Climate Adaptation Innovation and Learning

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Lost in Translation

Unlocking adaptation finance through better information flows

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Glossary

Adaptation finance: investment, lending or insurance activity directed at reducing vulnerability to physical climate risks and building resilience to current and future climate impacts. Adaptation finance encompasses a wide range of sectors, asset types and financial instruments.

Adaptation taxonomy: A classification system that identifies which economic activities or investments contribute to climate adaptation objectives, providing criteria for assessment and eligibility. Adaptation taxonomies may be standalone frameworks or embedded within broader sustainable finance taxonomies as one of several sustainability objectives.

Adaptation impact: The positive, real-world contribution an investment or activity makes toward climate change adaptation, typically assessed through output, outcome and impact indicators.

Adaptive capacity: The ability of a counterparty, asset or system to prevent, respond to and recover from a climate hazard. One of the two components of vulnerability alongside sensitivity, per the IPCC framework set out in Figure 3.

Bankable pipeline: A set of investment opportunities that are sufficiently well defined, de-risked and commercially structured to be financeable, as distinct from a general need or priority that has not yet been converted into an investable proposition.

Blended finance: The strategic use of concessional or public capital alongside commercial capital to improve the risk-return profile of an investment, intended to correct a specific market failure rather than to substitute for commercial finance.

Climate resilience: The capacity of a system, community, asset or institution to anticipate, absorb, accommodate and recover from climate-related stresses and shocks, while maintaining or transforming structures and functions. Used interchangeably with climate adaptation in this paper.

Credit risk: The risk that a borrower or counterparty will fail to meet its financial obligations, commonly assessed through metrics such as probability of default and loss given default.

Do No Significant Harm (DNSH): A safeguard principle requiring that an activity classified as sustainable, including as adaptation finance, does not cause significant harm to other environmental or social objectives.

Exposure: The extent to which a counterparty's assets and value chain, upstream and downstream, are located in places or circumstances that could be adversely affected by a climate hazard.

Expected Annual Loss / Average Annual Loss: The long-run average financial loss a portfolio or asset is expected to incur each year from a defined set of hazards, used particularly in insurance and catastrophe modelling.

Financial materiality: The degree to which a risk or opportunity, including a physical climate risk, is significant enough to affect an entity's financial position or performance.

Hazard: The potential occurrence of a climate-related event or trend that may cause damage or loss to physical assets, interruptions to counterparty operations, or affect worker productivity.

Maladaptation: An action taken to adapt to climate change that inadvertently increases vulnerability, shifts risk onto others, or otherwise undermines long-term resilience rather than building it.

Physical climate risk: The financial risks and losses that can arise from the adverse effects of

current or future climate conditions, expressed in this White Paper as a function of climate hazards, exposure and vulnerability.

Pricing floor: A minimum value assigned to avoided losses or resilience benefits within financial decision-making, intended to prevent these benefits from defaulting to zero.

Probability of Default (PD): The likelihood that a borrower will fail to meet its debt obligations within a given time horizon, a core input to credit risk assessment.

Loss Given Default (LGD): The proportion of an exposure that a lender expects to lose if a borrower defaults, after accounting for recoveries.

Sensitivity: The physical predisposition of a counterparty's assets to be adversely affected by a climate hazard. One of the two components of vulnerability alongside adaptive capacity.

Shadow financial metrics: Adaptation-informed financial metrics that sit alongside standard business-as-usual (BAU) metrics, used to illustrate how managing physical climate risk and building resilience could affect financial performance.

Sustainability-linked loan / bond: A financing instrument in which the pricing or terms are tied to the achievement of predefined sustainability performance targets, as distinct from a use-of-proceeds instrument such as a green or resilience bond.

Taxonomy (sustainable finance): A classification system that defines which economic activities qualify as environmentally or socially sustainable, including, where adaptation is included as an objective, which activities qualify as adaptation finance.

Translation matrix: As used in this White Paper, a reference tool mapping what each type of actor in the adaptation finance system can provide and what it needs from others, for each of the four information flows examined.

Vulnerability: The combination of a counterparty's sensitivity to a climate hazard and its adaptive capacity to respond to it, per the IPCC framework set out in Figure 3.

Windfall effect: An unintended benefit received by a party as a result of a concessional or blended finance structure, without that party having taken on additional risk or made an additional contribution that would justify it.

Acronyms and abbreviations

ACMF	ASEAN Capital Markets Forum
ARIC	Adaptation and Resilience Investors Collaborative
A&R	Adaptation and Resilience—throughout this document, A&R and "Adaptation" are used interchangeably
AAL	Average Annual Loss
ASEAN	Association of Southeast Asian Nations
BAU	Business As Usual
BCCR	Banco Central de Costa Rica (Central Bank of Costa Rica)
CAIL	Climate Adaptation Innovation and Learning (project)
CDI	California Department of Insurance
CBRT	Climate Bonds Resilience Taxonomy
CCA	Climate Change Adaptation
CFRF	Climate Financial Risk Forum (UK)
CGFI	Centre for Greening Finance and Investment (UK)
CIMNE	International Centre for Numerical Methods in Engineering
CoP	Community of Practice
CDRFI	Climate and Disaster Risk Finance and Insurance
CNE	Comisión Nacional de Prevención de Riesgos y Atención de Emergencias (Costa Rica's National Emergency Commission)
CPI	Climate Policy Initiative
DFI	Development Finance Institution
DNSH	Do No Significant Harm
DSCR	Debt Service Coverage Ratio
EBRD	European Bank for Reconstruction and Development
ECB	European Central Bank
EMDE	Emerging Market and Developing Economy
ESG	Environmental, Social and Governance
EU	European Union
FI	Financial Institution
GARI	Global Adaptation and Resilience Investment Working Group
GCF	Green Climate Fund
GEF	Global Environment Facility
GIIN	Global Impact Investing Network
GDP	Gross Domestic Product
GRMA	Global Risk Modelling Alliance
IDFC	International Development Finance Club
IFC	International Finance Corporation

IFRS	International Financial Reporting Standards
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
ISSB	International Sustainability Standards Board
LDC	Least Developed Country
LDCF	Least Developed Countries Fund
LGD	Loss Given Default
mARs	mitigation co-benefit and Adaptation for Resilience (Guide)
MDB	Multilateral Development Bank
MSME	Micro, Small and Medium Enterprise
NAP	National Adaptation Plan
NCQG	New Collective Quantified Goal on Climate Finance
NDC	Nationally Determined Contribution
NGFS	Network for Greening the Financial System
NGO	Non-Governmental Organization
NPV	Net Present Value
PCR	Physical Climate Risk
PD	Probability of Default
PML	Probable Maximum Loss
PRB	Principles for Responsible Banking
SCCF	Special Climate Change Fund
SEC	Securities and Exchange Commission (Philippines)
SFDR	Sustainable Finance Disclosure Regulation (EU)
SFIA	Sustainable Finance Institute Asia
SIDS	Small Island Developing States
SLB	Sustainability-Linked Bond
SLL	Sustainability-Linked Loan
SME	Small and Medium-sized Enterprise
SUGESE	Superintendencia General de Seguros (Costa Rica's insurance supervisor)
TCFD	Task Force on Climate-related Financial Disclosures
TNC	The Nature Conservancy
TPT	Transition Plan Taskforce (UK)
UAE	United Arab Emirates
UNEP	United Nations Environment Programme
UNEP FI	United Nations Environment Programme Finance Initiative
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization

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Foreword

Climate change is increasingly affecting lives, livelihoods and economies, with vulnerable populations and communities facing the greatest impacts.

As climate impacts intensify, demand is growing for goods, services and technologies that can help businesses, communities and economies prepare for, manage and recover from climate-related shocks. Recent analyses[1] point to significant opportunities for private investment in adaptation and resilience, while also highlighting barriers that continue to limit the flow of capital.

Among the most fundamental barriers is the difficulty of pricing adaptation and resilience, including both the financial implications of climate-related physical risks and the potential financial returns associated with investing in measures that reduce those risks. Better information, stronger methodologies and greater alignment between climate science and financial decision-making are therefore essential to enable financial institutions and markets to integrate adaptation and resilience more systematically.

It is in this context that the Global Environment Facility (GEF), in partnership with the United Nations Industrial Development Organization (UNIDO), the United Nations Environment Programme Finance Initiative (UNEP FI), the Global Adaptation & Resilience Investment Working Group (GARI) and Climate-KIC, has implemented the Climate Adaptation and Innovation Learning project. The project seeks to accelerate innovation and engage the private sector in climate change adaptation.

In its first phase, the project supported three communities of practice focused on complementary dimensions of this agenda: Impact Measurement and Information Flows, led by UNEP FI; Investment Funds, led by GARI; and MSME Incubation and Acceleration, led by Climate-KIC. These communities provide platforms for generating, exchanging and sharing knowledge.

This publication is part of the outcomes of the UNEP FI-led Community of Practice and complements the Impact Measurement Toolkit and the Adaptation Finance Taxonomy Playbook. It contributes to a more practical understanding of the types of climate-related information that can enable financial markets to incorporate adaptation and resilience more systematically into financing decisions.

This has a dual purpose. First, better information can help financial institutions identify, assess and manage the physical climate risks to their investments and portfolios. Second, it can help them identify and capture emerging investment opportunities associated with adapting to climate impacts and building resilience.

A key contribution of this analysis is its distinction between four types of adaptation-related information. It identifies specific information needs and shows how improved information can strengthen the resilience of investments and support greater private-sector investment in adaptation.

1 The Resilience Opportunity, WEF; Climate Adaptation and Resilience Financing, BCG; Advancing adaptation: Mapping costs from cooling to coastal defenses, McKinsey

This approach is consistent with the direction set by the GEF Council in the GEF-9 Programming Strategy on Climate Change Adaptation for the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF),[2] including its focus on strengthening the enabling conditions for effective adaptation action and improving the delivery and impact of adaptation finance. The findings of this publication will therefore help inform the programming and design of GEF climate adaptation projects supported through the LDCF and SCCF during the GEF-9 period.

The scale and urgency of the adaptation challenge require action from governments, development partners, financial institutions, businesses and investors alike. The GEF is committed to strengthening the knowledge, partnerships and enabling conditions needed to mobilize greater investment in resilience, particularly in countries and communities most vulnerable to climate change.

The GEF thanks UNEP FI and all its partners for this important contribution to advancing the evidence and practical approaches needed to connect climate information and financial decision-making.



Chizuru Aoki, Ph.D.
Manager, MEAs and Funds Division
Global Environment Facility

2 Programme Operation and Resource Mobilisation—GEF

Executive summary

12–14×
adaptation investment needs vs. reported flows

3–8%
of reported adaptation finance comes from private sources

US$ 35–40bn
core adaptation solutions market today

US$ 9tr
investment opportunity by 2050

This White Paper focuses on how improving flows of climate Adaptation & Resilience (A&R) information can enable financial institutions (FIs) and financial markets more broadly to embed A&R into their financing operations, manage physical climate risks and realize the investment opportunities associated with A&R. It identifies four different kinds of A&R-related information that can inform and potentially enhance private financing flows for A&R.

The paper reflects findings of the Community of Practice on Impact Measurement and Information Flows of the Climate Adaptation Innovation and Learning project. This project aims to promote private sector involvement in climate A&R innovation, investment and action. This overall objective recognizes the fact that greater efforts are needed globally, especially in Emerging Markets and Developing Economies (EMDEs) and particularly in Least Developed Countries (LDCs) and Small Island Developing States (SIDS), to mobilize private finance for urgently needed climate change A&R investments.

The scale of that shortfall also points to the size of the opportunity awaiting private capital. UNEP estimates that developing countries have adaptation investment needs 12–14 times greater than current reported flows[3] and core adaptation solutions such as weather intelligence and monitoring already represent a market estimated at US$ 35–40 billion. The broader adaptation-related investment opportunity (spanning climate-resilient infrastructure, water management and agriculture) is estimated at around US$ 2 trillion today and could reach US$ 9 trillion by 2050. With less than 8% of reported adaptation finance currently coming from private sources, financial institutions that build the expertise and products this growing market demands stand to capture significant first-mover advantage.

Consultations across the UNEP FI Community of Practice point to a consistent binding constraint: the difficulty of translating adaptation priorities into propositions a financial institution can assess, price and defend. That is where information plays a fundamental role, becoming the translation layer that is needed to bridge policy and private finance.

