. Each identified solution is scored for its impact in 44 dimensions.

Thereby client FIs not only can measure risk but identify suitable and available solutions for adaptation. All operations are digitally documented, enabling transparency and traceability.

DATA SOURCES

Client, farmer, public, and private purchased sources

SUPPORTING SERVICES

CAPACITY DEVELOPMENT

Assist FIs in developing their resilience finance strategy, establishing internal policies, procedures and products as well as ongoing data-base learning

FI DIGITIZATION

Assist MFIs with digitizing their processes

TAXONOMY DEVELOPMENT

Assist FIs in developing their own internal operational taxonomy

COMMERCIAL PARAMETERS

TARGET CUSTOMERS

Financial institutions, institutional investors, development financial institutions

READINESS TO IMPLEMENT

High

PRICING/REVENUE MODEL

Varies by offering: 1.SaaS subscription fee based on number of user licenses 2. Variable pricing by data needed 3. PayGo for standardized software

CUSTOMIZATION OPTIONS

Fully customizable and integrable into client IT system

DATA PROTECTION

GDPR compliant

GEOGRAPHIC REACH

Applicable globally with experience in Latin America, the Caribbean and Africa

ACTIVITIES COVERED

Agriculture, Animal Husbandry, Resilient Housing, Service, Trade, Manufacturing

LANGUAGES AVAILABLE

English, Spanish, French, Arabic

ENGAGEMENT OPPORTUNITIES

FINANCIAL INSTITUTIONS

Track record of working with FIs across loan cycle:

- Loan underwriting
- Loan monitoring
- Loan collection/recovery
- Portfolio management
- Portfolio allocation

INNOVATIVE FINANCING MECHANISMS

Portfolio certification for GSS Bond emission or credit line reporting, portfolio stress testing, Special Purpose Vehicles (SPV) for smaller FIs

agroclimatica

<https://www.agroclimatica.com>

Platform that assesses agroclimatic risk at an individual farm level to assist FIs in making objective lending decisions

CLIMATE RISK TOOLS AND SERVICES

RESILIENCE FINANCE RELEVANCE

Identifies agroclimatic and soil risks, as well as deforestation and crop applicability. Solutions are also available for cattle farming.

BUSINESS MODEL OVERVIEW

Risk scoring platform that computes projected agroclimatic risk, identifies soil limitations, and proposes ideal crop and livestock fit for farm plots. Carbon quantifier available, plans to add water quantifier

CLIMATE RISK ANALYTICS

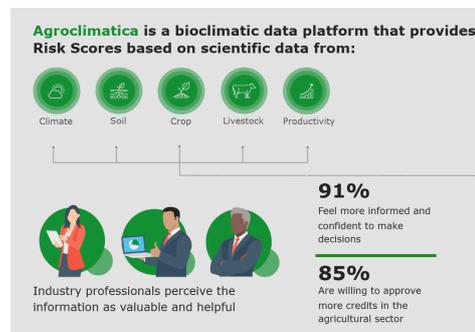
Combines farmer payment history/financial risk scores with future payment capacity based on agroclimatic risk scores (include temperature, precipitation, climate viability, soil suitability, crop scenario). Offer predictive risk assessment for 3 to 4 years. Risk scores offer 95% accuracy.

DATA SOURCES

Climate data (historical performance across 13 parameters), soil data (office maps, satellite imagery), crop and livestock data (local experts, research/scientific based documentation)

SUPPORTING SERVICES

Does not appear to offer supporting services



COMMERCIAL PARAMETERS

TARGET CUSTOMERS

Financial Institutions, End beneficiaries

READINESS TO IMPLEMENT

High

PRICING/REVENUE MODEL

Fee per click or subscription model

CUSTOMIZATION OPTIONS

Agroclimatic risk score is standardized, small adjustments are possible

DATA PROTECTION

No personal information about the farmers is stored

GEOGRAPHIC REACH

Central and South America, Kenya and India with plans to expand to Eastern Europe

