GLOBAL
CENTER ON
ADAPTATION

Handbook for Financial Institutions

Climate Adaptation Finance

Module 4

GLOBAL CENTER ON ADAPTATION

In collaboration with:

European Bank for Reconstruction and Development

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About the Global Center on Adaptation

The Global Center on Adaptation (GCA) is an international organization that promotes adaptation to the impacts of climate change. It works to accelerate action and support for adaptation solutions by shaping policy reforms and influencing investments made by international financial institutions and the private sector. The goal is to bring climate adaptation to the forefront of the global fight against climate change and ensure that it remains prominent. Founded in 2018, GCA ensures a continuous, two-way exchange of knowledge and best practices that empower communities and drive resilient and inclusive growth worldwide.

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The European Bank for Reconstruction and Development (EBRD) is a multilateral development bank founded in 1991 with a mandate to foster sustainable, well-functioning market economies. Its governance and mandate enable it to combine finance, policy support and capacity building – powerful tools for unlocking private investment and scaling adaptation finance in the financial sector.

The EBRD works closely with private-sector and public partners to complement its adaptation financing. The Bank has financed climate-resilient infrastructure in its regions, advanced nature-based solutions, and strengthened the management of physical risk across sectors. Through financial institutions, the EBRD channels green finance via hundreds of thousands of sub loans, an intermediation model that the Bank also leverages to expand adaptation lending.

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Module 4

Where to Invest

Adaptation Needs, Finance Solutions and Tools

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The resulting Handbook reflects a **co-created approach**, shaped by valuable input and feedback from participating institutions. It draws on **real-world case studies, policy tools, financial instruments**, and **modelling techniques** relevant to FIs operating across both emerging and developed markets.

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Acronyms

ALM	Asset Liability Management
AfDB	African Development Bank
AI	Artificial Intelligence
ARRP	Africa Recovery and Resilience Plan
BCP	Banco de Crédito del Perú
BD	Bilateral Donor
BRT	Bus Rapid Transit
CAPEX	Capital Expenditure
CBI	Climate Bonds Initiative
CPI	Climate Policy Initiative
COP	Conference of the Parties (COP)
CSA	Climate-Smart Agriculture
DBSA	Development Bank of Southern Africa
DCAS	Digital Climate Advisory Services
DFI	Development Finance Institution
EbA	Ecosystem-Based Adaptation
EBITDA	Earnings before interest, taxes, depreciation, and amortisation
EBRD	European Bank for Reconstruction and Development
EU	European Union
EUR	Euro
FI	Financial Institution
FSP	Financial Service Provider
GCA	Global Center on Adaptation
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEFF	Green Economy Financing Facility
GET FiT	Global Energy Transfer Feed-in Tariff
GFDRR	Global Facility for Disaster Reduction and Recovery
GHG	Greenhouse Gas
GTS	Green Technology Selector
ICMA	International Capital Market Association
IEA	International Energy Agency
IMF	International Monetary Fund
KPMG	Klynveld Peat Marwick Goerdeler
KPWF	Kenya Pooled Water Fund

LDC	Least Developed Country
LEED	Leadership in Energy and Environmental Design
MCF	Multilateral Climate Fund
MDB	Multilateral Development Bank
MEBA	Microfinance for Ecosystem-Based Adaptation
MFI	Microfinance Institution
MHEWS	Multi-Hazard Early-Warning Systems
MHS	Meteorological and Hydrological Service
MSME	Micro, Small, and Medium-sized Enterprise
NDB	National Development Bank
O&M	Operations and Maintenance
OPEX	Operating Expenditure
PAYG	Pay-As-You-Go
PPP	Public-Private Partnership
R&D	Research and Development
RCP	Representative Concentration Pathway
SALM	Sustainable Agriculture Land Management
SLB	Sustainability-Linked Bond
SME	Small and Medium-sized Enterprise
TA	Technical Assistance
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
US$	United States Dollars
USGBC	United States Green Building Council
WEF	World Economic Forum
WMO	World Meteorological Organization
WRI	World Resources Institute
WWF	World Wide Fund for Nature
WWTW	Wastewater Treatment Work

Module Description

Module 4: Where to Invest – Adaptation Needs, Finance Solutions and Tools

Description

This Module outlines the opportunities for investing in adaptation for financial institutions (FIs), and the tools that enable FIs to do so. Chapter 1 situates FIs within the broader adaptation finance ecosystem. It explores their role as channelers of adaptation finance as well as their ability to raise adaptation-linked capital. Chapters 2 and 3 present the need and opportunity for investing in adaptation solutions, an overview of key climate hazards and risks across sectors of importance for FIs, and the adaptation solutions that could be implemented. Chapter 4 builds on the exploration of adaptation opportunities, with in-depth analyses of the instruments available to FIs, both for adaptation-aligned finance and for the development of new, innovative products. Giving a broad overview of the different adaptation financing products available, the Module shows how FIs can best serve clients' needs.

Target group

- Corporate/Wholesale, Small and Medium-sized Enterprise (SME) and Retail Banking Departments; Credit, Product and Structured Finance Departments
- Treasury and Asset Liability Management (ALM) Department.

Learning outcomes

Chapter 1: The Climate Adaptation Ecosystem and the Role of Commercial FIs

- Distinguish between climate adaptation and climate mitigation
- Develop a clear understanding of climate adaptation finance and how it differs from climate mitigation finance
- Understand the different actors within the adaptation finance ecosystem and the key role that commercial FIs can play
- Distinguish between financing and funding, their role in adaptation and who provides it
- Understand the interaction between public and private sources of funding and financing, and how proactive adaptation strategies can improve access to concessionary capital

Chapter 2: Identifying Climate Adaptation Needs

- Clarify the main types of adaptation activities and the process-based approach for effective implementation
- Explain what maladaptation is and how it can be a risk for FIs
- Explore why adaptation is not just a risk management strategy but a strategic opportunity

Chapter 3: Mapping Adaptation Needs and Opportunities Across Sectors

- Provide an overview of the climate hazards and risks that sectors relevant to FIs are facing
- Identify adaptation opportunities across key client sectors
- Provide an overview of adaptation solutions that could be implemented across these sectors to address client adaptation needs

Chapter 4: Matching Adaptation Needs and Financing Solutions

- Building on the exploration of adaptation needs of clients, understand how FIs can match clients' adaptation financing needs with available financing solutions
- Understand the conceptual link to key FI clients and their characteristics
- Understand the wide range of financial products which FIs can offer and how these may be adapted to suit adaptation needs. This includes how to develop adaptation-specific innovative products such as adaptation-linked loans, bonds, insurance and concessional instruments
- Understand the role of blended finance and why adaptation, including exploration of concessional layering and risk-sharing models, is important.

01

The Climate Adaptation Ecosystem and the Role of Commercial Financial Institutions

Changing climatic conditions are increasing the frequency and intensity of climate hazards, exposing people, assets and the economy to greater risks. As key actors within the economy, FIs face both direct and indirect impacts. To respond effectively, FIs must first grasp the fundamentals of climate adaptation finance, including how it differs from climate mitigation finance and how the two can complement each other. Crucially, this must be coupled with situating FIs within the wider adaptation finance ecosystem, recognising their strong client insight. This foundational understanding is critical for commercial FIs to make the most of their crucial role in the adaptation finance ecosystem. It enables them to understand adaptation needs, capture emerging opportunities, and strengthen their support to clients.

This chapter addresses the following questions:

- **Adaptation vs. Mitigation: Defining Climate Adaptation**
- **Adaptation finance: How does adaptation finance differ from mitigation finance?**
- **What role does the public sector play in financing adaptation?**
- **What role does the private sector play in financing adaptation?**
- **What is the difference between funding and financing?**
- **Where do commercial FIs sit within the wider adaptation finance ecosystem?**
- **What is the role of commercial FIs regarding adaptation?**
- **What is the triple-dividend of investing in climate adaptation?**
- **What are the wider benefits for FIs of investing in adaptation?**
- **How can investing in adaptation improve portfolio risk mitigation?**
- **How can investing in adaptation unlock new revenue streams?**
- **How can promoting adaptation improve access to capital for commercial FIs?**

Target Group: Corporate/Wholesale, SME and Retail Banking Departments; Credit, Product and Structured Finance Departments; Treasury and ALM Department.

Adaptation vs. Mitigation: Defining Climate Adaptation

According to the Intergovernmental Panel on Climate Change (IPCC, 2023), *climate adaptation* is: "In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects".

In contrast, *climate mitigation* is "a human intervention to reduce emissions or enhance the sinks of greenhouse gases". In short, climate **mitigation** is focused solely on actions to reduce or capture **greenhouse gases (GHGs).** Climate **adaptation** is focused on actions that aim to reduce the current and future impacts of climate change and manage its consequences. Climate adaptation does not seek to stop climate change; it seeks to minimise the adverse impacts on people, assets and economies caused by changing climatic conditions now and in the future, such as floods, droughts or heatwaves. For FIs, understanding this distinction is critical. Mitigation actions align with low-carbon strategies, while adaptation is about managing physical climate risks and building resilience. Climate adaptation seeks to integrate solutions and focuses on addressing the impacts of climate change in operations, portfolio management and client engagement.

Adaptation activities typically fall into two categories: adapted and enabling:

- **Adapted activities** are interventions that integrate specific measures to manage their physical climate risks, ensuring that the core objectives of the activity can still be achieved under current and future climate conditions. These activities typically involve *design modifications or operational improvements* to safeguard performance and reduce vulnerability or exposure of the activity to climate hazards. However, they do not have climate adaptation as their primary objective. Instead, adaptation is a secondary outcome, embedded to enhance the activity's resilience.

- **Enabling activities** are designed to directly reduce physical climate risks or enhance the adaptive capacity of the broader system within which a project operates. These activities address systemic vulnerabilities by tackling the root causes of physical climate risk or removing barriers to adaptation, such as gaps in knowledge, capacity, governance or access to technology. Adaptation is either the main or one of the explicit objectives of enabling activities. These activities are based on a comprehensive understanding of the system's **exposure** to climate risks and typically yield benefits that extend beyond the immediate project scope and beyond those that can be accrued by FIs.

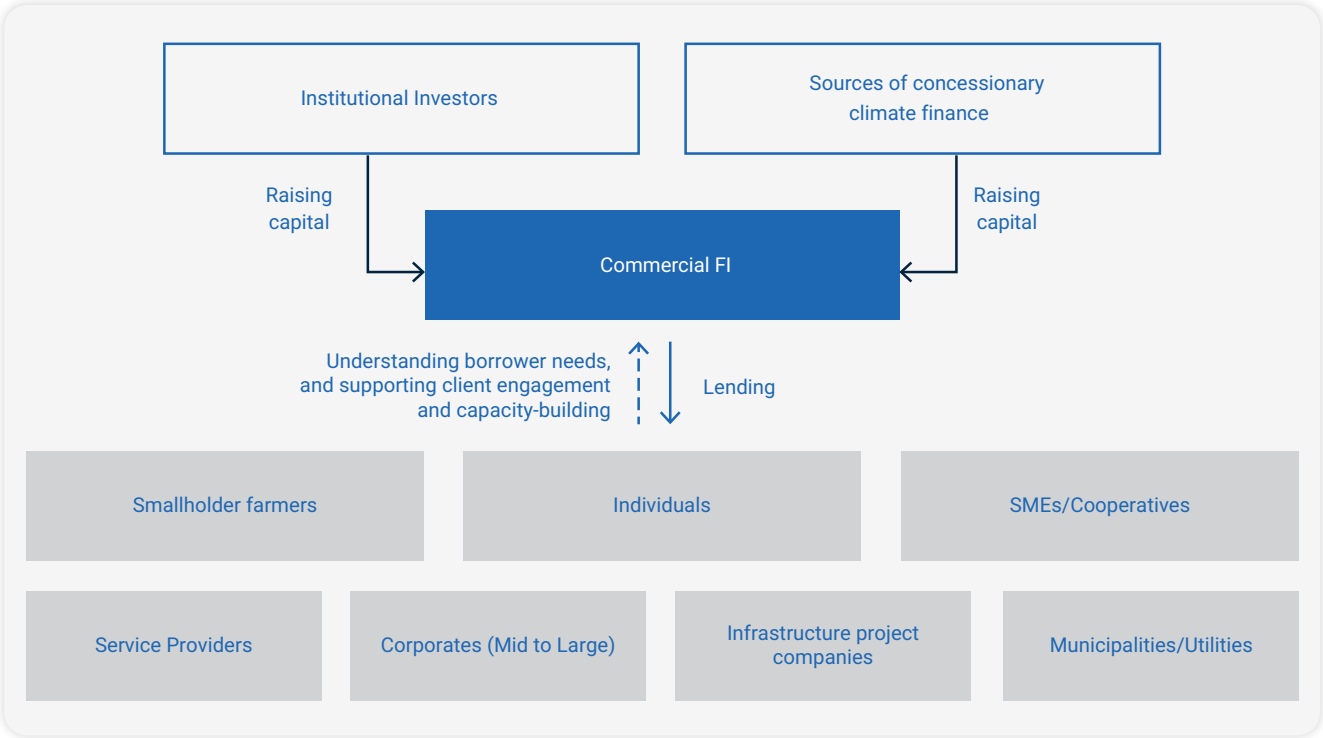
'Adapted activities' and 'enabling activities' are also referred to as 'adaptation of' and 'adaptation through', or 'asset level adaptation' and 'system level adaptation'. Both are vital, and FIs can support them at various scales. Adapted activities involve project-level investments, such as loans for climate-resilient housing, which incorporate measures to manage physical climate risks and safeguard project outcomes. Enabling activities operate at the system level and include initiatives like funding early warning systems or integrating climate risks into national infrastructure plans. These system-level interventions are not confined to regional programmes but can also be implemented at national, regional or local levels to address broader vulnerabilities and remove barriers to adaptation.