3 https://www.unep.org/resources/adaptation-gap-report-2025

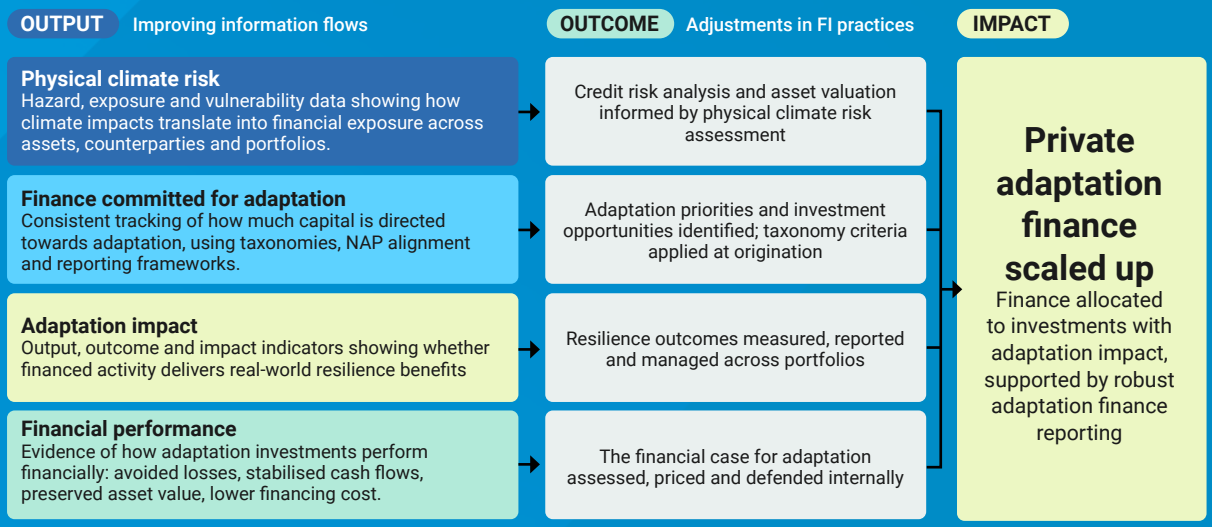
Four information flows that make A&R financeable

The Community of Practice identified four different kinds of adaptation-related information that can inform and potentially enhance private financing flows for adaptation.

- Information about **physical climate-related financial risks**: how climate hazards translate into financial exposure across assets, counterparties and portfolios.
- Information about the **allocation of finance for A&R**: how much capital an institution is directing towards A&R, tracked consistently enough to report and manage.
- Information about the **positive impacts of A&R investments:** whether financed activity is producing real-world resilience outcomes.
- Information about the **financial performance of A&R investments**: how adaptation investments may perform financially.

These four information flows function together as a theory of change: strengthening their availability, quality and consistency helps financial institutions change their internal policies and processes and consequently it makes adaptation investable. This paper also clarifies that improved information is a necessary, not a sufficient, condition for scaling adaptation finance. It cannot on its own resolve the institutional and financial barriers that constrain the mobilisation of adaptation finance in EMDEs, and particularly in LDCs and SIDS, barriers which also degrade the availability, quality and flow of adaptation information itself.

Theory of change: how adaptation information flows scale private adaptation finance



The relevance of each information flow varies across financial sector industries and across FI business functions such as risk management, product development, business development, client engagement and reporting. Physical climate risk information anchors credit risk analysis and asset valuation; information on committed finance underpins portfolio tracking and disclosure; adaptation impact information supports product design and stakeholder reporting; and financial performance information determines whether adaptation is treated as a strategic investment case. Realizing these applications also depends on wider enabling conditions, many of which sit with public authorities.

How each actor can contribute to improving information flows

Interviews with Community of Practice members identified a series of potential actions that different actors could consider to improve the flow of climate adaptation information. These reflect stakeholder input and emerging practice rather than recommendations by UNEP FI, and are summarized below and expanded in section 7 of this document.

Private financial institutions	Translating physical risk into the credit-adjusted metrics already used to price risk, and embedding taxonomy criteria into origination rather than only into reporting.
DFIs and MDBs	Sharing methodologies and lessons from A&R financing (e.g. impact measurement approaches) with private financial institutions
Governments and policymakers	Investing in hazard and exposure data as a public good, and articulating national adaptation priorities that financial institutions can align with
Financial supervisors and regulators	Addressing material physical climate-related financial risks within existing prudential mandates, as a growing number of supervisors already do
Data and standard-setting bodies	Continuing to build interoperable platforms and indicators, informed directly by the institutions applying them.
Startups and MSMEs	Documenting and sharing evidence, proportionate to their capacity and growth stage in a form that financial institutions can use

This document also includes a translation matrix (Annex 1), a reference tool mapping what each type of actor in the adaptation finance system can provide and what it needs from others, for each of the four information flows examined.

These findings set out a practical agenda for closing the information gaps that currently constrain private adaptation finance, and for building the market architecture needed to mobilize capital at the scale the adaptation finance gap demands.



1. Closing the adaptation finance gap

The past decade has been the warmest on record. Economic losses from extreme weather over that period are estimated at US$ 2 trillion globally and in 2026 the World Economic Forum named extreme weather the greatest global risk over the coming decade.

US$ 2 trillion
global economic losses from extreme weather, last decade

US$ 200bn+
economic damage from extreme weather in 2025, more than double early-2000s levels

–12% GDP
potential EMDE GDP reduction by 2050 against baseline, if unmitigated

The physical impacts of climate change are increasingly being experienced by people, communities, businesses and economies in all parts of the globe. The past decade has been the warmest on record,[4] with extreme weather events such as heat waves, floods, droughts and wildfires becoming more frequent and more intense.[5] The economic losses associated with extreme weather are significant, estimated at US$ 2 trillion globally over the last decade,[6] and they are increasingly recognized as material risks to business and financial institutions (FIs).

In 2026, the World Economic Forum recognized extreme weather events as the greatest risk to the global economy over the coming decade.[7]

Recent analysis by the Network for Greening the Financial System (NGFS) has found that economic damage caused by extreme weather events amounted to more than US$ 200 billion in 2025, more than double levels reported in the early 2000s. The magnitude of these impacts varies from country to country, with GDP reductions ranging from 0.03% to 57% across 31 country case studies analyzed by the NGFS, with average inflation increases of up to 17%.[8] Emerging markets and developing economies (EMDEs) are especially vulnerable to the adverse economic impact of climate change, which if unmitigated, could reduce GDP by 12% against a baseline scenario by 2050.[9]

Despite the backdrop of growing awareness of climate change impacts and of their economic implications, reported climate change adaptation finance flows still fall far short of estimated needs. In 2025 global adaptation finance needs in developing countries were estimated to be in the range of US$ 310 billion to US$ 365 billion per year by 2035, while international public adaptation finance flows to developing countries were estimated to be only US$ 26 billion per year in 2023.[10] Private finance only contributed about 3–8% of the total financing in 2024.[11] Part of this gap is likely to reflect measurement as well as volume; a substantial amount of adaptation-related investment is not labelled or tracked as such, as discussed later in this paper, so better information flows can also help surface investments that already support A&R.

4 WMO confirms 2025 was one of warmest years on record
5 Extreme Weather—NASA Science
6 The economic cost of extreme weather events: cost economy $2 trillion over the last decade—ICC—International Chamber of Commerce
7 The Global Risks Report 2026 | World Economic Forum
8 NGFS publishes a report on the macroeconomic and financial impact of extreme weather events | Network for Greening the Financial System
9 Country Climate and Development Reports (CCDRs)
10 Adaptation Gap Report 2025 | UNEP—UN Environment Programme
11 Global Landscape of Climate Finance 2024—Climate Policy Initiative

Barriers are amplified for the most vulnerable

In particular, Least Developed Countries (LDCs) and Small Island Developing States (SIDS) face some of the most severe barriers to accessing adaptation finance. Drawing on insights from E3G[12] and CPI,[13] these barriers can broadly be grouped into two interconnected categories: institutional barriers and financial barriers.

Examples of institutional barriers

Limited technical and administrative capacity constrains the flow from information to finance.

- Gaps in climate data, and in the capacity to interpret it
- Difficulty identifying, quantifying and articulating financing needs
- Cross-cutting adaptation priorities spanning multiple ministries
- Absence of effective adaptation finance budget tagging

Examples of financial barriers

Constrained fiscal space meets uncertain or inadequate funding mechanisms.

- Limited domestic budgets and narrow economic bases
- Currency volatility and high levels of sovereign debt
- Donor reductions to development and climate finance
- Weak project pipelines, feeding perceptions of higher risk

Institutional barriers relate to the limited technical and administrative capacity that many SIDS and LDCs face, can limit countries' ability to identify, quantify and articulate their adaptation financing needs, weakening the flow from information to finance. These challenges are compounded by the cross-cutting nature of adaptation, with priorities and investments often spanning multiple sectors, ministries and policy frameworks, as well as relatively low policy prioritization at the national level. The absence of effective adaptation finance budget tagging can further limit countries' ability to track and communicate how resources are allocated for adaptation.

Financial barriers include constrained domestic budgets and limited fiscal space, alongside uncertain or inadequate funding mechanisms. Given the fiscal constraints that many governments currently face the mobilisation of greater volumes of private finance will be essential for addressing increasingly urgent adaptation investment needs. However, factors such as currency volatility, narrow economic bases and high levels of sovereign debt constrain the ability of SIDS and LDCs to develop viable adaptation project pipelines, contributing to perceptions of higher risk by private investors.

Businesses and FIs in these markets and others are increasingly perceiving the physical impacts of climate change as being financially material to their operations.[14] However, the comparatively low volumes of reported private adaptation finance indicate that this growing awareness is not currently being translated into private sector financial flows towards adaptation. This poses an important question around **why private adaptation finance is not currently scaling to close the adaptation funding gap, despite the increasing awareness of physical climate risks and the availability of capital for climate investments.**[15]

This White Paper proposes that imperfect information in support of adaptation financing present important barriers to the mobilization of private finance for adaptation and explores how these obstacles may be removed through the provision of clear, consistent and decision-useful adaptation information flows for FIs.

12 E3G-briefing-Climate-finance-access-for-SIDS-and-LDCs.pdf
13 State-and-Trends-of-Climate-Adaptation-Finance-in-Small-Island-Developing-States.pdf
14 Physical Climate Risks: 6 Things Portfolio Managers Need to Know
15 Sustaining the Private Capital Opportunity in Climate | BCG



2. The role of private financial institutions

Financial institutions around the world are increasingly understanding the materiality of physical climate risks and realizing that they need to be managed as part of their overall approach to risk management.

In some jurisdictions this is being given sharper focus by financial supervisory regimes that require financial and non-financial firms to assess and disclose climate-related and sustainability-related risks that may affect their financial positions, in many cases underpinned by international frameworks such as the Task Force on Climate-related Financial Disclosures (TCFD)[16] recommendations, or the International Sustainability Standards Board (ISSB) standards.[17]

At the same time, there are compelling arguments for FIs to go beyond compliance-based requirements related to the assessment and disclosure of physical climate risks, to also focus on the emerging investment opportunities associated with climate change adaptation. The need for adaptation solutions is beginning to drive value creation through the provision of innovative technologies, equipment and materials that build climate resilience. This in turn is creating a large emerging market for adaptation-related investment, which has been estimated at around US$ 35–40 billion for core adaptation solutions such as weather intelligence and monitoring. The broader adaptation-related investment market covering areas such as climate-resilient infrastructure, water management, and agriculture could be larger still, at an estimated US$ 2 trillion today and potentially US$ 9 trillion by 2050.[18]

Evolving corporate behaviour and practices on adaptation are also influencing the way that FIs factor adaptation into financing and investment decisions as more businesses embed adaptation systematically into their corporate transition plans and longer-term strategic planning.[19] Financing adaptation can help protect performance by reducing climate-related disruption, preserving revenues and strengthening capacity to sustain and expand operations in climate vulnerable markets, including SIDS and LDCs.

As demand for adaptation grows, embedding adaptation into financing decision-making and scaling up the financing available for adaptation can open up new revenue opportunities that support client growth. FIs that develop the expertise and products needed to meet this growing demand can gain a competitive advantage, further strengthening the broader financial case for adaptation.