ACTIVITIES COVERED

Agriculture, Animal Husbandry

LANGUAGES AVAILABLE

English, Spanish

ENGAGEMENT OPPORTUNITIES

FINANCIAL INSTITUTIONS

Track record of working with FIs across loan cycle:

Loan underwriting

Loan monitoring

Loan collection/recovery

Portfolio management

Offer risk and ESG management platforms for FIs

Methodology has been validated by industry players; in Kenya, Agroclimatica has been approved by the Central Bank of Kenya to use among regulated financial entities.

AGRIBUSINESS

N/A, primarily geared towards FIs

Year founded:

2016

Headquarters:

Part of Ingemann data, based in Denmark and Nicaragua

Regional Scope:

Latin America, India, Kenya adaptable worldwide

Provider Type:

Climate Risk Intelligence Provider

CLIMATE X

<https://climate-x.com/>

SaaS solution providing explainable climatic physical and transition risk for physical assets and land, both at portfolio and individual locations levels

CLIMATE RISK TOOLS AND SERVICES

RELEVANCE TO THESIS

- Climate Risk Analytics
- Lending Risk Offering

BUSINESS MODEL OVERVIEW

Platform providing physical and transition climate risks, financial loss impacts under a range of climate scenarios through 2100
Access to 10-90m resolution data and predictive risk analytics through Spectra (online SaaS platform), API integration, reporting, or raw data exports

CLIMATE RISK ANALYTICS

Climate risks include river/surface/coastal flood/sea level rise, extreme heat, subsidence, landslides/ coastal erosion, drought, wildfire, wind/storm, calculated as combined risk score and total loss, up to 95% accuracy
Ability to assess physical asset risks at individual or portfolio level. Use of AI but focus on physics-based models. Suitable for retail and commercial exposures

DATA SOURCES

Remote sensing data, geolocation data Updated every 6-12 months

SUPPORTING SERVICES

CAPACITY DEVELOPMENT

Comprehensive training, knowledge hub, and support ticket services
Implementation support available via major consulting groups including Deloitte
Additional Services and features continuously being deployed

COMMERCIAL PARAMETERS

TARGET CUSTOMERS

FI
GOVT/ NGO

READINESS TO IMPLEMENT

Low (FIs in developing markets)

PRICING/REVENUE MODEL

Annual license - direct sales/reseller options, enquire directly for pricing

CUSTOMIZATION OPTIONS

Configurable API+ license options

DATA PROTECTION

GDPR compliant, data passporting, ISO/Cyber essentials certified

GEOGRAPHIC REACH

US, Canada, APAC, LAC in planning

ACTIVITIES COVERED

Agriculture, Animal Husbandry, Resilient Housing, Service, Trade, Manufacturing

LANGUAGES AVAILABLE

English

ENGAGEMENT OPPORTUNITIES

FINANCIAL INSTITUTIONS

Track record of working with FIs across loan cycle:
Loan underwriting
Loan monitoring
Loan collection/recovery (EOY)
Portfolio management
Portfolio allocation

Platform allows FIs to input coordinates or addresses of assets to monitor, FIs can assess risk at portfolio or asset level, though no demonstrated agriculture use cases API allows FIs to integrate climate risk score directly into internal scorecards for decision making and capital modeling

AGRIBUSINESS

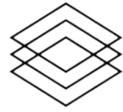
Primarily geared towards FIs/Real Estate/Govt/ NGO

Year founded:
2020

Headquarters
London, England

Regional Scope
Operational in US, Canada, and APAC

Provider Type
Climate Risk Intelligence Provider



Mantle Labs

<https://www.mantle-labs.com>

Ag-focused (Ag-fintech) automated financial analytics platform for banks, insurance and asset managers to make lending decisions and monitor portfolios