Adaptation finance: How does adaptation finance differ from mitigation finance?

Mitigation finance describes financing targeted at reducing or avoiding GHG emissions (e.g., investments in renewables, energy efficiency or reforestation). The return profile is typically tied to revenue streams, such as the sale of renewable power or revenue from carbon credits resulting from avoided emissions. Adaptation finance, by contrast, supports efforts to reduce vulnerability to climate impacts by enhancing resilience across a range of sectors. While adaptation activities have historically been associated with less direct or immediate revenue generation than some mitigation projects, they nonetheless offer significant financial value through indirect benefits such as avoided losses, enhanced revenues, and improved creditworthiness—often accruing over a longer time horizon. Adaptation finance also spans a broad and dynamic range of sectors, from agricultural resilience and water conservation to business continuity planning and health system strengthening. While this diversity can pose challenges for standardisation, it also reflects a wide spectrum of investment opportunities. Increasingly, financial institutions are adapting their investment and lending approaches to capture these opportunities. From an FI perspective, supporting adaptation strengthens the resilience of both clients and institutions themselves by reducing exposure to asset damage, loan defaults, and costly recovery efforts. (Climate Policy Initiative [CPI], 2024b).

Commercial FIs are key intermediaries in the climate finance ecosystem, connecting real-economy clients with institutional investors and sources of concessional climate finance, including dedicated multilateral climate funds (introduced below and further detailed in Chapter 4 of this Module). **Figure 1** illustrates the position of commercial FIs in the adaptation finance ecosystem.

Figure 1: The position of the commercial financial institution in the adaptation finance ecosystem



Source: Authors.

What role does the public sector play in financing adaptation?

Currently, most adaptation finance originates from public sources, reflecting the limited capacity of private markets to quantify and manage climate-related risks. According to the CPI's (2024a) Global Landscape of Climate Finance, 92% of adaptation finance is provided by public actors, including bilateral donors, multilateral development banks (MDBs), and dedicated global climate funds such as the Green Climate Fund and the Adaptation Fund. This reliance on public sources is largely due to the nature of adaptation investments, where revenue models are still developing, upfront costs can be higher, and benefits tend to materialise over longer time horizons. **Table 1** outlines the main public actors and their roles in financing adaptation.

Table 1: Public adaptation finance actors

Actor	Role
National or Regional Governments	Governments continue to play a significant role in financing climate adaptation. In fact, 14% of tracked adaptation finance flows in emerging markets came from governments during 2018-2022 (CPI, 2024a). While governments are often able to finance activities that primarily serve the public good and absorb risks that are difficult to accommodate on purely commercial terms, public budgets in many countries remain fiscally constrained.
National Development Banks	National Development Banks (NDBs) are usually either wholly or partly government-owned or sponsored and are designed to provide long-term and concessional capital for projects that serve the government's development goals. With deep expertise in domestic markets and access to international capital markets, NDBs can raise capital from a wide range of sources. They often co-lend to alter the risk profile of an investment, aiming to crowd in private capital. In addition, they play a key role as intermediaries for finance from multilateral climate funds, with many being eligible to receive and channel multilateral climate funding.
Multilateral Development Banks and Bilateral Donors	MDBs and bilateral donors remain the primary source of funding for adaptation finance in emerging markets. In the period 2018-2022, multilateral development finance institutions (DFIs) provided 58% of adaptation finance in emerging markets and bilateral DFIs 23% (CPI, 2024a). DFIs are increasingly mainstreaming climate adaptation into their portfolio by insisting on climate risk and vulnerability assessments. Similar to NDBs, MDBs, and bilateral donors can crowd in private sector investment by de-risking, but they also often offer technical assistance and bridge knowledge gaps by providing open-access tools.
Multilateral Climate Funds	Multilateral climate funds (MCFs) refer to dedicated climate funds established through the United Nations Framework Convention on Climate Change (UNFCCC). These include the Green Climate Fund (GCF), Adaptation Fund, and the Global Environment Facility (GEF). They have a specific mandate to provide finance either through grants or market-linked instruments. With their mandate to catalyse private sector investment, they often reduce the risk profile of projects perceived as high-risk by providing instruments like first-loss or junior equity, repayment guarantees, and grants to mobilise private investments. MCFs have been critiqued both for having high barriers to access and for being entirely dependent on voluntary donations from governments.
Green Banks	Green Banks (or Climate Finance Facilities) are national, country-driven, dedicated, catalytic FIs designed to address domestic market gaps, take ownership of climate finance, and crowd-in private investments in low-carbon and resilient projects.

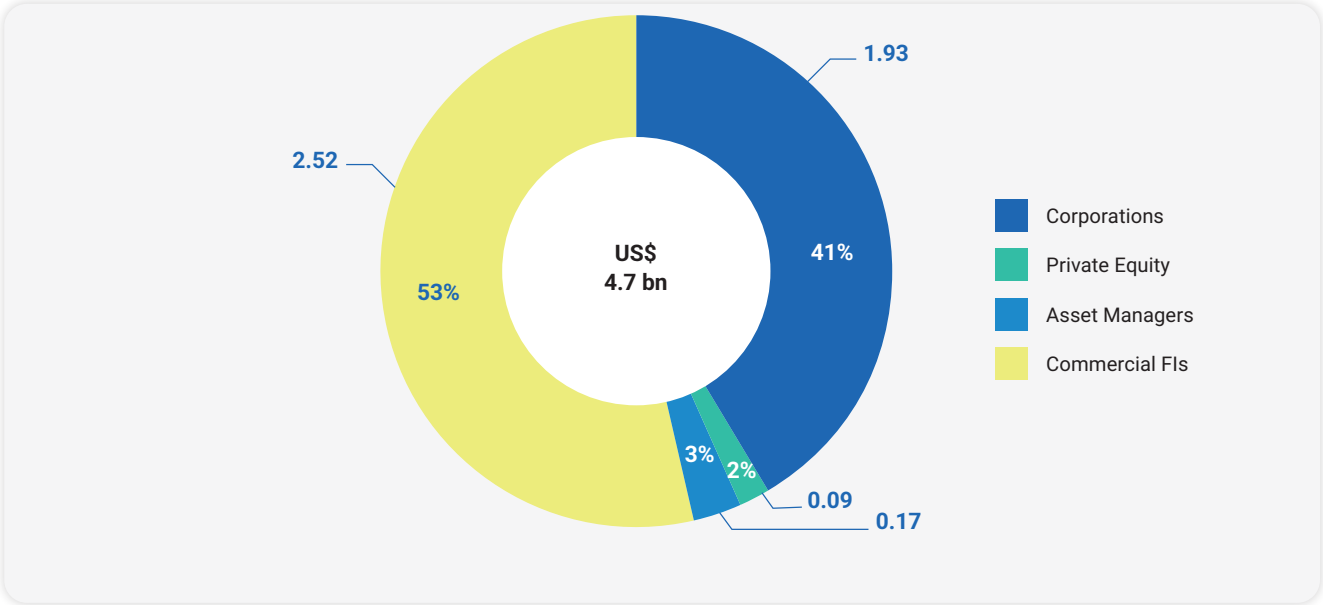
Source: Adapted from CPI (2024a, 2025).

What role does the private sector play in financing adaptation?

Private adaptation finance is currently limited globally, making up approximately 8% of total global adaptation finance in 2022 (CPI, 2024b). An overview of tracked annual private adaptation flows is shown in **Figure 2**. Among the private actors, commercial FIs contributed 53% of the total tracked private adaptation flows globally of US$ 4.7 billion.

Table 2 below explores key private sector actors in the adaptation ecosystem and how these dynamics shape their roles.

Figure 2: Tracked private adaptation finance (annual average 2019-2022)



Source: (CPI, 2024b).

Table 2: Private adaptation finance actors

Actor	Role
Blended Finance Platforms	Blended finance platforms (including, among others, Convergence, Private Infrastructure Development Group's Global Innovation Lab for Climate Finance) combine concessional and private finance into instruments that may support adaptation in the infrastructure sector and beyond.
Commercial Banks	Commercial banks dominate financial intermediation in many emerging markets and typically maintain the closest and most sustained relationships with local communities and clients. Through their extensive engagement with micro, small, and medium-sized enterprises (MSMEs), corporates, and households, commercial banks are well positioned to support climate resilience through lending and financial services. In addition to mobilising capital through deposits, commercial banks that demonstrate robust climate governance and disclosure practices are better positioned to access concessional finance and risk-sharing instruments. These mechanisms can help address risk-return mismatches and enable banks to finance adaptation investments that may otherwise be considered commercially unviable. However, as commercial banks are required to operate on a market-based basis, their capacity to absorb elevated or uncertain risks is limited in the absence of such support.
Institutional Investors	Institutional investors, a category that includes insurance companies, pension funds, sovereign wealth funds, and hedge funds, among others, represent a large pool of capital on the continent. Their assets under management by African institutional investors are estimated to have reached US$ 1.8 trillion in 2020. While their ability to raise capital is very high, their prudential responsibilities require them to invest in assets with high credit ratings.
Insurance	While there has historically been very low insurance penetration in emerging markets, with 3-4% of **gross domestic product (GDP)** insured, as compared to the Organization for Economic Cooperation and Development country average of 10%, the assets-under-management of insurers in those markets are still significant. While, due to their liquidity needs, their risk appetite is relatively low, they may be incentivised to invest in adaptation to improve resilience to climate shocks and reduce potential payouts later.
Philanthropists, Foundations, and Non-Profits	In private sector investment adaptation, philanthropies play a large role, due to their high-risk appetite and strong climate mandate. In 2021/22, philanthropists provided US$ 465 million of tracked adaptation finance flows globally.
Corporations	While corporations may not always have explicit adaptation mandates or a high standalone risk appetite for these investments, they are increasingly investing in adaptation measures where there is a clear business case - particularly where these actions support operational resilience, risk management, and alignment with evolving climate-related disclosure and reporting frameworks.

Source: Adapted from CPI (2025).

What is the difference between funding and financing?

In the context of climate adaptation, distinguishing between funding and financing is essential because they play complementary but distinct roles in adaptation projects (see **Box 1**).

Box 1: Funding versus Financing

Funding

How a project will ultimately be paid for (e.g., through user fees, carbon credits, grants).

Financing

Who provides the upfront capital, often with the expectation of a return on investment.

Source: Authors.

Funding refers to the ultimate source of repayment or revenue that sustains a project over time. It might include government budgets, user fees, insurance payouts, carbon credits or donor grants. In contrast, financing relates to the upfront capital required to design, develop and implement the project, typically provided by investors, banks, DFIs or public agencies, often with the expectation of a financial return. While financing enables the project to get off the ground, funding ensures its long-term viability and payback capacity. In adaptation, many projects, such as building flood defences or drought-resilient agriculture projects, struggle to attract private financing because they lack clear, bankable funding streams. Bridging this gap often requires blended finance instruments or public support to de-risk investments and create credible repayment mechanisms.

Where do commercial FIs sit within the wider adaptation finance ecosystem?

Commercial FIs occupy a pivotal intermediary position within the adaptation finance ecosystem. As part of the financial sector actor group, they serve as a bridge between sources of capital, such as institutional investors, DFIs and concessional climate funds and clients in the real economy, where adaptation needs are most urgent. Through this position, they are well-placed to aggregate and allocate capital efficiently by drawing on customer deposits or leveraging concessional capital and risk mitigation instruments from public actors. In collaboration with national development banks, climate funds and technical assistance providers, commercial FIs can channel blended finance into underserved sectors while managing climate risk through financial instruments such as guarantees, first-loss tranches, or other credit enhancements. FIs ability to deploy capital at scale, particularly through retail and MSME networks, makes them essential partners for governments and donors seeking to mainstream adaptation into core financial systems.

What is the role of commercial FIs regarding adaptation?

Beyond their financial intermediation role, commercial banks bring unique value through their longstanding and granular relationships with local clients. These institutions maintain direct engagement with MSMEs, corporates and households, many of which can be both highly vulnerable to climate shocks and have low **adaptive capacity**. Commercial FIs understand their clients' seasonal cash flows, production cycles, collateral realities and risk perceptions. This allows FIs to tailor financial products to these groups' specific needs and contexts. With the right support - such as access to climate data, targeted capacity building, and, where needed, concessional co-investment - commercial banks can translate client-level insights into scalable and commercially viable adaptation solutions, strengthening resilience from the ground up.

What is the triple-dividend of investing in climate adaptation?

Climate adaptation investments offer FIs a distinct **triple dividend** of value. (GCA, 2019; World Resources Institute [WRI], 2022, 2025b):

- **1st Dividend: Avoided losses and enhanced investment performance**. Integrating climate risk considerations into investment decisions both protects assets and enhances long-term returns. By proactively identifying and addressing climate-related risks, financial institutions can significantly reduce losses and disruptions over the project lifecycle. Studies show that every US$ 1 invested in climate-resilient infrastructure can generate up to US$ 4 in avoided losses – a compelling value proposition. When climate risks are properly assessed and quantified, these investments become more attractive, offering both financial and resilience dividends.