However, despite the increasingly compelling reasons for FIs to take action on climate change adaptation—both in terms of managing the risks as well as seizing the opportunities—FIs also face barriers of their own, which sit alongside the wider institutional and financial barriers described above. These include limited in-house expertise on adaptation, difficulty identifying adaptation-relevant activity within existing portfolios and pipelines, the absence of widely recognized metrics linking resilience to credit risk, pricing and returns, and financing tenors that are often shorter than the time horizons over which physical risks and adaptation benefits are typically expected to materialize.

Evidence suggests that there is, in principle, no shortage of capital for climate-related investments, and yet this capital is not yet finding its way towards adaptation investments. Extensive consultations with the UNEP FI Community of Practice on Adaptation Information Flows (under which this white paper was developed), point to the key barrier being the difficulty of translating adaptation priorities into clearly defined, commercially viable and investable propositions. Pipelines of investable adaptation opportunities—or at least that are clearly defined and identified as such—are limited and tending to be generated by public entities such as governments or utilities and therefore lacking a private finance perspective.

Strengthening the flow of information between adaptation priorities and investment opportunities can therefore play an important role in enabling FIs to identify, assess and ultimately finance adaptation opportunities at greater scale.

16 Task Force on Climate-Related Financial Disclosures | TCFD)
17 IFRS—International Sustainability Standards Board
18 Climate adaptation provides private investment opportunities | World Economic Forum
19 TPT Adaptation Working Group—ITPN



3. A theory of change: from information to scaled financing

This White Paper argues that strengthening information flows related to climate change adaptation can play an important role in enabling FIs to scale up private adaptation finance while at the same time seizing the opportunities associated with the growing demand for investment in adaptation.

Specifically, this White Paper identifies four kinds of adaptation-related information flows defined as being potentially decision-useful for FIs, as illustrated in Figure 1.

- Information about **physical climate risks**: this can enable financial institutions to understand how their investments in assets or companies may be affected by climate change impacts, and to understand the nature, scale and materiality of physical climate risks in their portfolios and pipelines.
- Information about the **allocation of finance for adaptation**: this can enable financial institutions to measure and track the amount of finance that they commit towards building resilience to identified physical climate risks.
- Information about the adaptation impact **of investments:** this can help financial institutions to assess and measure the way that their investments make positive contributions towards real-world CCA improvements.
- Information about the **financial performance of adaptation investments**: this can help financial institutions to understand how adaptation investments perform financially, and to assess the financial case for investing in adaptation.

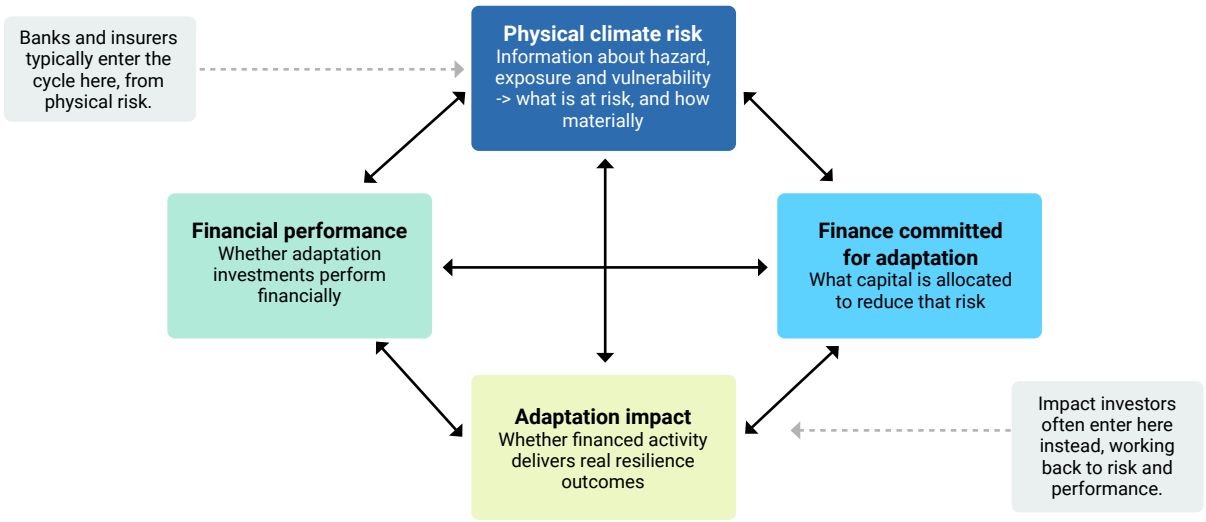


Figure 1: Information flows related to financial decision-making on adaptation

These four information flows do not necessarily form a linear sequence but may inform and feed into each other in a number of different ways, depending on the context for a given investment or a given FI's business practice. For some FIs, physical climate risk information may provide a starting point for generating the other information flows on finance committed, adaptation impact and financial performance. For other kinds of FIs, such as impact investors, the assessment of an investment's positive contribution to adaptation may be the focal issue that drives adaptation information flows. In other cases, information about the adaptation impact of investments may be needed to qualify investments for adaptation finance tracking purposes, or to inform assessments of the financial performance of adaptation investments.

As illustrated in Figure 2, the theory of change suggests that improved A&R information flows can enable FIs to embed adaptation into their financing operations, pursue financing opportunities related to adaptation and scale up urgently needed financing for climate change adaptation.

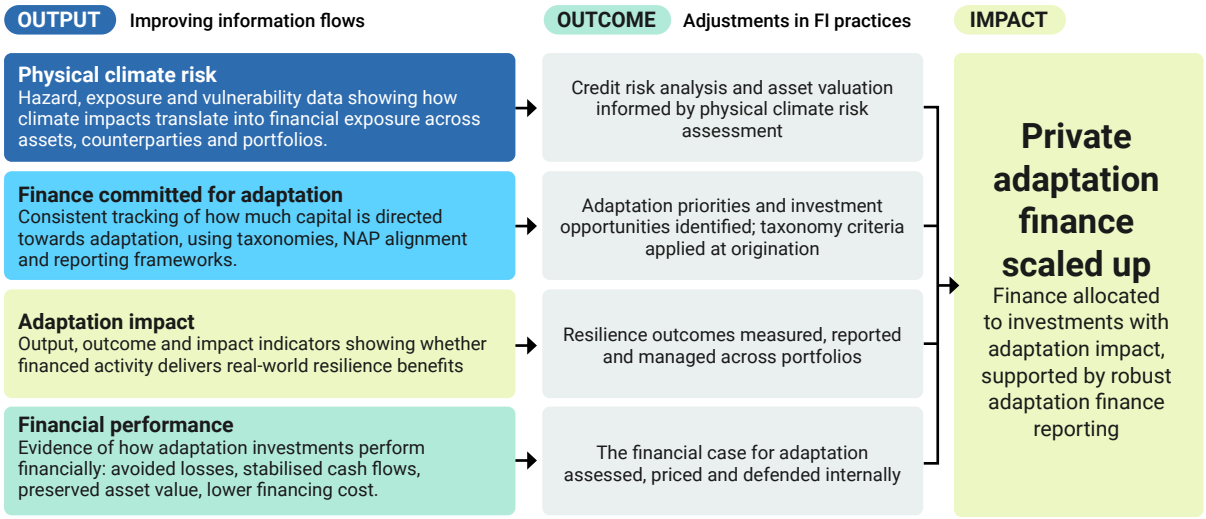


Figure 2: Theory of change—adaptation information flows support FI action on financing adaptation

However, it is important to note that while improving these information flows can enable FIs to better identify and assess adaptation opportunities, this alone cannot overcome the underlying financial and institutional barriers that constrain the mobilisation of adaptation finance in some EMDEs, including SIDS and LDCs. These same barriers also undermine the availability, quality and flow of adaptation-related information, leaving it incomplete, fragmented or difficult to access. As elaborated further in section 6 of this white paper, policy interventions may also be needed to address some of the obstacles to this theory of change.



4. The four adaptation information flows

This section of the white paper provides a detailed analysis of each of the four types of adaptation information flows and their respective roles in enabling financial decision-making, including through interactions between FIs, policymakers, regulators, businesses, market observers and other relevant organizations.

4.1 Information about physical climate risks: translating climate hazards into financial risk

Physical climate risk refers to the negative impacts and losses—including financial losses—that may arise from the physical effects of current and future climate conditions

These matter to FIs as well as regulators, businesses, market observers and others, as they pose growing threats to investment assets, portfolios, and financial stability across sectors and geographies.[20] Financial institutions need to be able to assess and manage physical climate risk to build resilience, safeguard returns, and align with global adaptation goals. Specifically, this requires financial institutions to be able to translate physical climate risks into credit risk analysis and asset valuations.

The determinants of physical climate risk are set out in widely recognized IPCC definitions,[21] which define them as **hazard, exposure** and **vulnerability** as displayed in Figure 3.

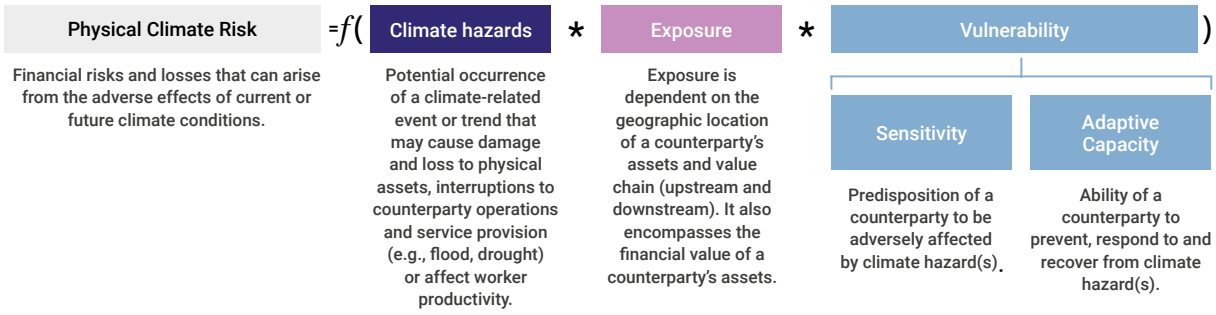


Figure 3: Determinants of physical climate risk (from ARIC, 2024)[22]

Recent guidance from the UK's Climate Financial Risk Forum[23] and the European Central Bank[24] illustrate how physical climate risk information is increasingly being used to inform credit modelling and risk management by financial institutions, including by adjusting key credit risk metrics such as Probability of Default (PD) and Loss Given Default (LGD) to reflect physical climate risks and corresponding resilience measures at the investment-level. Approaches such as these can support financial institutions in lowering capital costs, safeguarding asset values in the face of physical climate risks and unlocking private finance for adaptation.

20 The Landscape of Sustainability Risk Integration
21 2—Determinants of Risk: Exposure and Vulnerability
22 ARIC Physical Climate Risk Assessment and Management An investor playbook (ARIC-PCR-Playbook-2.pdf)
23 From Risk to Resilience: Integrating Adaptation into Finance
24 ECB report on good practices for climate and nature-related risk stress testing

Case study 1 Pricing flood risk into mortgage collateral	Case profile	
As part of the UNEP FI TCFD pilot for banks, Brazil's Bradesco assessed how flooding could affect its retail mortgage portfolio, focusing on properties for which it had also financed construction. The bank combined current flood frequencies from Swiss Re's CatNet with forward-looking projections from Acclimatise under a 4°C (RCP8.5) warming scenario, over an exposure period of up to 33 years. The analysis translated changes in flood frequency into property value depreciation, and therefore into the collateral values that drive loss given default. In the most exposed locations, the annual probability of flooding was projected to rise from 2.0% (a 1-in-50-year event) to 4.8% (1-in-20) by the 2040s, with estimated depreciation of around 4.5% for affected properties. The study illustrates how hazard information can be expressed in a metric that a bank's credit models already use.	**Geography**	Brazil
	Sector(s)	Residential real estate
	Actor	Commercial bank
	Instrument	Retail mortgages
	Information flow	Physical climate risk
	Key figures	Flood probability 2.0% to 4.8% by the 2040s in the most exposed areas; ~4.5% property depreciation; up to 33-year exposure
	Partners	UNEP FI, Swiss Re, Acclimatise
	Date / status	2021 analysis
	Sources	Bradesco physical risk case (2021)

The availability of frameworks and resources that enable FIs to access physical climate risk information has increased in recent years. In 2025, UNEP FI's Risk Centre[25] identified over a hundred risk analytics tools that had been developed to support FIs. However, the availability, quality, and granularity of physical climate risk information remains limited and translating climate science into decision-useful financial metrics may require expertise that only few FIs have in-house.