CLIMATE RISK TOOLS AND SERVICES

RELEVANCE TO THESIS

- Climate Risk Analytics
- Lending Risk Offering
- Agriculture Focus
- Working in emerging markets

BUSINESS MODEL OVERVIEW

Turnkey financial analytics platform providing complete risk assessment solution for FIs to manage their agriculture portfolios

CLIMATE RISK ANALYTICS

Two primary data sets:

Level 1. Regional credit risk score to determine risk capital allocation, default probability of loans and portfolios and collections monitoring

Level 2. Field level credit score to determine the expected loan default probability, used by banks to make final lending decisions

Provide automated risk scores to advise banks on lending (only 10% need human component)

Uses include: climate-optimize in-season production tracking, invest in climate-proof locations, understand extreme weather risks for loan portfolios at asset level

DATA SOURCES

Satellite data from European Space Agency/
NASA

Data cleaned with AI and updated every 10 days

SUPPORTING SERVICES

PRODUCTION PLANNING AND DECISION-MAKING

Offer historical and predictive yield data on plots of land, portfolios, and regions

COMMERCIAL PARAMETERS

TARGET CUSTOMERS

FI,
AG Producer
AG Buyer/Processor

READINESS TO IMPLEMENT

High; turnaround for new client is 2-3 weeks

PRICING/REVENUE MODEL

1. Subscription fee per month per user
2. Fee per loan for over 50 users

CUSTOMIZATION OPTIONS

Off the shelf standardized solution but customizable depending on client need

DATA PROTECTION

N/A

GEOGRAPHIC REACH

Global, with extensive work in India

ACTIVITIES COVERED

Agriculture

LANGUAGES AVAILABLE

English, regional languages in India, French, Portuguese, Spanish

ENGAGEMENT OPPORTUNITIES

FINANCIAL INSTITUTIONS

Track record of working with FIs across loan cycle:

- Loan underwriting
- Loan monitoring
- Loan collection/recovery
- Portfolio management
- Portfolio allocation

Strong track record of working with commercial banks and insurance Uses include pre-season systematic risk index to identify where to lend, risk capital allocation tool, loan processing and collection, and FI corporate level agricultural analysis

AGRIBUSINESS

Crop monitoring platform used by agribusinesses and agri- commodity companies to plan and execute their businesses

Year founded:
2016

Headquarters
London, England

Regional Scope
India, SE Asia, Africa, Americas,
Europe

Provider Type
Financial Analytics Company

CONCLUSION

This paper has highlighted the transformative role of digital tools in advancing resilience finance, focusing on the Caribbean's unique challenges and opportunities. With climate change posing increasing risks to vulnerable populations and economies, FSPs are at the forefront of enabling climate adaptation investments. We hope that throughout the pages of this document, the need for scalable, data-driven solutions to address these pressing concerns has been emphasized. The key takeaways from this document boil down to this:

- 1 Resilience finance is gaining prominence as global priorities shift towards adaptation and climate risk mitigation. The Caribbean, with its vulnerability to climate-related events, must embrace innovative and digital solutions to channel resources effectively into climate-resilient projects.
- 2 Digital transformation is no longer optional; it is a necessity to meet the demands of modern resilience finance.
- 3 Tools like climate risk engines, APIs, and mobile applications allow FSPs to manage and process complex climate data efficiently. These innovations enable informed decision-making, risk assessment, and resource allocation, and are critical in identifying vulnerabilities, assessing investment impacts, and guiding adaptation strategies.
- 4 By adopting digital tools, FSPs can transform resilience finance in the Caribbean, providing targeted, impactful solutions to communities most in need. However, success requires careful alignment with local realities, customer needs, and robust data frameworks.

To conclude, digitization offers an unprecedented opportunity to scale resilience finance while addressing climate risks. Caribbean FSPs, leveraging digital tools and aligned with global adaptation priorities, can lead the way in creating sustainable, inclusive, and impactful financial ecosystems that build resilience for future generations.



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SECTION 8

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