- **2nd Dividend: Operational savings and economic gains from enhanced resilience**. Investing in climate-resilient infrastructure and technologies can generate significant long-term economic benefits by reducing both capital and operating expenditures over time. While resilient **investments** may involve higher upfront capital costs, they often lead to lower operational and maintenance expenses throughout the asset's

lifecycle. It also minimises costly service disruptions and supports continuity in trade and access to critical services. For example, efficient irrigation technologies such as drip systems lower water usage and boost crop productivity, improving farmers' incomes and contributing to food security.

3rd Dividend: Environmental and social co-benefits from implementing adaptation measures. The implementation of a water-saving technology in manufacturing increases the productivity of the facility and leaves more water available in the wider system for ecosystems and communities. When quantified, these benefits can increase the return on investment.

What are the wider benefits for FIs of investing in adaptation?

As mentioned in Module 1, the broader benefits from investing in adaptation fall into four buckets: improved risk mitigation, enhanced long-term market position, reduced costs, and unlocked capital. **Figure 3** explores the different groups of benefits.

Figure 3: Wider benefits of investing in climate adaptation for financial institutions

Source: Authors.

How can investing in adaptation improve portfolio risk mitigation?

One of the primary ways adaptation investments may benefit FIs is by enhancing the value of assets and improving the credit quality of clients. When FIs lend specifically for activities that improve resilience to extreme weather events, their clients become better equipped to withstand the adverse effects of climate change. This leads to more stable financial performance and greater repayment reliability. Loan performance is affected by a myriad of factors.

In cases of material physical climate risk to the borrowers, lending to businesses that have invested in adaptation measures, such as water-efficient industrial machinery or climate-resilient supply chains, may reduce the risk of non-performing loans. Concurrently, investing in adaptation reduces exposure to transition risk. As regulation shifts, the risk of non-compliance becomes more material. For instance, the European Union (EU) Corporate

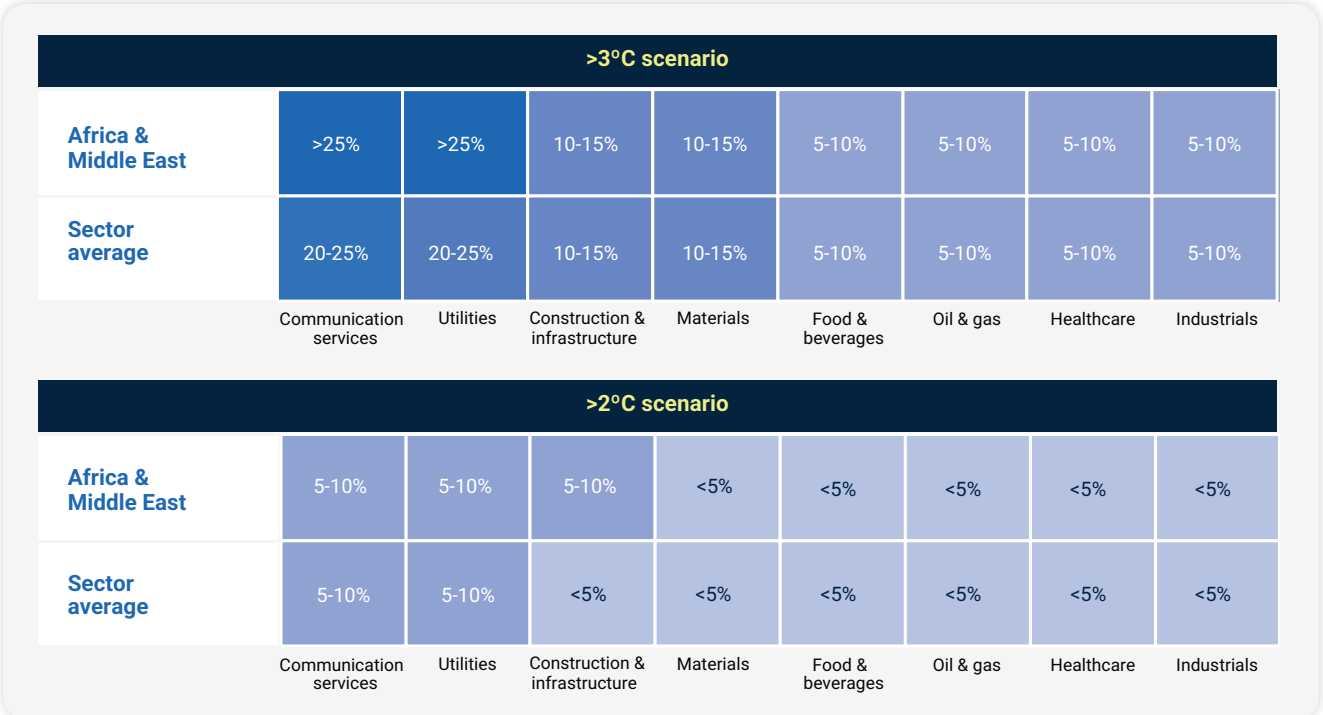
Sustainability Reporting Directive regulation, which came into effect in January 2024, mandates that EU and non-EU companies with more than 250 employees or a net turnover of EUR 40 million disclose their strategies for managing or reducing exposure to unsustainable or vulnerable assets. Similarly, shifting consumer preferences, including towards more sustainable investment, is likely to benefit FIs that integrate such criteria into their lending portfolios.

How can investing in adaptation unlock new revenue streams?

Investing in adaptation can unlock new revenue streams for commercial FIs. These are explored in more detail in Chapters 2 and 3 of this Module. For instance, new pay-as-you-go (PAYG) service providers of modular, off-grid solar pumps and drip irrigation lines on small farms shield farmers against rainfall variability and rising diesel prices, boosting yields of cash crops, and provide revenue generation opportunities from metered water payments, bundled input sales, and potential carbon/renewable-energy credits. Similar novel market opportunities exist across the forestry, energy, water and sanitation, and transport sectors, among others.

Institutions that embed climate resilience into their lending and investment decisions serve to reduce physical and transition-related climate risks and unlock new streams of revenue. As shown by research from the World Economic Forum (WEF, 2024; see **Figure 4**), climate-related **physical risks** have a financial impact on FI clients' earnings before interest, taxes, depreciation, and amortisation (EBITDA). In Africa and the Middle East, the impact could range between 5% and more than 25% by 2050. This represents a significant exposure of the portfolio, so climate-related physical risks need to be addressed.

Figure 4: Earnings before interest, taxes, depreciation, and amortisation exposed to climate-related physical risks across different climate scenarios by 2050

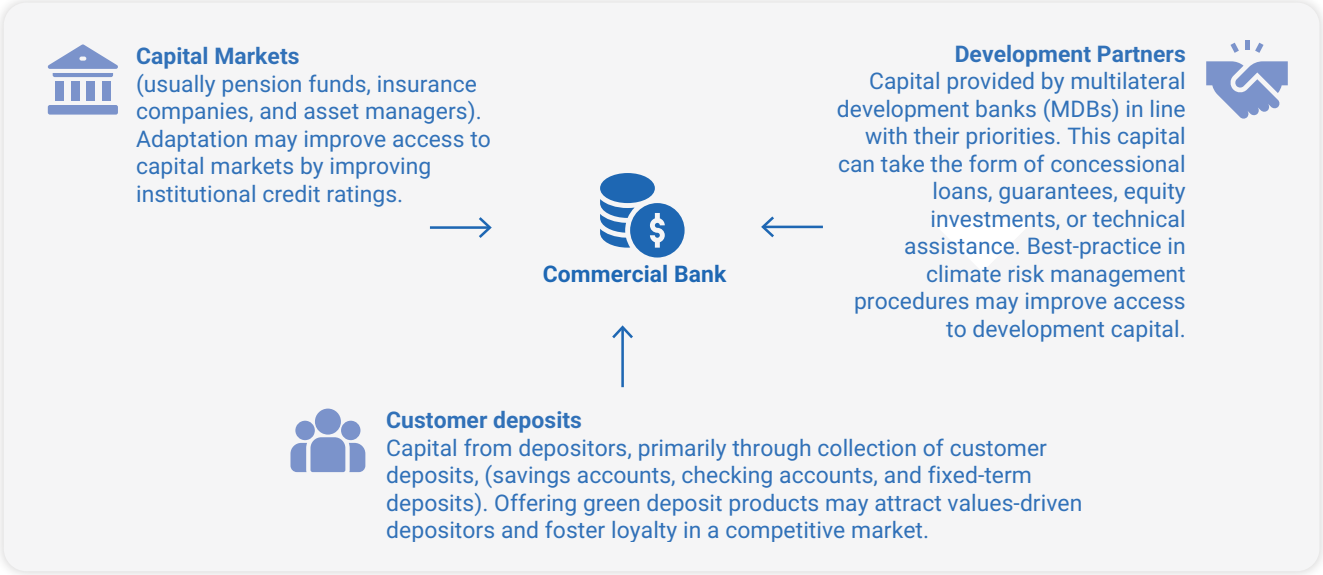


Source: Adapted from WEF (2024).

How can promoting adaptation improve access to capital for commercial FIs?

Following best practice in climate risk management and adaptation financing can significantly enhance a bank's ability to access capital markets. Investors and regulators are increasingly scrutinising how FIs assess, disclose, and mitigate climate-related financial risks. Banks that demonstrate robust climate governance, scenario analysis capabilities, and alignment with frameworks like the Task Force on Climate-related Financial Disclosures (TCFD) (now integrated into the International Financial Reporting Standards S1 and S2) are viewed as more resilient to transition and physical risks. As shown in **Figure 5,** this can translate into higher credit ratings and stronger investor demand. In addition, demonstrating the best practice in climate risk management and adaptation financing allows FIs to access capital earmarked for green, resilient, or sustainable activities.

Figure 5: Mobilising capital for climate investments: The role of commercial banks



Source: Authors.

Adaptation finance presents a climate imperative and a compelling strategic opportunity. As climate change continues to worsen, from increasingly erratic rainfall and droughts to flooding and supply chain disruptions, FIs that take a proactive stance on adaptation investment can unlock new sources of capital, strengthen their balance sheets, and lead innovation in financial product development tailored to their clients' evolving needs.

Module 6 builds on these insights to show how FIs can engage with public-private stakeholders, DFIs, and technical assistance providers to scale up their impact and market reach.

02

Identifying Climate Adaptation Needs

The benefits of climate adaptation extend beyond short-term risk reduction. Well-designed adaptation strategies can strengthen long-term resilience and support improved financial performance over time. By understanding existing adaptation practices, FIs and their clients can identify opportunities to strengthen and scale these measures in response to climate change. Awareness of maladaptation further enables FIs to prioritise solutions that genuinely enhance resilience, rather than shifting or amplifying risk. Together, this supports more robust investment decisions and strengthens the resilience of clients' operations and cash flows.

This chapter addresses the following questions:

- **What do FIs need to consider when identifying adaptation solutions?**
- **What are the types of adaptation solutions that FIs can consider?**
- **Why do FIs need to be aware of the risk of maladaptation?**
- **Why is it important for the client and the FI to understand which adaptation benefits can be monetized?**
- **How can adaptation solutions have mitigation co-benefits?**

Target Group: Corporate/Wholesale, SME, and Retail Banking Departments; Credit, Product and Structured Finance Departments; Treasury and ALM Department.

What do FIs need to consider when identifying adaptation solutions?

Whether considering adaptation solutions to protect their own assets and portfolio, or to support their clients, FIs need to be clear that **adaptation solutions are context and location-specific**. There is no 'one size fits all' adaptation solution that will be suitable for all climate **hazards**, geographies, or sectors. The key principles behind identifying a suitable adaptation solution are the following:

- **Understand the problem:** the adaptation solution should be targeted at addressing specific climate hazards and risks.
- **Understand the solutions:** the adaptation solution must be tailored to the sector, geographic and social context, and to the environmental characteristics of the location where it will be implemented. It also needs to address the specific climate hazards and risks identified.
- **Clarify the expected outcomes:** Adaptation solutions should clearly define the results intended. As discussed in the previous chapter, well-designed adaptation measures can deliver a "triple dividend" by reducing climate-related losses, improving investment performance and operational efficiency, and generating broader economic, environmental, and social co-benefits.

What are the types of adaptation solutions that FIs can consider?

Adaptation solutions or measures can be categorised in different ways. For this Handbook, they are grouped into three types representing measures that FIs can support: (1) Physical, Digital, and Nature-based Infrastructure Measures; (2) Technical and Financial Capacity Measures; and (3) Governance and Strategy Measures. Understanding the range of available solutions serves several purposes. First, it helps FIs and their clients recognise that many adaptation measures are not new - they often reflect sound business practice already embedded in operations, such as diversifying supply chains, or stress-testing assets. Framing these as climate adaptation clarifies their role in managing climate-related risk and identifies where existing practices may need strengthening. Second, it enables FIs to ensure that all material climate impacts are considered systematically, supporting more robust and resilient investment strategies and strengthening the resilience of clients. Third, familiarity with adaptation measures can facilitate access to climate finance and climate-related financial products - such as insurance or green lending facilities - by providing a clear rationale for implementation and the benefits expected.

The three types of adaptation solutions/measures are described below, and **Table 3** provides a non-exhaustive list of measures across each type.