Furthermore, while modelled risk estimates can provide useful context on how physical climate risks may impact FIs, the complex and sometimes unpredictable nature of climate change means that such estimates are likely to understate the full extent of risk. Given that information about physical climate risks underpins the wider flow of adaptation information, these barriers have implications across all four flows.

25 Database: Sustainability Risk Tool Dashboard—United Nations Environment Programme Finance Initiative

Case study 2 Navigating physical risk tools	Case profile	
The number of tools available to assess physical climate risk has grown quickly, and financial institutions now face the challenge of selecting among them and integrating their outputs into existing decision-making. UNEP FI's Risk Centre maintains the Sustainability Risk Tool Dashboard, an open-access database first launched in June 2023 and updated quarterly. It profiles more than 100 tools, setting out each tool's features, metrics, methodologies, assumptions and common use cases, and now covers nature, pollution and social risks alongside climate. The Risk Centre's June 2026 report, The Landscape of Sustainability Risk Integration, draws on a consultation with 28 banks that are signatories to the Principles for Responsible Banking across five regions. It finds that the main difficulty lies less in accessing tools than in using their outputs: among banks relying on third-party data providers and tools, 57% struggle to translate outputs into measurable financial metrics and 50% struggle to integrate them with existing models. More than 90% of the banks consulted considered that their practices would benefit from a structured reference framework.	**Geography**	Global
	Sector(s)	Banking, insurance, investment
	Actor	UNEP FI Risk Centre
	Instrument	Tool database and research report
	Information flow	Physical climate risk
	Key figures	100+ tools profiled (2025); 28 banks consulted in 5 regions
	Partners	PRB signatory banks
	Date / status	Dashboard since June 2023; report June 2026
	Sources	Tool Dashboard; Landscape of Sustainability Risk Integration

4.2 Information about finance committed for adaptation: translating adaptation priorities into financed activities

Tracking the amounts of finance that are committed for adaptation is centrally important for monitoring progress towards global climate action commitments under the 2015 Paris Agreement, including the New Collective Quantified Goal on Climate Finance (NCQG),[26] which calls for a significant scaling-up of adaptation finance in line with the UAE Framework for Global Climate Resilience.[27] Multilateral Development Banks (MDBs) and DFIs have been tracking and reporting adaptation finance for more than a decade, applying granular approaches as set out in shared methodologies such as the MDB Joint Methodology for Tracking Climate Change Adaptation Finance[28] and the IDFC-MDB Common Principles for Climate Change Adaptation Finance.[29]

From the perspective of private FIs, common definitions can help to integrate adaptation considerations into portfolio management and strengthen reporting to external stakeholders on how FIs are contributing towards adaptation goals. It can also create opportunities for launching new financing products focused on adaptation, such as resilience bonds, adaptation-themed funds, or credit lines—all of which call for clear, consistent and externally recognizable definitions of adaptation finance.

Case study 3
Certifying a resilience bond

In October 2025 the Tokyo Metropolitan Government issued a EUR 300 million, five-year bond, the first worldwide to be certified under the Climate Bonds Resilience Taxonomy (CBRT). The bond drew EUR2.2bn in bids, achieving a 7x oversubscription, underscoring strong investor demand for high-quality, resilience-focused instruments.

Proceeds will support projects under the TOKYO Resilience Project, including upgrading rivers for flood resilience, coastal protection for the Port of Tokyo and outlying islands, and undergrounding power lines to reduce disaster risk.

Certification against a dedicated resilience taxonomy gives investors confidence through an external, criteria-based basis for counting the bond as adaptation finance.

Case profile	
Geography	Japan
Sector(s)	Flood defence, ports, power distribution
Actor	Sub-national government
Instrument	Certified resilience bond
Information flow	Allocation of finance
Key figures	EUR 300 million, 5-year, mid-swaps + 40 bps; EUR 2.2 billion orderbook (7x); nearly 120 accounts
Partners	Climate Bonds Initiative; Barclays, Bank of America, Crédit Agricole, Citigroup
Date / status	October 2025
Sources	Press Release; TOKYO Resilience Project

26 New Collective Quantified Goal on Climate Finance | UNFCCC
27 UAE Framework for Global Climate Resilience | unfoundation.org
28 Joint methodology for tracking climate change adaptation finance
29 idfc-2023-common-principles-adaptation.pdf

Sustainable finance taxonomies, whether developed by national governments, regional or international organisations have an important role in providing clear and comparable definitions of adaptation investments that can be used consistently by FIs. As elaborated in the Adaptation Finance Taxonomy Playbook,[30] a growing number of sustainable finance taxonomies now include adaptation as a sustainability objective, including taxonomies such as the EU Sustainable Finance Taxonomy,[31] the ASEAN Taxonomy for Sustainable Finance,[32] the Hong Kong Taxonomy for Sustainable Finance,[33] the South African Green Finance Taxonomy,[34] or international taxonomies focused specifically on adaptation such as the Climate Bonds Resilience Taxonomy.[35]

While interest in climate adaptation continues to grow, FIs often face difficulties applying these frameworks within their financial decision-making process. Some of the most common barriers include:

- A complex and fragmented landscape of sustainable finance taxonomies
- Many FIs continue to engage with taxonomies primarily as reporting or labelling frameworks rather than embedding them within core financial decision-making processes.
- Adaptation criteria is often not consistently translated into climate risk assessment or other transaction processes.
- Internal capacity constraints and limited access to practical implementation guidance continue to slow their adoption.
- Because adaptation interventions are inherently context-specific, demonstrating substantial contribution to adaptation frequently depends on process-based approaches that can be technically demanding, resource intensive and difficult to apply consistently across jurisdictions.
- Uneven access to reliable, localized climate risk data which limits the ability of financial institutions to compare investment opportunities or evidence adaptation needs.
- Limited practical guidance on implementing maladaptation assessments and Do No Significant Harm (DNSH) safeguards
- Incomplete sectoral coverage within existing taxonomies
- Additionally, it is important to note that many FIs in EMDEs operate in contexts where national taxonomies, and in some cases even NAPs, are absent. In such contexts, there may be need for FIs to develop their own frameworks for defining adaptation investments.

In response to these identified challenges, the UNEP FI Adaptation Community of Practice has overseen the development and launch of the Adaptation Finance Taxonomy Playbook.[36] This is designed to help bridge this gap by offering practical principles, tools, and methodologies that support the operational use of adaptation taxonomies across portfolios, asset classes and jurisdictions. Drawing on existing taxonomy approaches and lessons from FI implementation, the Playbook promotes a more decision-oriented use of adaptation. It provides guidance to help institutions focus on areas of greatest adaptation relevance, anchor decisions in climate risk and contextual analysis, navigate differing taxonomy requirements, incorporate Do No Significant Harm (DNSH) considerations and recognize potential maladaptation risks throughout the investment lifecycle.

30 Adaptation Finance Taxonomy Playbook—United Nations Environment Programme Finance Initiative
31 EU taxonomy for sustainable activities—Finance—European Commission
32 ASEAN Capital Markets Forum
33 brdr.hkma.gov.hk/eng/doc-ldg/docId/getPdf/20260122-5-EN/Hong Kong Taxonomy for Sustainable Finance (Phase 2A).pdf
34 SA Green Finance Taxonomy—1st Edition.pdfSA Green Finance Taxonomy—1st Edition.pdf
35 Climate Bonds Resilience Taxonomy
36 Adaptation Finance taxonomy playbook

Case study 4 Adaptation Finance Taxonomy Playbook	Case profile	
The Adaptation Finance Taxonomy Playbook was developed through the UNEP FI-led Community of Practice under the Climate Adaptation Innovation and Learning project. It responds to a gap identified by Community members: a growing number of taxonomies now include adaptation, but financial institutions often struggle to apply them in financing decisions. Drawing on existing taxonomy approaches and lessons from implementation, the Playbook offers practical tools for using adaptation taxonomies across portfolios, asset classes and jurisdictions. It guides institutions to anchor eligibility decisions in climate risk and contextual analysis, to navigate differing requirements where they operate under more than one taxonomy, and to incorporate Do No Significant Harm and maladaptation considerations at origination.	**Geography**	Global
	Sector(s)	All taxonomy sectors
	Actor	UNEP FI-led Community of Practice on Adaptation
	Instrument	Guidance
	Information flow	Allocation of finance
	Key figures	5 tools to implement adaptation taxonomies; over 80 jurisdictions reviewed
	Partners	Climate Adaptation Innovation and Learning project
	Date / status	June 2026
	Sources	Adaptation Finance Taxonomy Playbook

In addition to national taxonomies and global frameworks, there are some examples of how private FIs are taking action to define and quantify allocations of finance for adaptation. In some cases, this takes the form of defining how financing commitments are aligned with the National Adaptation Plans (NAPs)[37] of countries where they operate, where available. In 2025 the Principles for Responsible Banking (PRB) initiative issued guidance for banks on implementing Adaptation & Resilience,[38] which included ensuring that their portfolios are aligned with NAPs to support strategic adaptation objectives set out by national governments.

4.3 Information about the impact of adaptation investments: translating resilience outcomes into measurable results

There are a number of different reasons why FIs (alongside other relevant organisations including policymakers, market observers, etc.) may need information about the positive adaptation impact of their financing. These may include regulatory and compliance requirements to substantiate sustainability (or adaptation) claims, such as the EU Sustainable Finance Disclosure Regulation,[39] which requires that financial products define specific and measurable sustainability objectives, (potentially including adaptation).[40]

There may also be commercial or competitive drivers, through which demonstrated positive adaptation impact could enhance investor interest, pricing terms, or access to concessional or blended co-financing. This information flow can also support product development in the form of dedicated adaptation instruments such as funds, bonds or credit lines. Furthermore, it can support business development, client engagement, the marketing of adaptation financing products, and upstream signalling to investors.

37 National Adaptation Plans | UNFCCC
38 Practical Guidance on Implementing Adaptation and Resilience for Banks
39 Sustainability-related disclosure in the financial services sector—Finance
40 Business responsibility and sustainability reporting by listed entities

Case study 5 **Reporting resilience outcomes in physical and monetary terms**	**Case profile**	
In September 2019 the European Bank for Reconstruction and Development (EBRD) issued the world's first dedicated climate resilience bond: a USD 700 million, five-year issue placed with about 40 investors in 15 countries. Projects financed under the programme included the Qairokkum hydropower upgrade in Tajikistan and the water conservation in Morocco's Saïss plain. The results of the projects in the bond are reported based on the estimated physical climate resilience outcomes that projects are expected to deliver: ▪ Water Security: Projects in the bond contribute to increasing water availability either through water savings or the provision of additional usable water. ▪ Energy Reliability: Upgraded critical generation facilities to maintain consistent power outputs despite shifting weather patterns and river flows. ▪ Infrastructure Protection: Reduced weather-related damage and service disruptions for municipal infrastructure, transport, and energy grids While that individual initial bond matured, by pricing a AAA-rated dedicated adaptation bond that was heavily oversubscribed ($200 million in excess demand), the EBRD proved to capital markets that institutional investors were hungry to finance climate adaptation. Through various subsequent transactions and taps under the framework, the EBRD had issued a cumulative EUR 1.2 billion in dedicated Climate Resilient Bonds.	**Geography**	EBRD countries of operation (e.g. Morocco, Türkiye, Ukraine, Georgia, Jordan)
	Sector(s)	Infrastructure, business and commercial operations, agriculture, and ecological systems
	Actor	Multilateral development bank
	Instrument	Climate resilience bond
	Information flow	Adaptation impact
	Key figures	US$ 700 million (2019); 1.2bn (2026)
	Partners	Climate Bonds Initiative; BNP Paribas, Goldman Sachs, SEB
	Date / status	Issued 2019; portfolio reported annually
	Sources	EBRD launch release; EBRD Investor Report on Sustainability 2025; EBRD Climate Adaptation Plan 2023-2025; information on performance; benefits of resilience bonds

Some of the challenges associated with the impact measurement of investments include a lack of consistently recognized metrics. This is more challenging for adaptation financing as compared to mitigation financing, where widely recognized and comparable metrics such as tonnes CO_2 equivalent reduction per dollar invested may be used to inform decisions . The highly diverse and contextualized nature of adaptation investments calls for a more varied and customizable set of adaptation metrics. For example, the ARIC Adaptation & Resilience Impact measurement framework[41] defines adaptation impact metrics around three core impact themes of people, planet and economy, recognizing differentiated needs to define positive adaptation contributions in terms of impact on beneficiaries, impact on natural systems, or economic impact.