- **Physical, Digital, and Nature-based Infrastructure Measures** include traditional engineering solutions, technological advancements, nature-based solutions, and services (i.e., disaster response) that address the impacts of climate change. Examples include climate-resilient storage facilities, climate-resilient crops or seeds, efficient irrigation systems (e.g., drip irrigation), rainwater harvesting, sea wall and coastal protection infrastructure, improved drainage infrastructure, wetlands restoration, and implementation of early warning systems.

Technical and Financial Capacity Measures include solutions targeted to enhance the capacity of FIs' clients, their staff, and relevant community stakeholders to address the impacts of climate change. Examples include training SMEs on climate risk management or sustainable farming practices, awareness raising on climate change risks, emergency response and preparedness planning for SMEs, financial literacy and access to climate risk insurance for vulnerable client groups, and behavioural practices such as water saving or soil/agricultural management practices integrated into business operations.

Governance and Strategy Measures include policies, plans, strategies, regulations, and disclosure mechanisms that stimulate the adoption of climate adaptation measures. Examples include incentives or benefits for implementing adaptation measures, development of integrated water management plans, and working with communities and regulators on adaptation planning.

Table 3: Examples of climate adaptation measures and how they relate to the triple dividend of adaptation

Physical, Digital, and Nature-based Infrastructure Measures	Technical and Financial Capacity Measures	Governance and Strategy Measures
• Climate-resilient storage facilities to protect produce from climate impacts. • Improved drainage, culverts, and sewage infrastructure. • Climate-resilient crop varieties. • Water saving technologies, including rainwater harvesting and efficient (drip) irrigation. • Coastal protection measures to protect assets and businesses. • Cooling solutions and heat-resistant materials to provide better insulation. • Implementation of weather forecast, and early warning and emergency response systems.	• Awareness raising and capacity building on climate change risk management for SMEs and FI staff. • Changing cropping practices, patterns and planting dates based on climatic conditions. • Supporting financial literacy of SMEs and access to climate risk insurance products. • Provision of insurance, including index-based weather insurance schemes. • Implementation of disaster contingency funds.	• Development of climate risk management plans, including hazard, exposure and vulnerability mapping to inform the identification of adaptation investment opportunities. • Implementation of disaster risk planning and preparedness programmes. • Working with communities and public institutions in the development of national, regional and sectoral adaptation plans that mainstream climate change. • Financial incentives for implementing climate adaptation measures, including subsidies.
Example of how adaptation solutions relate to the triple dividend of adaptation		
• **1st Dividend** – Avoided losses. • **2nd Dividend** – Productivity and resilience gains. • **3rd Dividend** – Environmental co-benefits.	• **1st Dividend** – Faster recovery from shocks. • **2nd Dividend** – Improved workforce health and productivity. • **3rd Dividend** – Inclusion, empowerment of clients and communities to tackle climate risks.	• **1st Dividend** – Lower exposure via planning and regulation. • **2nd Dividend** – Incentivised climate-smart investment. • **3rd Dividend** – Governance, systems strengthening.

Source: Authors, adapted from Noble et al. (2014).

Why do FIs need to be aware of the risk of maladaptation?

According to the Intergovernmental Panel on Climate Change (IPCC, 2023), *maladaptation* is defined as "actions that may lead to increased risk of adverse climate-related outcomes, including via increased GHG emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future". **Maladaptation** is often an unintended consequence of implementing adaptation or mitigation measures. The consequences of maladaptation can be avoided by (1) having a thorough understanding of climate hazards and risks and the vulnerabilities of assets and the communities to these hazards, and (2) by identifying and prioritising adaptation solutions that are effective for the (local/project) context. By understanding this concept, FIs can avoid investments that might lead to greater risks and financial losses in the future. Knowledge of maladaptation helps FIs prioritise effective adaptation solutions that genuinely enhance resilience rather than create new problems.

Examples of solutions that can lead to maladaptation, according to Noble et al. (2014) and the University of Florida Institute of Food and Agricultural Sciences (2022) include:

- Developing large engineering projects that do not consider future climate projections and are designed based only on historic climate trends.
- Constructing a dam or barrier that protects a certain area against flooding can cause flooding and land/biodiversity loss for communities upstream and downstream.
- The provision of subsidies to farmers during drought events so they can continue cultivating water-intensive crops can exacerbate the lack of water.
- The intensification of agricultural practices, such as using pesticides or building artificial reservoirs to ensure the supply of water, can lead to a reduction in agricultural productivity over time.
- Overuse of irrigation methods that require significant water volumes in drought-prone areas can lead to groundwater depletion and reduce long-term agricultural viability.
- Forgoing longer-term benefits in favour of immediate adaptive actions, such as using chemical fertilisers to boost yields, can lead to soil acidification and water pollution.

Why is it important for the client and the FI to understand which adaptation benefits can be monetized?

Understanding which adaptation benefits can be monetized is essential for both clients and FIs because it directly affects a project's financial viability and attractiveness for investment, or 'bankability'. Monetizable benefits translate into measurable cost savings or revenue streams that can support loan repayment or attract investment. Examples of monetizable benefits include:

- Reduced downtime or business interruptions due to resilient infrastructure networks.
- Increased agricultural yields due to the use of climate-resilient crops and efficient water use.
- Lower water bills due to water-saving technologies, such as low-flow water fixtures and fittings in buildings, grey water re-use technologies and rainwater harvesting.
- Reduced produce losses due to improved cold storage or climate-resilient facilities.
- Lower insurance premiums from reduced exposure to climate risks.
- Extended asset lifetime due to the design and use of materials that consider the impacts of climate change, such as extreme heat.
- Increased rental or resale value of climate-resilient facilities/properties.

For clients, this means stronger business cases, greater access to funding, and long-term sustainability of adaptation projects. For FIs, monetized benefits reduce perceived risk, improve project bankability, and enable better assessment of creditworthiness. While some benefits, like improved health outcomes, job creation or ecosystem restoration, are harder to monetize, they still provide indirect financial and economic returns. Identifying and quantifying these monetizable benefits enables clearer performance metrics, supports blended finance models, and ultimately helps scale adaptation finance by aligning climate resilience with financial returns.

Box 2 illustrates benefits in the agriculture sector, while **Table 4** shows examples of key adaptation benefits, whether they can be monetized, and how monetization supports clients and FIs.

Box 2: Example of benefits for a Small and Medium-sized Enterprise in the agricultural sector

An SME involved in agriculture faces frequent droughts and unpredictable rainfall, leading to crop failures and financial losses. An adaptation investment in climate-resilient seeds and improved irrigation systems helps to ensure stable crop yields despite adverse weather conditions, avoiding significant losses and damage to the SME's agricultural output.

- **Capital Expenditure (CAPEX) reduction:** Climate-resilient seeds and efficient irrigation systems reduce the need for frequent replanting and water usage, lowering long-term capital expenditure.
- **Operating Expenditure (OPEX) reduction:** Improved irrigation systems reduce operational costs related to water management and emergency responses to drought conditions.
- **Financial benefits:** Stable crop yields lead to consistent revenue streams, avoiding losses in income and enhancing the SME's financial stability.
- **Environmental benefits:** Promotion of sustainable agricultural practices, reduction of water usage and preservation of soil health for future growing seasons.
- **Social benefits:** These measures improve food security for local communities, supporting livelihoods and enhancing social resilience.

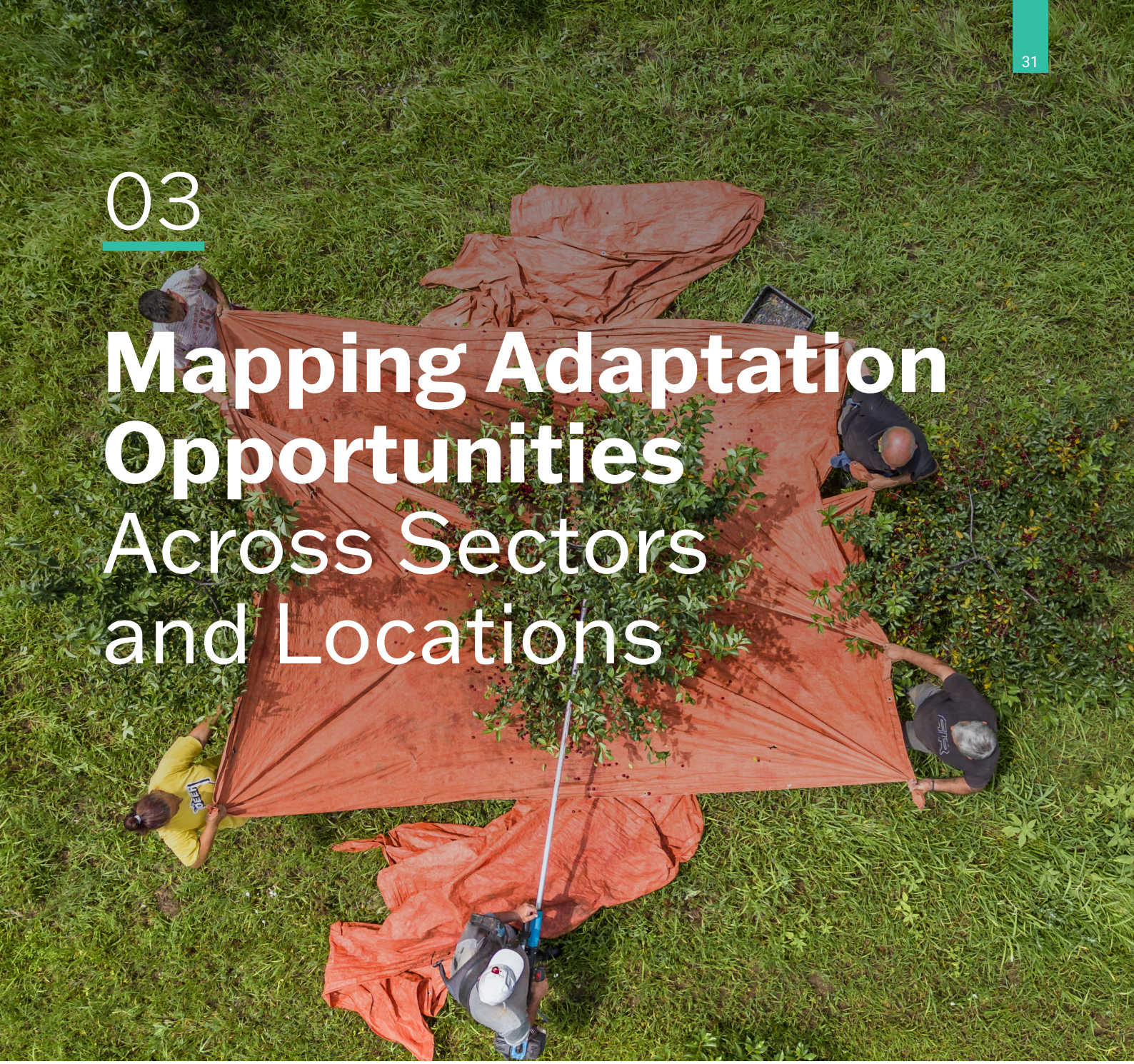
Table 4: Monetization of adaptation benefits and their importance to financial institutions and their clients

Adaptation Benefit	Can Be Monetized?	Monetization Mechanism	Importance to Client	Importance to Financial Institution
Reduced Property Damage (e.g., floods)	Yes	Avoided repair/ replacement costs; lower insurance premiums	Justifies investment; supports resilience goals	Shows risk reduction; improves creditworthiness
Improved Agricultural Yields	Yes	Increased revenues from higher crop output	Boosts income; improves project viability	Predictable cash flow; enhances loan repayment capacity
Energy Savings (e.g., cooling demand)	Yes	Reduced utility bills	Operational cost savings; more resilient infrastructure	Improves project cash flow; lowers default risk
Improved Human Health Outcomes	Partially	Reduced healthcare costs; productivity gains from improved worker health (difficult to quantify fully)	Supports social goals; indirect financial savings	Impact reporting (difficult to value directly)
Ecosystem Restoration	Partially	Tourism, carbon credits, water purification benefits	Long-term sustainability; potential for indirect revenues	May require blended finance; benefits are longer-term
Reduced Business Interruption	Yes	Continuity in operations; sustained revenue	Maintains income; critical for business resilience	Enhances stability of client; lowers investment risk
Water Security	Partially	Potential revenue from tariffs; reduced emergency costs	Essential service continuity	Difficult to monetize fully; strategic value recognised
Job Creation from Adaptation Projects (e.g., short-term construction jobs and long-term maintenance)	Partially	Taxes, economic stimulation (indirect benefits)	Social benefits; local development	May enhance political and reputational value

Source: Authors.

How can adaptation solutions have mitigation co-benefits?

Acknowledging that solutions aimed at climate adaptation often have mitigation co-benefits is important. Green spaces in urban areas can help to reduce temperature and water runoff and contribute to absorbing GHG emissions. Efficient integrated water management practices can ensure the availability of water during drought periods and reduce flood risks, while reducing the consumption of energy for water treatment and pumping. In many hot regions, well-insulated and energy-efficient buildings are designed primarily as adaptation measures to ensure thermal comfort and protect occupants during extreme heat, with the **co-benefit** of reducing the energy required for cooling. Similarly, mitigation projects can also have adaptation co-benefits. Decentralised renewable energy systems (e.g., solar mini grids) cut emissions and improve energy access while increasing the reliability of energy supply during extreme weather events. These additional mitigation co-benefits can qualify for carbon credits, providing additional value that can strengthen the economic case for investing in adaptation solutions.



03

Mapping Adaptation Opportunities Across Sectors and Locations

FIs must understand sector and location-specific climate hazards and the adaptation needs of their clients and then match them with the right types of adaptation solutions available to generate measurable value for both clients and institutions. This section provides a structured overview of sectoral climate risks and links them to practical, bankable adaptation solutions and practical examples, helping FIs mainstream adaptation into their lending and investment portfolios.

This chapter addresses the following questions:

- **Why do adaptation solutions vary across sectors, and where are the opportunities for FIs?**
- **How do the costs and benefits of investment in climate adaptation vary?**
- **Sector Factsheets: How to go from theory to application?**

Target Group: Corporate/Wholesale, SME, and Retail Banking Departments; Credit, Product and Structured Finance Departments; Treasury and ALM Department.

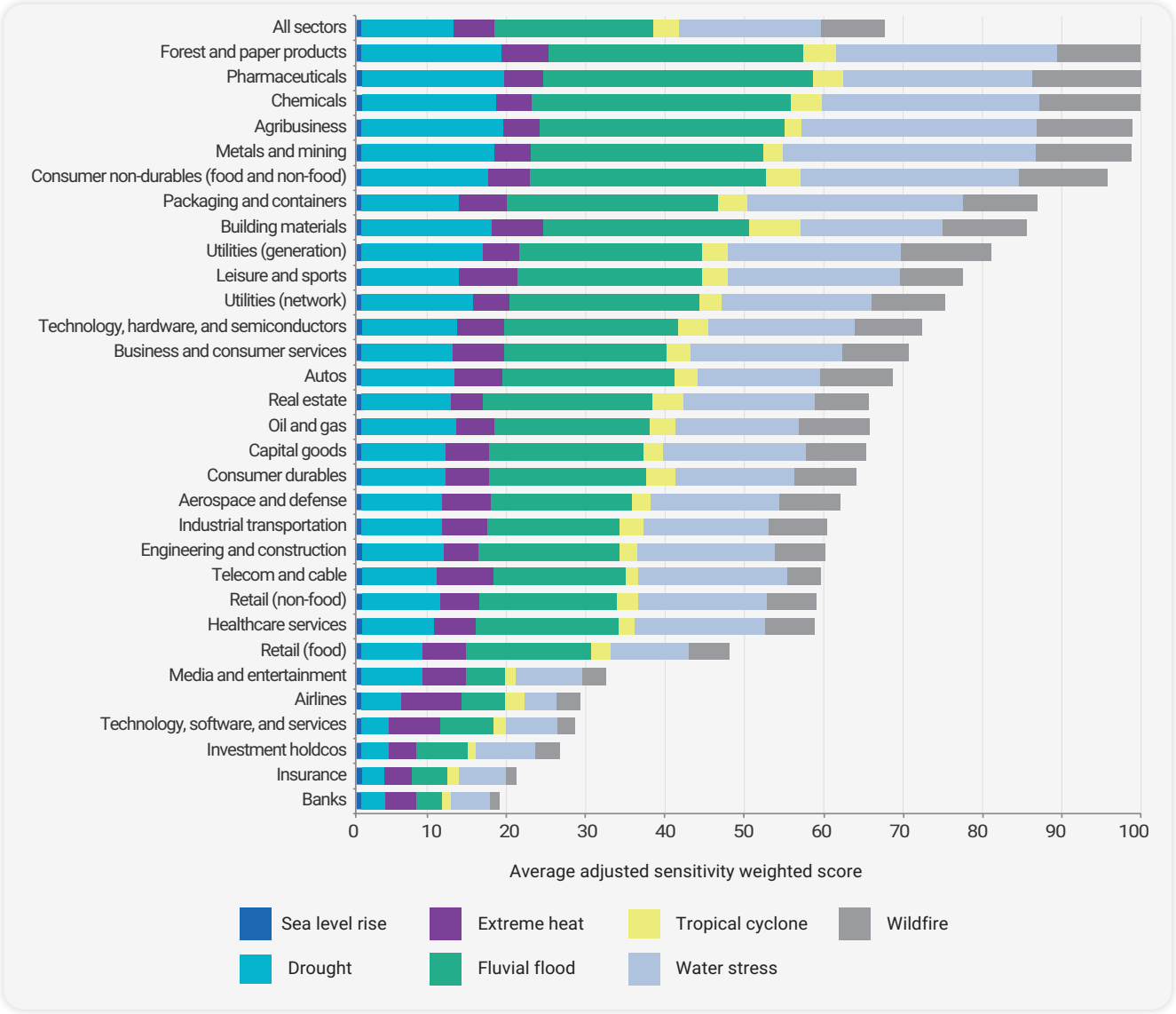
Why do adaptation solutions vary across sectors, and where are the opportunities for FIs?

Adaptation needs are closely tied to key climate risks, which differ by geographic location and hazard exposure (e.g., exposure to drought, flooding, sea level rise), and sector (as described at the beginning of Chapter 2). Each sector faces specific climate vulnerabilities. For instance, agriculture is highly susceptible to droughts, while transport may be prone to flooding (see **Figure 6**). **Vulnerability** - broadly, the economic damage a hazard event would cause relative to the value of exposed assets - also varies significantly across sectors. For the real estate and housing sector, the concentration of buildings and economic activity in urban areas means that damages can be extensive in monetary terms. For the agricultural sector, a reduction in agricultural productivity can lead to food insecurity and cause widespread disruptions to regional and international trade.

Different locations or communities will also be more or less sensitive to climate hazards and will have distinct adaptive capacities to respond to these events and to implement adaptation solutions (depending on the human and financial resources available). To ensure their effectiveness, adaptation solutions need to be targeted to addressing specific climate risks and the context of the sector and location where they are going to be implemented.

The sector-specific vulnerabilities described above can create diverse adaptation needs, which in turn open financing opportunities for FIs. Examples include investments in improved drainage systems (water sector), climate-resilient seeds (agriculture sector), flood-proofed buildings (real estate and housing sector), or decentralised energy solutions (energy sector). By understanding these differentiated needs, FIs can tailor products and strategies to support resilient growth across a range of sectors.

Figure 6: Sensitivity to climate hazards across sectors worldwide



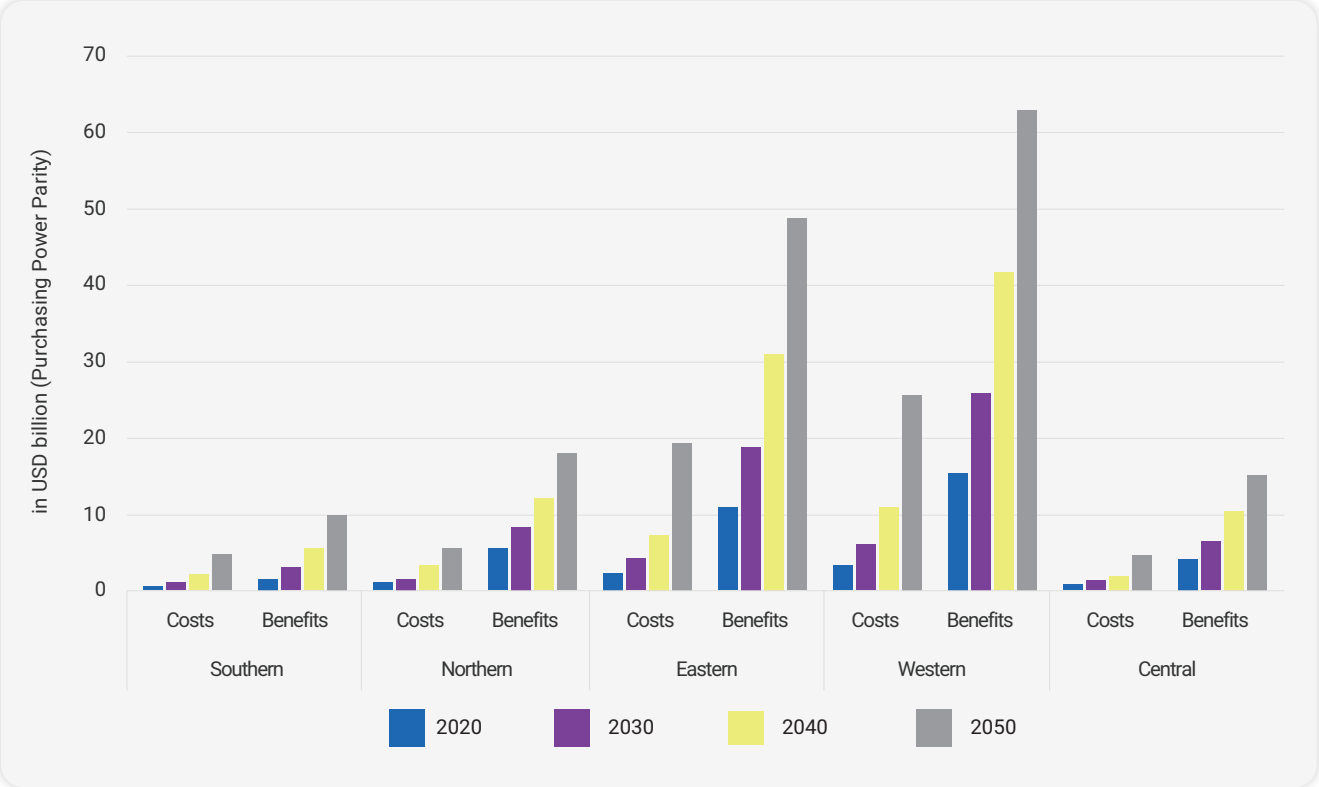
Source: S&P Global (2024).

How do the costs and benefits of investment in climate adaptation vary?

Both the costs and benefits of adaptation investments can vary significantly depending on local and contextual factors. The cost of implementing adaptation solutions is influenced by the availability and pricing of local materials, the technical capacity of service providers, and ongoing maintenance requirements. External factors, such as supply chain disruptions, dependency on a single supplier, taxation policies, or tariffs on imported technologies, can further affect overall investment costs. Likewise, the benefits of adaptation solutions depend on how effectively they reduce exposure and vulnerability to climate risks and on the intensity and frequency of climate hazard events over the investment lifecycle.

Figure 7 provides an example of the overall costs and benefits of climate adaptation investments in Africa in the high-warming scenario, exceeding 2°C by 2050 and heading towards above 4°C by 2100. It is possible to observe that, while the costs of adaptation investments increase between a factor of 2 and 5 from 2020 to 2050, the proportion of increase in the benefits is much higher, increasing between a factor of 5 and 8 in the same period. This reflects the fact that in the future, climate change is expected to worsen and, therefore, lead to higher risks.

Figure 7: Costs (represented by damages) and benefits of adaptation across African regions and time horizons in the high-warming scenario



Source: African Development Bank (AfDB, 2019).

Sector Factsheets

How to go from theory to application?

This section maps out climate risks to adaptation solutions for the **agriculture**, **forestry**, **energy**, **water**, **transport**, **housing and commercial real estate**, and **manufacturing** sectors. For sectors made up of numerous small or informal clients, such as agriculture, fisheries, or small-scale manufacturing, FIs may need to adopt a collective approach. This means working with groups of clients, such as cooperatives, producer associations, or community-based organizations, rather than expecting individual smallholders to identify and articulate their own adaptation needs. For example, in certain instances FIs have partnered with agricultural cooperatives to conduct joint climate risk screenings and design tailored financing products that support shared adaptation needs (e.g., irrigation systems, resilient seed varieties or storage facilities). This type of collective engagement helps to identify common adaptation needs and investment priorities across clients, reduces transaction costs, and makes adaptation solutions more scalable.

By presenting sector-specific factsheets, this chapter highlights relevant adaptation measures, identifies financing opportunities, and illustrates how benefits can be monetized within each sector. Each factsheet is structured to address:

- **The key climate hazards per sector (e.g., drought, flood, heatwaves)**
  This breaks down sector-specific hazards that need tailored adaptation solutions.
- **Types of adaptation solutions exist, and how they address specific risks**
  This bridges hazards with solutions to create climate-resilient outputs.
- **Real-world examples showing how adaptation benefits FIs and clients**
  This links adaptation solutions to the type of investment or financial product required and the benefits that can be achieved by implementing such solutions.

Climate hazards and associated adaptation solutions presented in the factsheets do not constitute an exhaustive list. The intent is to provide examples applicable to the sector and geographic context of FIs and their clients. Chapter 4 presents further details on the financial products that can be offered by FIs across the different sectors.