Wide-ranging consultations with the FIs that make up the Community of Practice found that FIs need to be able to reliably measure and demonstrate the adaptation impact of their financing activities to make the business case for scaling adaptation finance. When the benefits of adaptation are not visible or verifiable, FIs may find it harder to justify the allocation of finance for adaptation. To address this challenge, the Community developed the A&R Impact Measurement Toolkit.

41 Adaptation-and-Resilience-Impact_A-measurement-framework-for-investors.pdf

Case study 6 **A&R Impact Measurement Toolkit: a common framework for reporting outcomes**	**Case profile**	
The Adaptation and Resilience Impact Measurement Toolkit provides a practical framework for financial institutions to measure, track and communicate the adaptation and resilience impacts of their financing activities. Designed for commercial banks, development finance institutions, insurers and asset managers, it combines common measurement principles with institution-specific guidance. The framework centres on two complementary indicator types: ▪ Results indicators: track the outputs, outcomes and longer-term impacts of financed activities. Results indicators follow an impact pathway linking financing to delivered outputs, performance under climate stress and, ultimately, benefits for people, economies and ecosystems. ▪ Practice indicators: assess the institutional capabilities, policies and processes needed to measure and drive resilience outcomes. Practice indicators capture progress in areas such as client engagement, climate data coverage, staff capacity and internal processes. To support the selection of relevant metrics, the Toolkit provides prioritisation and scoping criteria, institution-specific indicator modules, and decision tables linking evidence to financing decisions. An accompanying Excel-based and web-based tool (The Companion), supports the specification, selection and tracking of results and practice indicators.	**Geography**	Global
	Sector(s)	All
	Actor	UNEP FI-led Community of Practice
	Instrument	Measurement framework
	Information flow	Adaptation impact
	Key figures	1 Excel companion and a webapp to help set practice and results indicators
	Partners	Climate Adaptation Innovation and Learning project
	Date / status	2025
	Sources	A&R Impact Measurement Toolkit

4.4 Information about the financial performance of adaptation investments: translating impact into investment value

Information about the financial performance of adaptation investments is a critical missing link for determining investability and therefore for determining the scope for scaling private adaptation finance. FIs need ways of assessing the financial performance of adaptation investments in a consistent and credible way, to demonstrate how they can generate financial value. Without these, adaptation may be regarded by FIs as simply a sustainability reporting issue, as opposed to a strategic investment that protects value, reduces risk and supports long-term performance.

While the economic case for investment in adaptation is now well understood and is important for building the case for public investments in adaptation, it is the financial case for adaptation that needs to be articulated and substantiated in order to mobilize greater volumes of private finance for adaptation.[42]

Financial returns associated with adaptation can be derived from a number of sources, including avoided losses, reduced volatility, stabilized cash flows, preservation of asset value, or reduced insurance or financing costs. The use of recognizable financial metrics that FI practitioners are familiar with, and which can input into established FI business practices is more likely to optimize the uptake of such information by FIs. This could entail the use of adaptation-informed A&R 'shadow' financial metrics that sit alongside BAU financial metrics to illustrate potential financial enhancements through managing physical climate risks and building resilience, like the climate informed PD and LGD credit risk metrics that have been recommended by the UK CFRF and ECB (see previous references).

Case study 7 **Modelling the borrower's financial case**	**Case profile**	
This case study of drip irrigation for arabica coffee in Brazil's Cerrado Mineiro region illustrates the borrower side of the business case for adaptation finance. Drought is the main climate hazard for the region's coffee producers, and coffee adaptation is a named priority under Brazil's ABC+ Plan (2020–2030). A field study across 22 farms in the region (11 irrigated and 11 rainfed) over four harvests from 2019 to 2022 found that irrigated arabica yielded an average of 50 bags per hectare, against 36 for rainfed systems, an increase of 38%, with no meaningful difference in cup quality. Modelling of a representative US$ 350,000 drip irrigation investment on a 50-hectare farm estimates a discounted return of 2.4–5.8 times and a payback period of two to three years, at an 8% discount rate over a 15-year asset life. A financial institution would still need to translate these modelled returns into its own risk-adjusted terms, but a bank could use the estimated repayment capacity and payback to structure capex loans or partial credit guarantees, and an insurer could use the relationship between drought and yield to inform the pricing of index-based crop insurance.	**Geography**	Cerrado Mineiro, Minas Gerais, Brazil
	Sector(s)	Agriculture (arabica coffee)
	Actor	Farm borrower and agricultural lender
	Instrument	Capex loan or partial credit guarantee
	Information flow	Financial performance
	Key figures	+38% yield, irrigated vs rainfed (2019–2022); US$ 350,000 per 50 ha; 2.4–5.8x discounted return
	Partners	IFC, Systemiq (modelling)
	Date / status	Modelling not published
	Sources	IFC and Systemiq (not published); Agronomy (2025); Reuters (2025); Cecafé; Agroforestry Systems (2019); Netafim

Differentiated approaches may be required for investments in different asset classes and sectors, e.g. debt vs equity, project finance vs corporate finance, infrastructure assets vs financing businesses, etc. This calls for the definition of more customized financial metrics for these different archetypes—e.g. net present value (NPV), internal rate of return (IRR), debt service coverage ratio (DSCR), etc. This application will also require a number of key barriers to be addressed, such as data gaps, modelling uncertainties and time horizons that extend beyond financing tenors.

42 Strengthening the Investment Case for Climate Adaptation: A Triple Dividend Approach | World Resources Institute

It is also essential for these kinds of metrics to be appropriate, applicable and decision-useful for FIs at a practical level, recognizing that many FIs (especially in certain markets) typically lack deep expertise on adaptation, and that the application of such tools in FI decision-making may need to be done by non-specialists who will require approaches and metrics that are recognizable and useable for FI practitioners.

Case study 8
Proving that flood resilience can generate financial returns for financial institutions

BRAC, the largest microfinance institution in Bangladesh, tested whether guaranteeing access to credit after a flood would change how farmers invest beforehand. In a randomised evaluation across 200 branches, 100 branches offered clients a pre-approved emergency loan available in the event of a flood, while 100 served as a comparison group; more than 150,000 clients were informed of the offer.

The guarantee encouraged greater agricultural investment: cultivated land increased by 18% and average crop production by 19%. Among farms with access to the loan that were not affected by flooding, crop production increased by 35%. Households affected by floods that had access to the loan recorded consumption levels 10% higher than those without access, suggesting that the loan helped cushion the effects of flooding.

Borrowers who accessed the Emergency Loan had higher repayment rates overall than those observed under other credit schemes, and BRAC branch profits increased, with the largest increases in profits coming from "marginal" clients who just qualified for the Emergency Loan. This illustrates that lenders can minimize the default risk of customers affected by climate events by providing them with means to adapt in advance.

The Emergency Loan combines aspects of microcredit and insurance, addressing key limitations of both products. Specifically, the financial institution determines eligibility for the loan before the climate event occurs, overcoming the usual hesitation to lend money after the event. Moreover, eligible clients are guaranteed credit in advance without having to make an upfront payment. This encourages them to invest more in climate adaptation strategies, which they might have avoided without the guaranteed credit during a climate event.

Case profile

Geography	Bangladesh (LDC)
Sector(s)	Smallholder agriculture
Actor	Microfinance institution
Instrument	Pre-approved emergency credit
Information flow	Financial performance
Key figures	+18% land cultivated and +19% crop output; branch profits increased; reduced default risk.
Partners	BRAC; researchers (G. Lane, University of Chicago)
Date / status	Published 2024
Sources	Econometrica (2024); VoxDev summary on PreventionWeb



5. Adaptation information flows to capital allocation: applications in financial decision-making

Different segments of the financial sector may use adaptation-related information flows in customized ways that reflect their respective business model and needs. The ways in which such information feeds into decision-making will depend on the type of FI, as well as factors such as investment strategy, product, geography and characteristics of the underlying asset, borrower or business models. The same information flow may therefore be relevant to different aspects of the decision-making process depending on the FI and the context in which it is applied.

Lending operations (e.g. banks, DFIs) may require adaptation-related information that informs credit risk assessment at asset-level, counterparty level and portfolio level. Loan pricing is another business function that may be informed by adaptation-related information flows. This could entail analysis of how the integration of adaptation considerations influences the financial performance (e.g. IRR) of investments, or in other cases (e.g. sustainability-linked financing) the positive adaptation impact of an investment might be linked to loan pricing adjustments. Information about positive adaptation impacts may be useful for qualifying investments for inclusion in adaptation-themes financing instruments such as bonds or credit lines.

Worked example (lending): A DFI is evaluating a loan to a coastal port upgrade in a North African country with a large shipping sector and export-oriented agricultural production that plays a key role in supporting rural livelihoods.

Physical climate risk screening identifies sea level rise and storm surge as material hazards over the loan tenor. The project design incorporates raised quay levels and reinforced drainage sized to projected rainfall intensification.

Information flows enter three decision points:

i. Credit risk assessment, where the adaptation measures reduce projected physical damage and business interruption, lowering expected loss estimates;
ii. Loan pricing, where the improved risk profile supports more favourable terms (or, in a sustainability-linked structure, verified adaptation outcomes trigger margin adjustments); and
iii. Instrument eligibility, where the loan qualifies for inclusion in an adaptation-themed bond.

Investment operations (e.g. asset managers, asset owners) may require adaptation-related information flows at the level of the entities in which they are investing (e.g. companies, assets) to inform decision-making around portfolio allocation, risk management and exposure limits. It could also be used for qualifying investment for specific investment vehicles such as adaptation themed funds. Adaptation-related information flows may also be used to inform investor engagement & stewardship, especially with investees that are vulnerable to climate change impacts and where investors may perceive a need to build resilience in order to preserve longer-term value.[43]

Worked example (investment): An asset manager operating across a number of Latin America countries runs portfolio-level physical risk screening that flags several agricultural holdings with high exposure to heat stress and water scarcity under mid-century scenarios.

The manager reviews each company's adaptation disclosures: whether it has assessed physical risks, invested in operational resilience (e.g. drought-tolerant varieties, water recycling) and reflected adaptation capex in guidance.

Companies lacking credible strategies face reduced exposure limits; those demonstrating strong resilience positioning receive increased allocations. High-exposure, low-preparedness holdings become targets for stewardship dialogues.

Selected holdings meeting defined adaptation criteria qualify for inclusion in a climate resilience fund.

43 2025-06-19-Investor-Stewardship-Climate-Resilience-Sourcebook-post-release-review.pdf

Insurance operations require adaptation-related information to inform core business functions including underwriting and premium-setting, where information about the physical climate risk profile of insured assets and about adaptation measures in place can influence risk selection and pricing. Adaptation-related information allows insurers to reflect the risk-reduction value of adaptation measures in pricing, creating a financial feedback loop in which policyholders who invest in adaptation receive more favourable premiums, analogous to how fire suppression systems or security installations already influence commercial property premiums. Adaptation-related information is also increasingly relevant to product development, as insurers design offerings that actively support or incentivize adaptation, including parametric coverage providing rapid post-event payouts, resilience-linked policies that tie terms to the implementation of specified measures, and technical assistance offerings that bundle risk transfer with advisory support on resilience investment.

Worked example (insurance): A property insurer operating in the South-East Asia region integrates building-level adaptation data (flood barriers, raised electrical systems, sustainable drainage) into its commercial real estate portfolio.

Properties with verified measures are assigned to a lower risk tier, receiving a 10 to 15 percent premium reduction reflecting lower expected annual loss. At portfolio level, aggregate adaptation data refines catastrophe model assumptions, adjusting probable maximum loss estimates and reinsurance purchasing.

The insurer also offers a "resilience partnership" product: policyholders commit to implementing specified measures within an agreed timeframe in exchange for guaranteed renewal and a phased premium reduction, linking pricing directly to resilience outcomes.