Agriculture

Table 5: Examples of climate hazards and impacts in the agriculture sector by location

Climate Hazards and Impacts	Examples by Location
Temperature	
Heat-related illnesses of livestock are increasing animal care costs. **Increase in pests** and invasive species (weeds, insects) outbreaks are increasing costs for pest control. **Increased water evaporation** and reduced soil moisture lead to higher water demands and deterioration and death of crops. **Increased heat stress** on employees working outdoors reduces harvest efficiency. **Shortened growing season** for some crops impacts the harvest yield.	In the State of Kansas, United States of America, it is estimated that every 1°C of warming leads to a decrease of corn, soy and wheat yields by up to 20% and reduces gross farm income by 7% More than 45 million hectares of crops are projected to suffer from significant heat stress (when temperatures surpass 32°C) in Africa. Crops like maize, wheat, beans and potatoes are more vulnerable to extreme heat conditions than crops like cassava and sorghum. These extreme temperatures are also projected to affect over 500 million people, particularly in the Sahel region, and 116 million heads of livestock (Consultative Group on International Agricultural Research, 2025). Heat stress in the Middle East and North Africa region is shortening the growing season and reducing the productivity of crops like wheat and barley (Gallas et al., 2025).
Water Stress and Drought	
The death of ground cover vegetation increases reliance on livestock feed. **Crop deterioration** or death results from a lack of water availability and reliance on crop irrigation.	Studies show that the global yields of maize, wheat and barley have decrease between 4% to 13% due to climate change impacts, particularly from droughts (Stanford, 2025).

Climate Hazards and Impacts	Examples by Location
Water Stress and Drought	
Reduced plant health increases susceptibility to pests and diseases, leading to reduced crop yields. **Lack of water availability** leads to high volumes of livestock offloading, reducing the market price for farmers. **Recurrent droughts** lead to human migration and conversion of forests for agricultural land. **An increase in food insecurity** and loss of livelihoods or employment leads to numerous human deaths. **Reduced crop and livestock productivity** leads to to an increase in product prices for consumers.	In Spain, two years of consecutive droughts and record temperatures caused a 50% decline in the olive crop, doubling olive oil prices globally (United Nations, 2025). In Tanzania, the agricultural sector accounts for 25% of GDP and 75-80% of workforce employment in the country. However, about 80% of agricultural production comes from low-input smallholder farms, which are predominantly rainfed and prone to droughts (International Monetary Fund [IMF], 2023). In Sudan, below-average rainfalls and prolonged dry spells resulted in a forecasted decrease in sorghum and millet production by about 25% and 50%, respectively, compared to 2022 (World Meteorological Organization [WMO], 2024). Countries like Morocco, Tunisia, and Jordan are facing severe water shortages, which impact irrigation and agricultural production (Hamed et al., 2025). The compound effect of drought and heatwave is projected to affect 500,000 km² of agricultural land by 2060.
Flooding/Extreme Precipitation	
Waterlogging of soils causes crop damage and death. **Erosion of topsoil** and loss of soil nutrients. **Runoff, including fertilisers and pesticides,** impacts the water quality of receiving water bodies. **The death of livestock** reduces financial yield for farmers. **Flooding and extreme rainfall** events restrict access for planting/harvest agricultural equipment. **Changing seasonal patterns** result in a shortened harvest window.	Research by the IMF (2020) finds that, globally, for every event of flood or drought, there is an increase in food insecurity of 5-20 percentage points. The 2022 floods in Pakistan affected around 2.67 million acres of Punjab's cropland and 287,000 hectares of cultivable land in the Khyber Pakhtunkhwa region (Khan et al., 2025). Across the Horn of Africa, heavy precipitation was linked to outbreaks of desert locusts, affecting up to 2.5 million people in 2020 and another 1 million in 2021 (WMO, 2022). A catastrophic cyclone in 2023 submerged extensive agricultural areas and inflicted severe damage on crops in Mozambique and Malawi (IMF, 2023; WMO, 2024a).
Sea Level Rise	
Saltwater intrusion impacts the suitability of land for growing or grazing. **Coastal erosion** causes loss of agricultural land.	Research shows that 77% of coastal areas below latitude 60°N will be affected by saltwater intrusion issues, with the sea level rise being the key factor (Adams et al., 2024). Egypt, Mozambique and Nigeria are the African countries projected to be most affected by the sea level rise by 2100 under a 4°C warming scenario (Nhantumbo et al., 2023), which will affect livestock and agricultural production (e.g., beans and squash).

Table 6: Examples of adaptation solutions in the agriculture sector

Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Digital Climate Advisory Services (DCAS), including weather and seasonal forecasts and farmer-to-farmer training.	**All climate hazards** (better prediction of weather conditions, particularly on extreme heat and drought).	Small to medium scale, depending on the number of smallholder farmers involved. DCAS can be a subsidised addition to existing financial products.	• Improved agricultural production (more robust revenue stream). • Climate-informed decisions on agricultural techniques, including harvesting and planting periods (avoided losses).
Research and Development (R&D) in climate-resilient seeds and crop diversity.	• **Extreme temperature** – intense heat conditions. • **Drought** – lack of water availability	Small to large scale, although it requires investments in R&D for the development of climate-resilient seeds. This could, for example, be financed through agricredit products and might require concessional/blended finance.	• Improved agricultural production (more robust revenue stream). • Reduction of exposure by diversifying crops (avoided losses). • Access to financial instruments such as index-based crop insurance.
Expand irrigation infrastructure and modernisation of technologies (incl. just-in-time irrigation).	• **Drought** – lack of water availability.	Small to medium scale, depending on the agricultural production area. This could, for example, be financed through asset finance and bundled loans with insurance.	• Reduced dependency on rainfall-fed agriculture technologies (more robust revenue stream). • Reduced water consumption (cost savings). • Increased crop yields (more revenues).
No-til farming techniques to minimise the impact of soil erosion and water loss	• **Extreme temperature** – intense heat conditions. • **Flooding –** events can erode soil and damage crops.	Medium to large scale, depending on the equipment used and the extent of agricultural fields. This could, for example, be financed through term loans or equipment leasing.	• Increased yields and soil health for future growing seasons (more robust revenue stream). • Reduction of OPEX costs during plantation (cost savings).
Improve market access and distribution of agricultural produce.	**All climate hazards**	Medium to large scale and can include developing storage facilities and distribution centres to ensure farmers' produce reaches the market. This could, for example, be financed through asset finance and bundled loans with insurance.	• Increased market access and sales (more revenues). • Reduction of agricultural losses during the transport of produce (avoided losses).

Examples of Investments in Agriculture Sector

Working Capital and CAPEX Investment in Climate-Resilient Seed Development in Türkiye

In May 2025, the European Bank for Reconstruction and Development (EBRD) provided a EUR 20 million loan to MAY Seed, a leading Turkish seed company, to strengthen its operations after the 2023 earthquakes and to accelerate climate adaptation in agriculture. The financing aimed to provide the working capital to restore supply chains and expand R&D for climate-resilient seed varieties. MAY Seed, which pioneered private-sector breeding programmes for stress-tolerant crops in Türkiye, is now scaling up production of seeds designed to withstand drought, heat, and other climate extremes. The investment also supports improvements in logistics and distribution, ensuring the timely delivery of resilient seeds to vulnerable regions. By reducing crop failure risks and stabilising food production, the initiative enhances food security and promotes climate-smart agriculture at scale. Furthermore, the project strengthens the company's long-term resilience and signals confidence in Turkey's seed sector as a hub for adaptation technologies.

Source: Adapted from EBRD (2025b).

Insurance for Smallholder Farmers

The Global Innovation Fund, which focuses on poverty and early-stage innovation, has invested US$ 3 million in a technology provider, namely, Agritask, that unlocks the design of insurance products that protect smallholder farmers upon the occurrence of extreme weather events, allowing them to increase productivity and uptake new technology. The software platform registers and maps small farms, obtains field and high-resolution weather data, and correlates it with plot-level productivity. This empowers agricultural companies to build climate resilience into their supply chain by assessing risks and designing targeted insurance products.

Source: Johnstone, Z. (2022).

Scaling Up Adaptation Solutions in the Agriculture Sector in Tanzania

The Tanzania Agriculture Climate Adaptation Technology Deployment Programme was established to increase access to agricultural technologies for climate adaptation for local farmers and agricultural enterprises. This was supported by US$ 100 million concessional finance from the GCF and an additional US$ 100 million financed by CRDB (an African commercial bank). This created a credit line to ease lending for smallholder farmers looking to invest in adaptation and resilience technologies. A partial credit guarantee facility was also created to help CRDB cover any losses and overcome several challenges, including the high credit risk of clients and subsequent high interest rates that smallholder farmers and SMEs cannot afford.

Source: GCF (2021).

Forestry

Table 7: Examples of climate hazards and impacts in the forestry sector by location

Climate Hazards and Impacts	Examples by Location
Wildfires	
Destruction and damage of trees reduces timber yields, causing biodiversity and habitat loss and reducing tourism. **Compromised health of trees** increases susceptibility to pests and diseases. **Burning of timber** releases stored GHG, affecting ecosystem services (carbon sequestration). **Destruction of forest habitats** leads to forced shifts to migratory patterns. **Decreased timber supply** impacts the supply chain and increases consumer prices.	Global tropical forest losses reached a record high of 6.7 million hectares in 2024, with half of this because of wildfires (WRI, 2025a). Several wildfires were recorded in July 2024 in central and eastern Algeria, resulting in at least 44 deaths, the evacuation of more than 1,500 people from their villages, and the burning of 32,000 hectares of forest (WMO, 2024b). In 2024, Greece recorded more than 9,500 wildfires, corresponding to 42,000 hectares of land burned. This has led to significant biodiversity and ecosystem degradation, particularly in protected natural areas (Wendt, 2025). In 2025, Spain experienced its worst wildfire season in decades, with over 340,000 hectares scorched (Murcia Today, 2025).
Extreme Temperatures	
An increase in pests and invasive species (weeds, insects) outbreaks increases costs for pest control. **Increased evapotranspiration** through leaves increases demand for water. **High temperatures** increase seedling mortality or reduce tree growth rates. **Increased heat and changes to water availability** impact typical species growth and changes to land cover and landscape. **Lower regeneration and survival** of species due to decreased plant health.	Temperature changes present a negative contribution to the wider region's net primary productivity trend (World Bank, 2024). Glacial retreat on Mount Kilimanjaro has already resulted in changes in land cover (from montane forest to heathland) and species composition (World Bank, 2024).
Drought	
Long-term lack of water availability increases tree mortality. **A reduction in growth rates** reduces productivity in the timber industry.	In the Amazon, more intense and frequent drought events have increased tree mortality by 55% and, by 2100, it is projected that 'hot drought' conditions will happen 150 days per year (University of California, Berkeley, 2025).

Climate Hazards and Impacts	Examples by Location
Compromised tree health increases susceptibility to pests and diseases, resulting in tree death and biodiversity loss. **Lack of water** increases susceptibility to wildfires. **Increased costs for forest maintenance** and restoration.	Changes in suitable habitats in Tanzania are expected to fragment remaining forests and diminish their ecosystem services. Montane forests are expected to lose 47-64% of their suitable habitat extent by 2085 under the RCP 4.5 and RCP 8.5 scenarios, respectively, while microhabitat forests could lose more than 70% of their habitat. Woodland vegetation the country's most extensive forest type could lose close to 5% of its suitable habitat (World Bank, 2024). Changes to the region's forests are expected to cause shifts in spatial distributions of wildlife habitats, including the transboundary Selous-Niassa, Udzungwa-Ruaha and Muhezi-Swagaswaga corridors, which serve as important migratory routes for key species in Southern Africa (World Bank, 2024).
Flooding / Extreme Rainfall	
Waterlogging of soils reduces root stability and increases the risk of tree uprooting. **Soil erosion reduces soil nutrients** and impacts root stability, resulting in tree uprooting or safety risks. **Accessibility impacts for logging equipment and machinery** lead to operational delays.	Increasing temperatures and heavy rainfall are expected to shift the suitable ranges of plant and wildlife species, with detrimental impacts for some native species, threatening important ecosystem services and tourism revenue (IMF, 2023). The 2021 floods in British Columbia, Canada damaged forest roads and disrupted timber transport, causing millions in losses for the forestry industry and delaying harvest operations (CityNews Vancouver, 2021). In the Mantadia National Park in Madagascar, a study found that deforestation can increase water runoff by 4.5 times (World Bank, 2010).

Table 8: Examples of adaptation solutions in the forestry sector

Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Investment for ecosystem/ forest restoration, sustainable land management, and diversification of tree species.	• **Drought** – lack of water availability. • **Extreme Temperatures** – Pest and disease prevalence and heat tolerance.	Medium to large, depending on the size of the business. Relevant to timber and agroforestry businesses, forestry management organizations and governmental departments. This could, for example, be financed through long-term loans or project finance.	• Improved resilience to drought, pests and disease, heat, and wildfires (avoided losses). • Increased carbon capture and potential to access carbon markets (more revenues).
Mangrove conservation and restoration.	• **Flooding** – increase in sea level rise and wave overtopping on shorelines.	Medium to large scale, depending on area size/ landscape. Requires extensive stakeholder engagement and support for maintenance. Possible investments in land acquisition. This could, for example, be financed through long-term loans, project finance and might require blended finance for community-led components.	• Reduced flood damage (avoided losses). • Improved natural ecosystem (co-benefits). • Enhanced livelihoods of local communities (more revenues). • Support for biodiversity and habitat creation (co-benefits).
Selective thinning of vegetation, combined with controlled burns	• **Wildfires –** help minimise the intensity of wildfires.	Small scale. It requires little labour and simple trimming equipment but is relevant for forest management organizations. This could, for example, be financed through equipment leasing or small operational loans.	• Reduced damage from wildfires (avoided losses).