5.1 Application across different FI business functions

Adaptation-related information flows may also support a number of key business functions across different kinds of FIs, as illustrated in Table 1. As previously noted, the ways in which these information flows are used will vary depending on the FI and the particular decision being made.

Table 1: Role of adaptation information flows in supporting FI business functions

	Information about physical climate risks	Information about the allocation of finance for adaptation	Information about the adaptation impact of investments	Information about the financial performance of adaptation investments
Risk management	Feeding into credit risk assessment and management, so that FIs can manage physical climate risks (PCRs) to their investments and portfolios as part of their wider risk management regimes		Informing risk management, e.g. by adjusting risk models to account for improved resilience outcomes	Informing credit risk analysis
Capital allocation	Ensuring that capital allocation is informed by the physical climate risk profile of assets	Tracking capital allocation to assets that respond to PCRs and contribute to adaptation objectives	Allocating capital to investments that contribute towards adaptation goals	Allocating capital to adaptation investments that meet a financial performance threshold
Business strategy	Enabling FIs to understand where their investments and portfolio may be affected by climate change impacts, and whether those impacts are financially material.	Enabling FIs to track and manage how they are allocating capital in response to strategic adaptation priorities	Enabling FIs to identify and prioritize high-impact adaptation investments within their overall business strategy	Enabling FIs to identify and prioritize financially viable investments and allocate capital accordingly, including by adjusting financing terms where necessary

	Information about physical climate risks	Information about the allocation of finance for adaptation	Information about the adaptation impact of investments	Information about the financial performance of adaptation investments
Product development	Supporting product development, e.g. insurance underwriting	Supporting product development, e.g. demonstrating the scale of aggregators such as bonds and funds	Enabling FIs to develop adaptation-themed financial products including dedicated credit lines, aggregators of adaptation investments, e.g. bonds, funds, or adaptation-focused sustainability-linked products, e.g. SLLs, SLBs, sustainability-linked insurance, etc.	Enabling FIs to adjust lending terms appropriate for different kinds of investments within adaptation-themed financial products.
Client outreach	Engaging with clients in higher-risk sectors and geographies on adaptation priorities	Demonstrating to external stakeholder FI commitment to financing adaptation	Engaging with clients and demonstrating to them the benefits of adaptation investments and financial products	Demonstrating to clients the financial case for investing in adaptation
Stakeholder engagement inc. policy engagement	Engaging with policymakers on physical climate risk analytics and information provision, including capacity building in public and private sectors	Engaging with policymakers and demonstrating delivery on adaptation financing targets.	Engaging with policymakers on delivery of adaptation impact.	Engaging with policymakers on strengthening enabling environment for private finance mobilisation for adaptation.



6. Enabling conditions: how policy shapes adaptation information flows

Policy and regulatory frameworks can shape the environment in which adaptation-related information is produced, shared and used by the financial sector.

As noted earlier in this White Paper, improved information flows alone may not translate into greater financial sector action on adaptation where wider policy, institutional and financial barriers remain, and the availability of the information itself depends partly on public data, frameworks and infrastructure. Consultations with the Community of Practice identified a number of areas where policy frameworks might influence the availability, quality and use of adaptation-related information across the investment chain, with these considerations particularly relevant in EMDEs, and especially in LDCs and SIDS.

The analysis and consultations point to the value of a stronger information architecture for physical climate risk and adaptation assessment and measurement, spanning data infrastructure, analytics and tools, disclosure frameworks and capacity building, as well as knowledge exchange and collaboration between investors, corporates, policymakers and adaptation solution providers. The following sub-sections describe how these considerations, and the approaches that jurisdictions are taking, play out across the four types of adaptation information flows. They are intended to map an evolving policy landscape rather than to recommend particular policy choices, which remain for the relevant authorities to determine in line with their mandates and national circumstances.

6.1 Information about physical climate risks

Important progress has been made on financial sector physical climate risk assessment in numerous jurisdictions, and consultation participants identified several areas where further advancements, and in some cases public action, could help address remaining gaps. Approaches that jurisdictions are using or exploring include national climate risk information-sharing platforms, measures to improve access to the data needed to assess climate vulnerabilities, adaptation needs and investment opportunities, and disclosure frameworks for climate-related information. Participants noted that such approaches can help FIs better identify where capital is most needed and where adaptation investments can be most impactful. How risk information is made available, and how it is used, therefore matters for a just approach to adaptation, particularly in highly climate-vulnerable contexts.

- **Improvements to climate data infrastructure:** needs differ across countries, ranging from basic improvements in climate & meteorological monitoring, forecasting and modelling in some countries (especially some EMDEs), to the development of climate information portals that focus on the informational needs of businesses and financial institutions. Participants also pointed to the value of greater comparability, or at least clear mapping, between physical climate hazard categorisations, which vary between and within countries in line with national contexts and priorities, and which can make it harder to integrate physical climate information consistently into business practices.

Case study 9 **Building national physical risk data infrastructure**	**Case profile**	
The GRMA Costa Rica Project is a strategic partnership between the Superintendencia General de Seguros (SUGESE), the Global Risk Modelling Alliance, and specialized technical consortia. The initiative focuses on developing a multi-hazard risk assessment (floods, droughts, landslides, earthquakes, and volcanic activity) to guide investment decisions and provide access to financial instruments that support recovery and increase long-term resilience, among other aspects. At the core of this infrastructure is an open-source, modular platform used to conduct multi-hazard probabilistic risk assessments. The project has successfully broken down institutional silos by pooling data from national entities like the Laboratorio Nacional de Materiales y Modelos Estructurales (LANAMME) and the Instituto Meteorológico Nacional (IMN) to map out physical exposures alongside macroeconomic vulnerabilities. Furthermore, the initiative heavily emphasizes long-term sustainability, training national experts across government, academia, and the private sector to ensure the open-source data pipeline can be independently maintained and scaled. By standardizing geospatial data to "insurance-grade" metrics, the project directly supports Costa Rica's integration with global risk financing mechanisms like the Global Shield against Climate Risks. The open data generated by the project acts as a vital bridge between scientific climate modelling and financial decision-making.	**Geography**	Costa Rica
	Sector(s)	Agriculture, tourism, infrastructure
	Actor	Insurance supervisor, GRMA, Technical working group
	Instrument	National risk data and modelling programme
	Information flow	Physical climate risk
	Key figures	EUR 1.6 million GRMA programme
	Partners	GRMA; SUGESE and the local entities of the Technical Working Group
	Date / status	GRMA since 2023; Global Shield process since July 2024
	Sources	GRMA landscape report: Costa Rica; GRMA Project data; Project brief; Inception report

- **Methodologies & scenarios:** interviewees noted that guidance on country-appropriate methodological approaches for PCR assessment, whether from public authorities or standard-setting bodies, can support FIs to apply them more consistently. In particular, FIs often call for consistent, fit-for-purpose climate change scenarios to use in their climate risk assessments and disclosures. While NGFS scenarios meet this need to an extent, more customized country-level scenarios may be required to meet the needs of FIs operating in specific countries.
- **Supervisory expectations and guidance:** a growing number of financial supervisors have integrated climate-related financial risks, including physical risks, into their supervisory frameworks, generally within existing risk categories and governance and risk management expectations, consistent with international guidance such as the Basel Committee on Banking Supervision's Principles for the effective management and supervision of climate-related financial risks. The supervisory focus in these frameworks is on whether institutions identify, assess and manage financially material climate-related risks.

Case study 10 **Linking wildfire risk reduction to insurance pricing by regulation**	**Case profile**	
After a wave of insurer withdrawals from wildfire-exposed markets, the California Department of Insurance (CDI) has used regulation to strengthen the flow of physical risk information between insurers, homeowners and the state. Its 2022 Safer from Wildfires regulation introduced the first mandatory wildfire insurance safety discounts in the United States, requiring insurers to recognize defined home-hardening, defensible-space and community-level measures in their pricing. Under its Sustainable Insurance Strategy, CDI opened a review of forward-looking wildfire catastrophe models in January 2025 and, in July 2025, completed its review of the first model, allowing insurers to use reviewed models in rate filings rather than relying on historical losses alone. In exchange, insurers that use catastrophe models or reflect reinsurance costs in their rates must write at least 85% of their statewide market share in wildfire-distressed areas. The result is a regulator-led link between hazard modelling, documented risk reduction and the availability and cost of cover.	**Geography**	California, United States
	Sector(s)	Residential and commercial property insurance
	Actor	Insurance regulator
	Instrument	Rate regulation
	Information flow	Physical climate risk
	Key figures	First mandatory wildfire safety discounts in the US (2022); first catastrophe model cleared for rate filings (July 2025); 85% of state-wide market share to be written in distressed areas
	Partners	Admitted insurers; catastrophe model vendors
	Date / status	Regulation 2022; models in use since 2025
	Sources	CDI press release, July 2025; Safer from Wildfires Framework

- **Linkages with international processes and guidance:** some jurisdictions draw on international guidance and processes (e.g. NGFS, ISSB) to inform the development of nationally appropriate approaches, which participants noted can be particularly valuable in EMDEs, where data challenges may be greater and international support may be needed.

6.2 Information about the allocation of finance for adaptation

Consultation participants identified that clear and nationally appropriate definitions of adaptation finance is an important enabling condition. Jurisdictions are approaching this in different ways.

- Including adaptation as an objective within national sustainable finance taxonomies is one approach that jurisdictions have used, as illustrated by the Adaptation Finance Taxonomy Playbook (Case study 4). Consultation participants identified taxonomy coverage of adaptation as an important enabling condition, particularly where adaptation definitions and criteria reflect the national context of climate vulnerability and nationally owned adaptation priorities.
- National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs) can also support these efforts by articulating national adaptation priorities, increasingly with reference to globally agreed frameworks for adaptation, which FIs can use as a reference point when aligning investments with the adaptation needs of the jurisdictions in which they operate. Because

objectives differ across FIs, institutions typically need to interpret and translate these high-level priorities into their own investment frameworks, and participants noted that more specific priorities make this translation easier.

- Where such documents are not yet fully in place, for example in some SIDS and LDCs, FIs have fewer reference points for identifying and responding to national adaptation needs; as noted earlier in this paper, this is also one of the contexts in which FIs may need to develop their own frameworks for defining adaptation investments.
- Participants also emphasized the importance of interoperability between taxonomies across jurisdictions, alongside clear criteria for determining whether investments make a substantial contribution to adaptation.

Case study 11 **Interoperable hazard categorisation for adaptation finance**	**Case profile**	
The EU Taxonomy provides a prominent example of a standardised approach to categorising physical climate hazards, grouping them into four categories (temperature-related, wind-related, water-related and solid mass-related) with further distinctions between acute and chronic hazards. This common reference has been adopted or adapted in a number of sustainable finance taxonomies globally. The ASEAN Capital Markets Forum (ACMF), in coordination with the ASEAN Taxonomy Board (ATB), and with support from UNEP FI and the Sustainable Finance Institute Asia (SFIA), is developing the mitigation co-benefit and Adaptation for Resilience (mARs) Guide as a companion to the ASEAN Taxonomy. A first-phase white paper published in November 2025 proposed six principles, including maladaptation risk management and interoperability; later phases run through 2026 and 2027 under the chairmanship of the Philippine SEC and the Monetary Authority of Singapore. Common reference points of this kind allow financial institutions to compare adaptation claims across jurisdictions while each country keeps its own priorities.	**Geography**	ASEAN; EU
	Sector(s)	All taxonomy sectors
	Actor	Regional standard-setter
	Instrument	Taxonomy guidance
	Information flow	Allocation of finance
	Key figures	EU: 4 hazard groups, acute and chronic; mARs phase 1 published November 2025; 6 proposed principles
	Partners	ACMF, ATB, SFIA, UNEP FI, EU Sustainable Finance Advisory Hub
	Date / status	Phases 2–3 in 2026–2027
	Sources	UNEP FI: mARs white paper; EU Taxonomy

6.3 Information about the adaptation impact of investments

Consultation participants identified adaptation impact information as a significant gap in the informational architecture for adaptation financing. FIs look for clear and consistent information about the positive adaptation contributions of investments, with standardized metrics, frameworks and methodologies, but at present the main measurement systems available are voluntary frameworks developed by international organisations and initiatives, such as ARIC, the GIIN, or the Adaptation and Resilience (A&R) Impact Measurement Toolkit.

- Some FIs and sovereigns are beginning to build **country-specific outcome frameworks** through the design of green, sustainability and resilience bond programmes, which require issuers to define impact indicators and report against them on a recurring basis. Specific examples include Colombia's Sovereign Green Bond Framework[44] which includes a focus on adaptation that is customized to Colombia's national circumstances. These instrument-level frameworks offer a practical route to consistent, comparable adaptation impact reporting at country level, and can provide a foundation for broader country-level adaptation impact measurement frameworks where these are developed.

Case study 12
Reporting adaptation outcomes through a sovereign green bond

Fiji was the first emerging market to issue a sovereign green bond. Its first issue in 2017 raised USD50m, with 91% of the proceeds allocated to disaster relief and climate adaptation projects.

This case study shows how sovereign green bond proceeds can translate into measurable improvements in physical resilience, essential service access and emissions reduction, while also mobilizing private capital for climate investment. The proceeds of Fiji's 2017 bond supported the rebuilding of 101 cyclone-damaged schools, including 65 structures capable of serving as evacuation centres; rehabilitation of roads, bridges, drainage, and coastal protection; and rural water and rainwater-harvesting programmes providing improved water access to more than 40,000 people.

The Green Bond Framework was updated in 2022 to include priority areas such as nature-based solutions for coastal protection for low-lying vulnerability communities, aquaculture, and development of sustainable towns and cities using integrated planning solutions. This helped to pave the way for Fiji's USD9m sovereign blue bond in 2023.

The Fiji experience also demonstrates that sovereigns do not need to wait for the full sustainable finance architecture before going to the bond market. Fiji's sovereign issuance came a full seven years in advance of launching its Green Finance Taxonomy in 2025.

Case profile

Geography	Fiji (SIDS)
Sector(s)	Education infrastructure, water, roads, energy
Actor	Sovereign
Instrument	Sovereign green bond
Information flow	Adaptation impact
Key figures	FJD 100 million (2017–2018); 90.6% of proceeds to adaptation; 101 schools rebuilt to resilient standards
Partners	Reserve Bank of Fiji; World Bank; Sustainalytics
Date / status	Green Bond framework 2022 Sovereign Blue bond 2023
Sources	Climate Bonds Report; Fijian Sustainable Bond Framework 2022; Fiji Sovereign Green Bond Impact Report 2019

44 Colombia launches Sovereign Green Bond Framework and readies for first issuance—Minhacienda

- In practice, such approaches can start from the country's own NAP and NDC priorities (sectors, hazards, adaptation objectives) as the demand signal, then mapping those priorities against existing global metric resources (such as the A&R Impact Measurement Toolkit, the ARIC Adaptation & Resilience Measurement Framework for Investors, the UK Centre for Greening Finance & Investment metrics database[45] and the CBRT) to identify candidate indicators that are both domestically relevant and methodologically compatible with international reporting expectations. These indicators are then typically contextualized to reflect domestic hazard profiles, data availability and institutional capacity; a core set of quantitative resilience outcome indicators (e.g. reduction in expected annual losses, population with improved resilience to specified hazards) can be complemented by qualitative practice indicators tracking institutional readiness.

6.4 Information about the financial performance of adaptation investments

Among the gaps identified in the informational architecture for FI action on adaptation, frameworks for assessing the financial performance of adaptation investments emerge as a notable priority area. Participants pointed to several areas where public action could support progress, including improving the availability of data needed for assessing climate-related damage and losses and developing associated modelling capacity. Progress is also likely to require differentiated, FI type-specific approaches, for example PD, LGD and DSCR estimates for banks that reflect both counterparties' exposure to physical hazards and the risk-reducing effect of their adaptation measures; AAL and PML estimates incorporating non-stationary and compound hazards for insurers; treatments that locate resilience within the discount rate as a systematic factor for asset managers; and shadow-pricing of avoided public losses for DFIs and MDBs. Each implies distinct underlying methodologies, including probabilistic catastrophe modelling under forward-looking hazard scenarios, avoided-loss accounting, and explicit transfer functions linking physical impact metrics to financial cash flows.

Consultation participants highlighted two areas in particular.

- First, comparability of metrics. Without comparable, commonly accepted measurement of adaptation performance across institutions and jurisdictions, participants noted that FI-specific methodologies risk remain fragmented, slowing adoption.
- Second, mechanisms to recognize the value of adaptation services, designed in line with national context, so that the avoided losses and resilience benefits generated by adaptation investments are reflected in financial decision-making.

45 Aligning Finance with Adaptation and Resilience Goals—Targets and Metrics for Financial Institutions: Technical Note—UK Centre for Greening Finance and Investment (CGFI)

Case study 13 **How public investment in natural infrastructure can help protect economies and finance climate recovery**	**Case profile**	
In Mexico's Quintana Roo, coral reefs provide critical natural infrastructure, reducing more than 90% of wave energy during storms and supporting a tourism economy worth approximately USD 9 billion. In 2018, the state government and The Nature Conservancy established a coastal management trust to purchase parametric insurance for part of the Mesoamerican Reef, with a solution developed alongside Swiss Re. The policy pays up to approximately USD 3.8 million annually when hurricane wind speeds in the insured area exceed 100 knots, with payouts linked to storm intensity. In 2020, Hurricane Delta triggered an insurance payout of USD 850,000, providing funding for reef restoration. The funds support rapid intervention by trained local Reef Brigades, who repair damaged coral and help the reef recover after storms. This enables resources to be mobilized when they are needed, rather than relying solely on post-disaster funding. The case demonstrates how governments can use financial mechanisms to support climate adaptation while protecting natural assets that underpin local economies. Quintana Roo created a way to finance recovery and help maintain the reef's protective benefits. Although the available sources do not quantify a net financial return on investment, the payout illustrates how investing in resilience can provide tangible financial protection against climate-related risks.	**Geography**	Quintana Roo, Mexico
	Sector(s)	Coastal ecosystems, tourism
	Actor	State government trust; reinsurer; NGO
	Instrument	Parametric insurance
	Information flow	Financial performance
	Key figures	Up to ~US$ 3.8 million annual cover; US$ 850,000 payout after Hurricane Delta (2020); ~US$ 9 billion reef-dependent tourism economy
	Partners	Government of Quintana Roo; The Nature Conservancy; Swiss Re
	Date / status	Trust set up 2018; first payout 2020
	Sources	Swiss Re case study; TNC reef insurance primer

Beyond these, participants pointed to the underlying data layer, including public-good provision of geocoded loss records, standardized exposure and vulnerability data for EMDE contexts where catastrophe-model coverage is thinnest, and open forward-looking hazard catalogues. The appropriate level of granularity will depend on context, with particular care needed around privacy and household-level data.

Affordability remains a binding constraint in many EMDEs, and participants saw a role for financing incentives. Technical assistance and capacity building can help address some of the underlying institutional and financial barriers that may make viable opportunities harder to finance. In cases such as this, blended finance in particular can be understood not as generic de-risking but as correcting a measurable externality, given that adaptation benefits can often be partly a public good and partly accrue outside the immediate financing perimeter.

That framing supports a broader instrument set than first-loss tranches alone, including outcome-linked payments for resilience services, contingent grants tied to verified resilience performance, and guarantees calibrated to model-derived reductions in expected loss.



7. Potential actions to improve information flows by actor type

This section provides an overview of potential actions or areas for consideration to improve the flow of climate change adaptation information.

The findings that follow are organized around six actors: private financial institutions, DFIs and MDBs, governments and policymakers, supervisors and regulators, data and standard-setting bodies, and startups and MSMEs. They synthesize views expressed by Community of Practice members and other stakeholders consulted, together with emerging practice identified through the analysis, and are presented as areas for consideration for each group of actors. They do not constitute recommendations by UNEP FI, including on matters of financial regulation and supervision, which remain for the relevant authorities to determine in line with their mandates.

Table 2: Summary of potential actions identified through the consultation by actor

Private financial institutions	Translating physical risk into the credit-adjusted metrics already used to price risk, and embedding taxonomy criteria into origination rather than only into reporting.
DFIs and MDBs	Sharing methodologies and lessons from A&R financing (e.g. impact measurement approaches) with private financial institutions
Governments and policymakers	Investing in hazard and exposure data as a public good, and articulating national adaptation priorities that financial institutions can align with
Financial supervisors and regulators	Addressing material physical climate-related financial risks within existing prudential mandates, as a growing number of supervisors already do
Data and standard-setting bodies	Continuing to build interoperable platforms and indicators, informed directly by the institutions applying them.
Startups and MSMEs	Documenting and sharing evidence, proportionate to their capacity and growth stage in a form that financial institutions can use

7.1 Private financial institutions

Banks, insurers and asset managers engage with adaptation through different financing channels, so the considerations here are framed broadly around financing decisions rather than around any one channel alone. Participants indicated that physical risk information is most useful to this group once it is translated into the language each already relies on, and that prioritising this translation, rather than treating physical risk data as an end in itself, is the most direct way for private financial institutions to put it to use.

The same logic applies to how these institutions handle taxonomies and impact measurement. Embedding taxonomy criteria directly into origination and underwriting, rather than reserving them for external reporting, was seen as likely to do more to shift financing decisions than refining the criteria themselves, and adaptation finance reporting by private financial institutions was identified through this consultation as the most consistently cited lever for improving how adaptation finance actually gets tracked. On impact, private financial institutions would benefit from resources such as the Adaptation and Resilience Impact Measurement Toolkit, or other recognisable and standardized methodologies.

On financial performance, participants pointed to credit-adjusted metrics as the most useful primary reference point: probability of default and loss given default for banks, expected annual loss and probable maximum loss for insurers.

7.2 DFIs and MDBs

Participants saw particular value, across all four information flows, in DFIs and MDBs sharing the institutional experience they have already built. On physical climate risk, this could mean extending more mature assessment capability outward, through co-financing structures, shared risk data platforms and technical partnerships with the private institutions and enterprises operating in the same markets.

The same applies to allocation and impact. Having applied granular adaptation finance tracking methodologies for over a decade through frameworks such as the MDB Joint Methodology, DFIs and MDBs are well placed to help private financial institutions build equivalent capability and could support efforts to address taxonomy gaps in markets where national or regional frameworks remain limited or are still emerging. Their accumulated impact measurement experience could likewise be shared directly with private financial institutions and funds as they adapt their own reporting to classifications such as Article 9 under the EU Sustainable Finance Disclosure Regulation.

On financial performance, participants pointed to the value of DFIs and MDBs sharing their accumulated track record of pricing adaptation related risk and return directly with private financial institutions still building their own internal case. Doing so could help narrow what remains a genuinely thin evidence base across the sector.

7.3 Governments and policymakers

Consultation participants consistently pointed to national-level climate hazard, meteorological and exposure data as a foundational enabling condition. Participants noted that these data gaps are greatest in EMDEs, and particularly in LDCs and SIDS, where initiatives such as the Global Risk Modelling Alliance programme in Costa Rica (Case Study 9) illustrate what investment in this area can look like.

On allocation of finance, participants highlighted the role of clearly articulated national adaptation priorities, through NAPs and NDCs, and of taxonomy coverage of adaptation in jurisdictions that choose to include it, in giving FIs a reference point for identifying and tracking adaptation finance.

On adaptation impact, national authorities are well placed to articulate what adaptation impact means in their own context, and some are already translating national adaptation priorities into the outcome indicators that sovereign green and resilience bond frameworks increasingly require.

On financial performance, participants discussed mechanisms that could help recognize the value of adaptation services in line with national context. Evidence from the private sector, including financial institutions as well as businesses such as startups and MSMEs, on where capital mobilisation is falling short could help inform where public support, including blended and concessional finance, is targeted.

7.4 Financial supervisors and regulators

For financial supervisors and regulators, consultation discussions highlighted the importance of distinguishing between two different questions:

- The first is the supervision of financially material physical climate-related risks, which often falls within existing prudential mandates. Here, the established approach, reflected for example in the Basel Committee's Principles for the effective management and supervision of climate-related financial risks,[46] is for supervisors to assess whether institutions sufficiently identify, assess and manage material climate-related financial risks through existing risk categories and governance and risk management frameworks. A growing number of supervisors have issued expectations or guidance on this basis, and some have used practical entry points such as asset-level exposure data, including the share of collateral or insured assets located in high-risk areas, which do not presuppose that institutions already have mature internal assessment capability.
- The second is supporting an enabling environment for financing adaptation and resilience while recognizing that whether and how financial authorities engage with it depends on their own mandate and jurisdiction

Across the other three information flows, the relevant responsibilities are likely to sit with different authorities depending on the jurisdiction. The responsibility for overseeing adaptation-related disclosures and claims rests with the relevant authorities under each jurisdiction's institutional arrangements, which may include banking supervisors, securities regulators and other financial authorities.