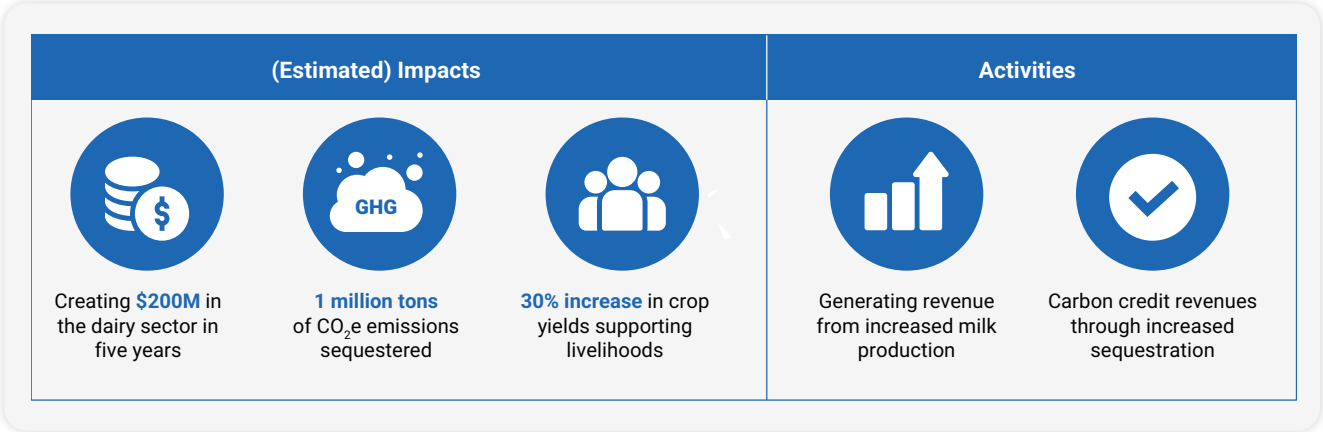
Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Training and education for sustainable forestry management practices, sustainable use of biodiversity, and responsible governance of natural resources.	• **Drought** – lack of water availability. • **Extreme Temperatures** – Pest and disease prevalence. • **Flood** – Impacts of erosion.	Small to medium scale, depending on which stakeholders are involved (e.g., smallholder farmers, government agencies related to agriculture, forestry and water). This may include timber and agroforestry businesses, forestry management and conservation organizations, and governmental departments. This could, for example, be financed through microloans, working-capital loans, or embedded in long-term loans.	• Protected and restored natural environment and biodiversity (co-benefits). • Reduced costs associated with management, damages and losses (cost savings). • Improved behaviour and increased number of visitors to natural parks and conservation areas (more revenues).

Examples of Investments in Forestry Sector

Sustainable Land Management in Kenya

The Livelihoods Mount Elgon project is in the Western part of Kenya, in the provinces of Mount Elgon, Bungoma, and Trans Nzoia. These regions faced the challenges of deforestation and unsustainable agricultural practices, causing significant negative impacts to soil conditions, biodiversity and sedimentation downstream of water bodies. As a result, private companies (including Brookside Dairy, a local company 40% owned by Danone) set up an impact investment fund (The Livelihoods Carbon Fund) to invest in biodiversity conservation, agricultural productivity and dairy value-chain development and improved the risk profile of investments. Specific interventions included the provision of training on Sustainable Agriculture Land Management (SALM) practices to 30,000 farmers and the support of 15 dairy production cooperatives with the aim of strengthening the resilience of their services.

Ultimately, the project's objective was to contribute to reducing deforestation and improving agricultural practices. Other benefits provided through this project were the preservation of biodiversity, improved quality of water resources, and enhanced soil fertility. The revenue increase from milk and dairy products using more sustainable SALM practices was estimated at US$ 200 million in five years a fivefold rise. Furthermore, the project accessed carbon credits through Gold Standard and Verra schemes, sequestering 1 million tons of CO_2, and having an additional climate mitigation co-benefit.



Source: Adapted from World Wide Fund for Nature (WWF, 2020).

Energy

Table 9: Examples of climate hazards and impacts in the energy sector by location

Climate Hazards and Impacts	Examples by Location
Water Stress and Drought	
Reduced water levels or competing water demands in dams impact the operational capacity of hydropower systems. **Impacted cooling processes** for thermal power plants due to reduced water availability. **Reduced energy output** results in higher energy costs for consumers.	Increased rainfall variability is likely to affect electricity prices in countries worldwide with a high dependency on hydropower (Trisos et al., 2022). In Brazil, hydropower dams in the Southeast-Midwest region are operating at 21% lower capacity compared to previous years due to extended drought periods (Brazil Energy Insight, 2024). In Tanzania, prolonged droughts have caused adverse economic impacts, including the reduction in hydropower capacity, with hydropower accounting for ~37% of electricity generation capacity. Dry spells in 2015 led to a near cessation of the Mtera dam (IMF, 2023).
Extreme winds / cyclone	
Damage to overhead power transmission lines and poles. **Increased risk of wildfires** due to fallen powerlines.	In 2021, Typhoon Odette in the Philippines cut off 269 municipalities from their energy supply. It caused network disruptions and reported damages of Philippine peso 373 million (Crismundo, 2021), which is about US$ 6.3 million. After the occurrence of Cyclone Idai in Mozambique in 2019, Zimbabwe Electricity Transmission and Distribution Company reported damage to almost 230 km of transmission lines and 40 substations, representing a recovery and repair cost of US$ 3.7 million (Global Facility for Disaster Reduction and Recovery [GFDRR], 2019).

Climate Hazards and Impacts	Examples by Location
Extreme temperatures	
Degradation and deterioration of equipment and infrastructure lead to higher replacement and repair costs. **Reduced efficiency of supply** infrastructure during hot weather. **Increased periods of high energy demand** and consumption for cooling lead to exceedances in supply/production capacity during hot weather. **More frequent brownouts and blackouts** due to high energy demand. **Reduced efficiency of power plants** reliant on water for cooling leads to higher costs and reduced output.	Given the increase in temperature and number of hot days, countries will require additional cooling that exceeds the capacity/efficiency of evaporative coolers. They will need to consider the extra energy demand for cooling (Parkes et al., 2022). The International Energy Agency (IEA) estimates that by 2050, the global electricity demand for cooling will represent 37% of the total electricity demand growth, double current levels (IEA, 2018). In the UK, heatwaves in 2006 disrupted the energy and agriculture sectors and caused market swings; colder temperatures in 2010 and 2011 led to an increase in the consumption of energy and supply chain disruptions, affecting the stock market and causing instability (MetOffice, 2012)
Flooding	
Damage to energy supply and transmission infrastructure results in power outages for communities and industry. **Infrastructure damage and disruptions** to energy supply due to overtopping and malfunctioning of reservoirs and spillway gates.	Hurricane Sandy in 2012 caused severe flooding events in New York City, disrupting the access of energy to millions of customers and showing the vulnerability of the electricity grid (Department of Energy, 2013). In Tanzania, a post-disaster assessment shows that the 2019 Tanga flood severely impacted critical infrastructure, including the water supply system, electricity networks, roads and bridges, schools, hospitals, and residential buildings, as well as various equipment. Direct damages and losses were estimated at US$ 19 million (IMF, 2023). Based on EM-DAT data, Tanzania was affected by 46 floods between 1980 and 2020. Heavy rainfalls in 2017 and 2020 threatened the structure of dams (IMF, 2023).

Table 10: Examples of adaptation solutions in the energy sector

Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Improve access to small-scale sustainable energy sources to reduce reliance on grid energy and burning of biofuels.	• **Drought** – Reliance on hydropower, water-cooled thermal power, and availability of biofuels. • **Extreme temperature** – Exceedances of grid capacity, increased blackouts and brownouts.	Small-scale implementation but requires reasonable capital investments to provide self-contained renewable energy for the community, industry, and businesses. This could, for example, be financed through project finance, term loans or blended finance when community-based.	• Improved redundancy, reducing pressure on the grid reliance on hydropower, limiting brownouts and blackouts (more robust revenues). • Reduced pollution and emissions due to the burning of biofuels (co-benefits). • Improved community access to electricity (more revenues).
Cooling measures to reduce heat stress, such as cold storage.	• **Extreme temperature** – Exceedances of grid capacity, increased blackouts and brownouts, and degradation of infrastructure.	Smaller-scale investments to improve the efficiency of buildings. Relevant to the community, industry and businesses. This could, for example, be financed through PAYG asset finance, equipment leasing, or short- to medium-term loans.	• Reduced risk of heat-induced damage (avoided losses). • Reduced maintenance and repair costs (cost savings). • Flattening of energy demand peaks. • Improved energy efficiency of buildings, reducing consumption (cost savings).
Adaptation and/or relocation of key energy transmission and supply infrastructure, including back-up power solutions.	• **Flooding** – Damage to the power supply. • **Extreme winds/ cyclones** – Infrastructure damage and flow-on risks.	Large-scale investments to determine high-risk infrastructure and adapt or relocate. Factoring costs for downtime and alternative supply. Applicable to energy/ utility providers and government departments. This could, for example, be financed through longer-term loans and public-private partnerships.	• Reduced damages and costs following a hazard event or disaster. • Improved community recovery with continued energy supply.

Examples of Investments in Energy Sector

Promoting Access to Small-scale Sustainable Energy in Tanzania

The REDAVIA Solar Farms project in Tanzania developed solar farms as an adaptation solution to provide access to energy for rural communities that were often cut off due to disruptions in energy supply or did not have access to energy. It focused on the deployment of containerised, fully assembled 87 kWp solar farms in remote communities to ensure the provision of reliable and competitively priced power to isolated SMEs and households. Besides promoting more access to energy, this initiative also contributes to reducing emissions of GHGs and other health and environmental impacts of using fuels like diesel and kerosene. InfraCo Africa provided an initial investment to this project and, considering other co-investments, the investment reached a total of US$ 2 million. The project will also provide this solution for the Commercial and Industrial sector, ensuring better predictability of cash flows and promising returns. It is expected to generate 3 MWp of clean power, benefiting 9,400 people and reducing energy costs by 20-30%.

Source: Adapted from WWF (2020).

Energy Transition and the Private Sector: Sindila Hydropower Plant

The Sindila Hydropower Plant Project in Uganda (with a capacity of 5.25 MW) is an example of integrating private sector investment in renewable energy infrastructure to address the country's growing electricity demand. Uganda, with a population expected to double by 2060, faces significant challenges in meeting its electricity needs, with only 42.1% of the population connected to the national grid in 2019.

Developed by Butama Hydroelectricity Company Ltd, under the Global Energy Transfer Feed-in Tariff (GET FiT) programme, the Sindila Hydropower Plant is one of 17 small-scale renewable energy projects aimed at increasing Uganda's energy production by 20% and reducing carbon emissions. The project, located on River Sindila, Bundibugyo District, produces approximately 26 GWh of energy annually and operates under a 20-year power purchase agreement with Uganda Electricity Transmission Company Limited.

The project faced several climate-related challenges, including landslides triggered by heavy rainfall during construction, which caused delays and financial impacts. Innovative solutions, such as a zipline system for material transport, were implemented to reduce the risks of climate change during the construction stage of the project. Environmental and social best practices were adopted, including support for the adjacent Rwenzori Mountains National Park to reduce biodiversity impacts. However, drought (or hydrological) risk, now a primary concern to the project due to the variability of water levels in the Sindila River, materialised during the first year of operation. This led to a significant reduction in expected energy generation.

The Sindila Hydropower Plant exemplifies the need to develop detailed climate risk assessments to create a better understanding of the impacts of climate change during the asset's lifetime and how they can be shared between the public and private partners. It also raises discussion about the need to consider climate projections in the definition of force majeure events, which are often defined as 'one-in-20' or 'one-in-100' year events, but in the future might become the 'new normal' and not necessarily an unforeseen event.

Source: Adapted from GCA (2023a).

Water

Table 11: Examples of climate hazards and impacts in the water sector by location

Climate Hazards and Impacts	Examples by Location
Extreme Temperatures	
A higher rate of evaporation results in greater water losses. **Increased water temperatures** cause a rise in waterborne diseases, bacteria and algae blooms. **Increased strain on the water treatment system** reduces water inflow quality. **Reduced efficiency of water treatment systems** leads to higher operational costs and lower outputs. **Higher temperatures reduce water oxygen levels,** leading to the death of aquatic life. **Increased concentration of pollutants** and nutrients in water results in impacts on aquatic life and human health.	Above 2°C of global warming, seasonal transmission and distribution of vector-borne diseases are projected to increase, increasing exposure to tens of millions more people (Trisos et al., 2022). At 2°C of global warming, 36% of freshwater fish species would be vulnerable to local extinction (Trisos et al., 2022). In the Hindu Kush Himalaya region, which feeds major rivers like the Ganges and Brahmaputra, 70-80% of current glacier volume is projected to disappear by 2100 unless global warming is limited to 1.5°C (Aegir, 2025).
Water Stress and Drought, including Decreased Precipitation	
Reduced availability of water resources. **Increased reliance on and depletion** of alternative water sources (such as groundwater). **Impacts on water-based tourism** due to the increased occurrence of drought. **Higher concentrations of pollutants** and nutrient load reduce water quality and impact aquatic life. **Higher mortality of aquatic life** impacts income streams and livelihoods of communities. **Habitat loss due** to a reduction in water flows and storage volumes.	Between 2020 and 2021, droughts affected over 1.4 billion people and caused US$ 170 billion in economic losses worldwide (United Nations Educational, Scientific and Cultural Organization, 2024). In the Amazon Basin, water levels reached a record low in 2023 and 2024, leading to a mass loss of biodiversity and disrupting the supply of drinking water (United Nations [UN], 2025b). Extensive droughts in Somalia, caused by four consecutive seasons with a lack of rain between 2016 and 2017, led to US$ 41.5 million in damages to the water supply and sanitation sectors (GFDRR, 2017b). In 2019, tourism represented Tanzania's largest foreign exchange earner, the second largest contributor to its GDP, and the third largest contributor to employment. However, with rising temperatures and increased frequency and intensity of droughts, wetlands and riverine systems are increasingly at risk of being converted to other ecosystems and lose the services they provide to tourism (IMF, 2023).