On financial performance, as methodologies for reflecting counterparties' adaptation measures in credit risk parameters mature, they may become relevant to supervisory review of institutions' risk models and to climate scenario analysis, insofar as they affect the measurement of financially material risk.

7.5 Data and standard-setting bodies

Participants saw a continuing role for data and standard-setting bodies in sharpening the translation of physical climate risk into financial materiality. On allocation of finance, this includes continued work on interoperability across jurisdictions through resources such as the Adaptation Finance Taxonomy Playbook. On adaptation impact, participants pointed to the value of continuing to refine output, outcome and impact indicators that can flex across the highly varied and context-specific nature of adaptation investments, informed directly by feedback from the institutions actually applying them.

46 Principles for the Effective Management and Supervision of Climate-Related Financial Risks

7.6 Startups and MSMEs

Startups and MSMEs are expected to document and share the evidence they generate across all four information flows; however, administrative capacity is often a binding constraint for smaller enterprises, as the Climate-KIC-led Community of Practice found. Expectations should therefore scale with growth stage: early-stage and micro enterprises can usefully record a small set of basics (location, hazards experienced, measures taken), while growth-stage and investment-ready enterprises can progressively align with the outcome indicators and financial data that investors and lenders use. Much of the burden of structuring this evidence is likely to sit with the financial institutions, intermediaries and support programmes that work with MSMEs, rather than with the enterprises themselves.

On allocation of finance, startups and MSMEs can continue to bring forward transactions that test whether a taxonomy's criteria reflect what adaptation looks like on the ground, particularly in the many markets where no applicable taxonomy yet exists. Participants also noted the importance of recognising adaptation-relevant activity that does not depend on a formal framework being in place first.

On adaptation impact and financial metrics, they and the communities they serve, as their capacity allows, can capture and share data on how a given resilience measure affected revenue, cost or survival.

Annex 1: A translation matrix for adaptation information flows

This matrix sets out, flow by flow, what each actor is typically positioned to provide, what it typically still needs from elsewhere in the system, and which actor is generally best placed to meet that need.

Physical climate risk

Actor	Provides	Needs	Best placed to help
Private financial institutions	Asset, underwriting and portfolio-level location and exposure data across lending, insurance and investment activity.	Granular, localized hazard data below city level, country-appropriate scenarios, and guidance translating hazard data into credit and underwriting metrics.	**Data and standard-setting bodies**
DFIs and MDBs	More mature physical risk assessment capability built up over the past decade, and co-financing structures and technical partnerships that can extend it to others.	Access to the private sector's granular asset and transaction data to validate and refine shared risk platforms.	**Private financial institutions**
Governments and policymakers	National hazard and meteorological data, and National Adaptation Plans identifying priority risks and vulnerable regions.	Standardized hazard categories, and signals from financial institutions on which data shifts financing decisions.	**Data and standard-setting bodies (hazard categories); private financial institutions (signals)**
Supervisors and regulators	A financial stability view of aggregate sector exposure to physical risk.	Asset-level exposure data from private financial institutions, and consistent methodology to compare institutions.	**Private financial institutions (exposure data); data and standard-setting bodies (methodology)**

Actor	Provides	Needs	Best placed to help
Data and standard-setting bodies	Catalogues of risk tools and standardized hazard categorization frameworks.	Real-world feedback from financial institutions, DFIs and enterprises on which tools work in practice, especially in EMDEs.	**Private financial institutions and DFIs**
Startups and MSMEs	Ground-level evidence of hazards actually faced, and resilience measures already taken.	Affordable, asset-level hazard data and simplified assessment tools usable without in-house expertise.	**Data and standard-setting bodies; private financial institutions serving SMEs**

Allocation of finance for adaptation

Actor	Provides	Needs	Best placed to help
Private financial institutions	Financing, lending, underwriting and investment data, once adaptation activity is identified and tagged.	National or regional taxonomies with clear, usable eligibility criteria	**Governments and policymakers**
DFIs and MDBs	Granular adaptation finance tracking methodology built up over a decade, including frameworks such as the MDB Joint Methodology.	Taxonomy interoperability across the markets where they co-finance alongside private institutions.	**Data and standard-setting bodies**
Governments and policymakers	NAPs, NDCs, national taxonomies and priority-sector identification.	Reporting data from private financial institutions to track finance reaching stated priorities.	**Private financial institutions**
Supervisors and regulators	Within their mandate (often securities or disclosure authorities), oversight of how definitions are applied in disclosures and product labels.	Comparable allocation data across institutions, and clear taxonomy definitions.	**Private financial institutions (allocation data); governments and policymakers (taxonomy definitions)**
Data and standard-setting bodies	Taxonomy playbooks, interoperability guidance, and DNSH and maladaptation safeguards.	Transaction-level feedback from financial institutions and DFIs on where taxonomies break down in practice.	**Private financial institutions and DFIs**

Actor	Provides	Needs	Best placed to help
Startups and MSMEs	Real transactions that test whether a taxonomy actually captures their activity.	Simple eligibility criteria, and recognition where no formal taxonomy exists yet.	**Governments and policymakers**

Adaptation impact of investments

Actor	Provides	Needs	Best placed to help
Private financial institutions	Transaction-level data on financed, underwritten or invested activity believed to carry adaptation impact.	Practical impact indicators usable without deep in-house expertise.	**Data and standard-setting bodies**
DFIs and MDBs	An established base of impact measurement experience built up over many years of development finance practice.	Comparable impact indicators from private co-financing partners to align joint reporting.	**Private financial institutions**
Governments and policymakers	National context for what impact should mean locally, and sovereign outcome frameworks.	Aggregated impact data from financial institutions and DFIs to check national priorities are being met.	**Private financial institutions and DFIs**
Supervisors and regulators	Within their mandate (often securities or disclosure authorities), oversight of whether sustainability-related claims are substantiated.	Standardized, verifiable metrics against which claims can be assessed.	**Data and standard-setting bodies**
Data and standard-setting bodies	Impact frameworks with defined output, outcome and impact indicators.	Feedback on which indicators are genuinely usable given how context-specific impact is.	**Private financial institutions, DFIs and startups**
Startups and MSMEs	First-hand evidence of what actually changed for the people they serve.	Low-cost ways to document this evidence in the language financiers expect.	**Data and standard-setting bodies**

Financial performance of adaptation investments

Actor	Provides	Needs	Best placed to help
Private financial institutions	Emerging transaction evidence, including early adjusted PD and LGD experience across lending, underwriting and investment books.	Credible, comparable evidence that adaptation-adjusted metrics predict performance.	**DFIs and MDBs**
DFIs and MDBs	A longer track record of pricing adaptation related risk and return.	Private-sector transaction data to test whether their pricing approaches hold in purely commercial deals.	**Private financial institutions**
Governments and policymakers	Shadow-pricing approaches for avoided public losses.	Evidence from the private sector showing where capital mobilization is falling short, to target public support.	**Private financial institutions; businesses, including startups and MSMEs**
Supervisors and regulators	Supervisory review of how material physical risk, including the effect of adaptation measures, is reflected in institutions' risk estimates.	Sufficiently mature, comparable methodologies for reflecting adaptation measures in risk estimates and scenario analysis.	**Data and standard-setting bodies**
Data and standard-setting bodies	A demand-led framework drawing on the existing catalogue of adaptation metrics.	Real transaction-level performance data to validate which metrics actually work.	**Private financial institutions and startups**
Startups and MSMEs	Ground-truth data on how resilience measures affected revenue, cost or survival.	Simple templates for presenting this evidence without an in-house finance team.	**Private financial institutions**

Annex 2: Case studies library

#	Case study	Information flow	Geography	Actor	Instrument	Description
1	Pricing flood risk into mortgage collateral	Physical climate risk	Brazil	Commercial bank	Retail mortgages	Bradesco translates projected flood frequency into property depreciation and loss given default
2	Navigating physical risk tools	Physical climate risk	Global	UNEP FI Risk Centre	Tool database and research report	Open-access dashboard of 100+ risk tools; 2026 consultation of 28 banks on turning tool outputs into financial metrics
3	Certifying a resilience bond	Allocation of finance	Japan	Sub-national government	Certified resilience bond	Tokyo's EUR 300 million bond, the first certified under the Climate Bonds Resilience Taxonomy
4	Adaptation Finance Taxonomy Playbook	Allocation of finance	Global	UNEP FI-led Community of Practice	Guidance	Principles and tools for applying adaptation taxonomies for private FIs
5	Reporting resilience outcomes in physical and monetary terms	Adaptation impact	EBRD Countries of operation	Multilateral development bank	Climate resilience bond	EBRD's US$ 700 million bond, with expected outcomes reported by hazard type in physical and monetary terms
6	A&R Impact Measurement Toolkit: a common framework for reporting outcomes	Adaptation impact	Global	UNEP FI-led Community of Practice	Measurement framework	Framework to set results and practice indicators for measuring the adaptation impact of financing

#	Case study	Information flow	Geography	Actor	Instrument	Description
7	Modelling the borrower's financial case	Financial performance	Brazil	Farm borrower and agricultural lender	Capex loan or partial credit guarantee	Modelling of drip irrigation for coffee in Brazil
8	Proving that flood resilience can generate financial returns for financial institutions	Financial performance	Bangladesh	Microfinance institution	Pre-approved emergency credit	BRAC's randomised trial: higher farm investment and output, and higher branch profits
9	Building national physical risk data infrastructure	Physical climate risk	Costa Rica	Insurance supervisor and Ministry of Finance	National risk data and modelling programme	GRMA programme building open risk data, with SUGESE as focal point
10	Linking wildfire risk reduction to insurance pricing by regulation	Physical climate risk	United States (California)	Insurance regulator	Rate regulation	Wildfire safety discounts and forward-looking catastrophe models, in exchange for coverage in distressed areas
11	Interoperable hazard categorization for adaptation finance	Allocation of finance	EU and ASEAN	Regional standard-setters	Taxonomy guidance	EU Taxonomy hazard groups and the ASEAN mARs Guide as common reference points across jurisdictions
12	Reporting adaptation outcomes through a sovereign green bond	Adaptation impact	Fiji (SIDS)	Sovereign	Sovereign green bond	FJD 100 million bond, 90.6% of proceeds to adaptation, reported against 13 key result indicators
13	How public investment in natural infrastructure can help protect economies and finance climate recovery	Financial performance	Mexico	State government trust and reinsurer	Parametric insurance	Reef insurance that paid US$ 850,000 after Hurricane Delta to fund rapid repairs

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UNEP Finance Initiative brings together a large network of banks, insurers and investors that catalyzes action across the financial system to deliver more sustainable global economies.

For more than 30 years the Initiative has been connecting the UN with financial institutions from around the world to shape the sustainable finance agenda. We've established the world's foremost sustainability frameworks, helping the finance industry achieve sustainability goals, address sustainability risks and identify the business opportunities in taking a responsible approach to banking and insurance.

Convened by a Geneva, Switzerland-based secretariat, more than 550 banks and insurers are individually implementing UNEP FI's Principles for Responsible Banking and Principles for Sustainable Insurance. Financial institutions work with UNEP FI on a voluntary basis to apply these industry frameworks and develop practical guidance and tools that drive institutional change, shaping the future of sustainable finance and positioning their businesses for the transition to a sustainable and inclusive economy. In parallel, UNEP FI also drives systems change and fosters enabling conditions in service of the broader mission to mobilize and align private finance to help achieve the UN Sustainable Development Goals.

Founded in 1992, UNEP FI was the first organization to engage the finance sector on sustainability and incubated the Principles for Responsible Investment, now the world's leading proponent of responsible investment.

Today, we cultivate leadership and advance sustainable market practice while supporting the implementation of global programmes at a regional level across Africa & the Middle East, Asia Pacific, Europe, Latin America & the Caribbean, and North America.

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