Climate Hazards and Impacts	Examples by Location
Flooding / Extreme Precipitation	
Potential damage or collapse of water infrastructure assets results in costly repairs and lengthy disruptions to the treatment and supply of water. **Increased concentration of sediment** and pollutant load in receiving waterways increases the strain on water treatment facilities. **Exceedance of sewerage system capacity or destruction of sanitation infrastructure** leads to contamination and an increase in the outbreak of disease and illness. **Spread of vector-borne diseases** impacts human health. **Exceedance of operational capacity** for water treatment systems due to extreme rainfall and flooding.	Flooding from Hurricane Harvey in 2017 damaged over 2,300 out of 4,500 drinking water systems in Texas and left around 800 wastewater treatment plants partially or fully non-operational (Environmental Protection Agency, 2017). The 2022 floods in Pakistan impacted 33 million people across 72 districts, destroying up to 50% of water systems in hardest-hit regions (UN, 2023). On 15 October 2023, heavy rainfall in Ghana forced the Volta River Authority to initiate the spillage of excess water to address rising levels threatening the Akosombo and Kpong dams, resulting in flooding downstream along the banks of the Volta River and the destruction of homes and farmlands (WMO, 2024b).

Table 12: Examples of adaptation solutions in the water sector

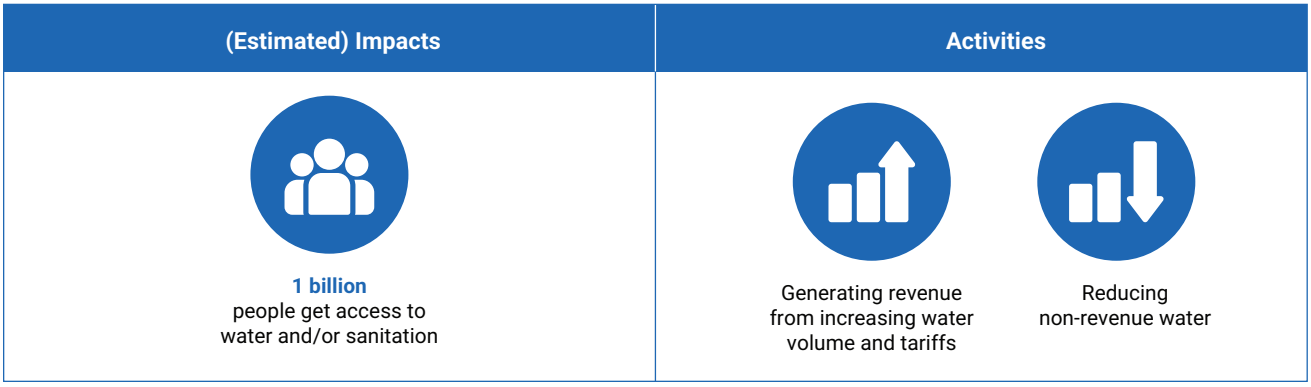
Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Improve and expand drainage and stormwater infrastructure	• **Drought/ Precipitation** – water accessibility, system losses. • **Flooding** – exceedance of operational capacity, spread of vector-borne diseases, contamination of water and outbreak of disease and illness.	Large-scale investments to improve the capacity of stormwater infrastructure and the reliability and efficiency of water conveyance infrastructure. This includes upgrades to existing infrastructure. Applicable to water utility companies, drainage for corporate industrial areas and relevant government departments. This could, for example, be financed through public-private partnerships (PPP), project finance, and public finance.	• Reduced damage to assets, business interruptions, and risk of contamination (avoided losses). • Reduced system losses and increased access to treated water (avoided losses and more revenues). • Reduced occurrence of vector-borne diseases due to better conveyance of stormwater (co-benefit).

Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Improve and expand water supply and treatment infrastructure, including desalination plants.	• **Extreme temperatures** – increase and spread of vector-borne diseases, bacteria and algae • **Drought/** • **Precipitation** – reduced water quality, water availability • **Flooding** – exceedance of sewerage system and operational capacity	Small- to large-scale investments to expand and optimise water treatment capabilities through technological improvements, facility expansion, and operational improvements. Applicable to water utility companies, manufacturers, industries, and hotels, as well as relevant government departments. This could, for example, be financed through equipment loans, PPP, project finance, and long-term loans.	• Improved accessibility of water supply to households and businesses (more revenues). • Reduced health risks and occurrence and spread of vector-borne disease, bacteria and algae growth (co-benefit). • Improved water quality and availability (reduced costs). • Reduced risk of contamination during a flood event (avoided losses).
Water savings, loss reduction, and recycling technologies (incl. rainwater harvesting)	• **Drought/Precipitation** – water availability, system losses, reliance on alternative water sources. • **Flooding** – risk of contamination. • **Extreme temperature** – system losses, strain on the water treatment system due to availability, and the concentration of pollutants in the inflow.	Opportunities include self-contained re-use systems or large-scale water reticulation facilities in urban settings. Applicable to water-intensive businesses, industries, and households. This could, for example, be financed through co-op lending (when it involves multiple SMEs), equipment loans and term loans.	• Improved efficiency of water resource usage (cost savings). • Redundancy for water supply provisions (more robust revenues). • Closed recycling system reduces risk of contamination with sewage during flood events (cost savings).
Investments in meteorological and hydrological services (MHSs) to enhance data collection, improve forecasting capabilities, and multi-hazard early-warning systems (MHEWS)	**All climate hazards** (depending on characteristics of the MHSs and MHEWS).	Large scale and requires integration of national MHSs to expand the network of hydro-meteorological stations and to establish MHEWS, including building capacity to operate these systems and to ensure adequate funding for maintenance. This could, for example, be financed through PPPs, public finance, concessional loans or grants, e.g., through disaster-risk reduction funding windows.	• Improved preparedness for disaster events (avoided losses). • Improved forecasting capabilities, reducing damage costs (cost savings). • Ability to plan and resource emergency and response services (avoided losses).

Examples of Investments in Water Sector

Innovative Financing Mechanisms for Water Supply and Treatment in Kenya

The Kenya Pooled Water Fund (KPWF) project aims to address the need to improve water and sanitation networks and access to sewage services in Kenya, particularly due to the increasing demand for water and the impacts of climate change. KPWF provides long-term financing to water service providers for essential sanitation infrastructure projects through issuing long-term bonds and credit enhancements to Kenyan institutional investors. Projects include establishing new water connections and enhancing sanitation infrastructure to improve water management, reduce non-revenue water, and promote resilience to climate change.



Source: Adapted from WWF (2020).

Climate Resilience in the eThekwini Wastewater Treatment Plant

The eThekwini Wastewater Treatment Works (WWTWs) project in South Africa is a PPP under the design, build, finance, operate, and maintain model for two regional greenfield WWTWs located in uMdloti and uMkhomazi, which will replace six existing WWTWs operating at full capacity. Its objective is to enhance service levels, increase water resource availability, and promote energy and operational efficiency. It also contributes to addressing the impacts of climate change in the water sector. The PPP contract will run for over 32 years, with construction starting in 2022 and commissioning in 2024. The International Finance Corporation from the World Bank Group serves as the lead transaction advisor, and Haskoning serves as the technical, environmental and social consultant to the project.

Climate resilience is a central focus of the eThekwini WWTW PPP, integrated at various stages of the project cycle. The feasibility study explicitly considers climate resilience, assessing the impact of climate change on wastewater inflows, average dry weather flow, and peak wet-weather flow. The studies recommended a climate change impact assessment to evaluate the climate hazards and risks to the project and its GHG emissions, to define appropriate adaptation solutions. Output specifications in the PPP procurement documents will ensure the implementation of climate resilience measures, including volumetric and quality requirements for treated effluent and on-site energy generation.

Source: Adapted from GCA (2023a).

Transport

Table 13: Examples of climate hazards and impacts in the transport sector by location

Climate Hazards and Impacts	Examples by Location
Flooding/Extreme Precipitation	
Soil erosion leads to pavement cracking and other damage, increasing delays and repair costs. **Potential damage or collapse of bridges** results in costly repairs and lengthy transport disruptions. **Supply chain shortages due to transport disruptions** impact the distribution of materials and products. **Flood waters may erode riverbanks** and cause damage to jetties, mooring points or ports, requiring repair or replacement. **Flooding may result in the isolation of communities** and restrict access to schools, hospitals and essential goods. **Exceedances of stormwater drainage capacity** lead to localised flooding of the corridor. **Deep water on road corridors** leads to the risk of aquaplaning and vehicle collisions.	In the United States of America, climate-related damage to roads may cost up to US$ 20 billion by 2100, with up to US$ 10 billion more being required for climate-proof upgrades (Pew, 2024). In February 2023, the White Nile River in South Sudan reached record high levels, prolonging flooding that had continued since 2020, rendering basic needs such as food, clean water and healthcare difficult to access, and contributing to the near collapse of local livelihoods (WMO, 2024b). Flooding and cascading landslides in Sierra Leone in 2017 led to the collapse of eight bridges in the Regent–Charlotte water and damage to 6 km of road assets, representing a total damage of US$ 0.97 million (GFDRR, 2017a).
Extreme Temperatures	
Softening and bleeding of asphalt surfaces leads to rutting and potholing. **Warping or buckling of railway tracks** leads to long-term disruptions to services. **Overheating of transportation vehicles and equipment** may reduce the efficiency of the transportation system.	Extreme heat damage to transport infrastructure in the UK is around US$ 300 million every year (Council on Foreign Relations, 2024). By mid-century, heatwave exposure to European transport infrastructure could increase by up to 70 times, and wildfire exposure up to 42 times, compared to historical levels (Deidda et al., 2025). In 2021, Egypt experienced some of the hottest weather in the past 50 years. For several weeks, temperatures were up to 7°C above average, along with high humidity. Temperatures exceeded 40°C in many areas and up to 47°C. Cairo experienced power outages and several closures of the metro transport system (Mikhail G., 2021).

Climate Hazards and Impacts	Examples by Location
Extreme Winds/Cyclones	
Damage to infrastructure, including high-voltage rail power lines, signalling and communication equipment, increases delays and downtime for repairs. **Damage to operational systems** may increase the risk of vehicle incidents. **High winds may result in the overturning** of vehicles or the derailing of trains leads to vehicle damage or injury to passengers. **Temporary closures** of roads and airports due to extreme events.	Cyclone Amphan, which hit India and Bangladesh in 2020, caused extensive damage to 1100 km of road and 200 bridges and culverts, causing US$ 11 billion in damages (Times Now, 2020). The Vietnam Road Administration (Ministry of Construction) estimates that the 2025 flood caused over 551.6 billion Vietnamese đồng (~ US$ 21 million) (Vietnam.vn, 2025). In January 2022, Cyclone Ana brought heavy rain, strong winds, and flooding to Madagascar, Mozambique, Malawi and Zimbabwe. It was followed by Batsirai, an even stronger tropical cyclone. These storms displaced tens of thousands of people, destroyed infrastructure and flooded farmlands, further exacerbating food insecurity (GCA, 2023a).
Drought	
Lower water levels in rivers and lakes limit transportation/vessel capacity and impact access to markets and trade points.	Low water levels in the Panama Canal plummeted transit by more than one-third of usual volumes, causing significant global supply chain disruptions (UN, 2025b). The 2018 Rhine River drought alone caused EUR 2.4 billion in economic losses in Germany due to disrupted inland shipping (Deidda et al., 2025).

Table 14: Examples of adaptation solutions in the transport sector

Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Incorporate climate risks into the design and the operations and maintenance (O&M) of transportation assets and facilities to withstand the impacts of specific hazard events.	**All hazards** – damage and disruptions due to climate hazards	Large-scale investments requiring review of existing design and O&M procedures to identify areas for improvement. Applicable to transport authorities, industry and governmental departments. This could, for example, be financed through long-term loans and PPP structures.	• Reduced damage from climate hazards (avoided losses). • Reduced O&M costs during the asset lifetime (cost savings). • Increased availability of the road infrastructure (more reliable revenues). • Improved resilience of the transport network and availability of service for trade (more reliable revenues).
Relocation of infrastructure assets and/or equipment out of hazard-prone areas.	• **Flooding** – restricted vehicle access, safety risks. • **Extreme temperatures** – overheating of assets and equipment. • **Extreme winds/ cyclones** – infrastructure damage, vehicle incidents, overturning of vehicles and derailing of trains.	Small-scale investments to identify suitable evacuation locations and procedures. Applicable to transport authorities, industry and relevant businesses. Reliant on reliable forecasting services. This could, for example, be financed through project finance, PPPs or equipment loans.	• Reduced asset damage/loss and replacement costs due to the event (avoided losses). • Reduced risk of personal injury (co-benefits). • Avoided losses from disruptions caused by damage or collapse of transport infrastructure (avoided losses).

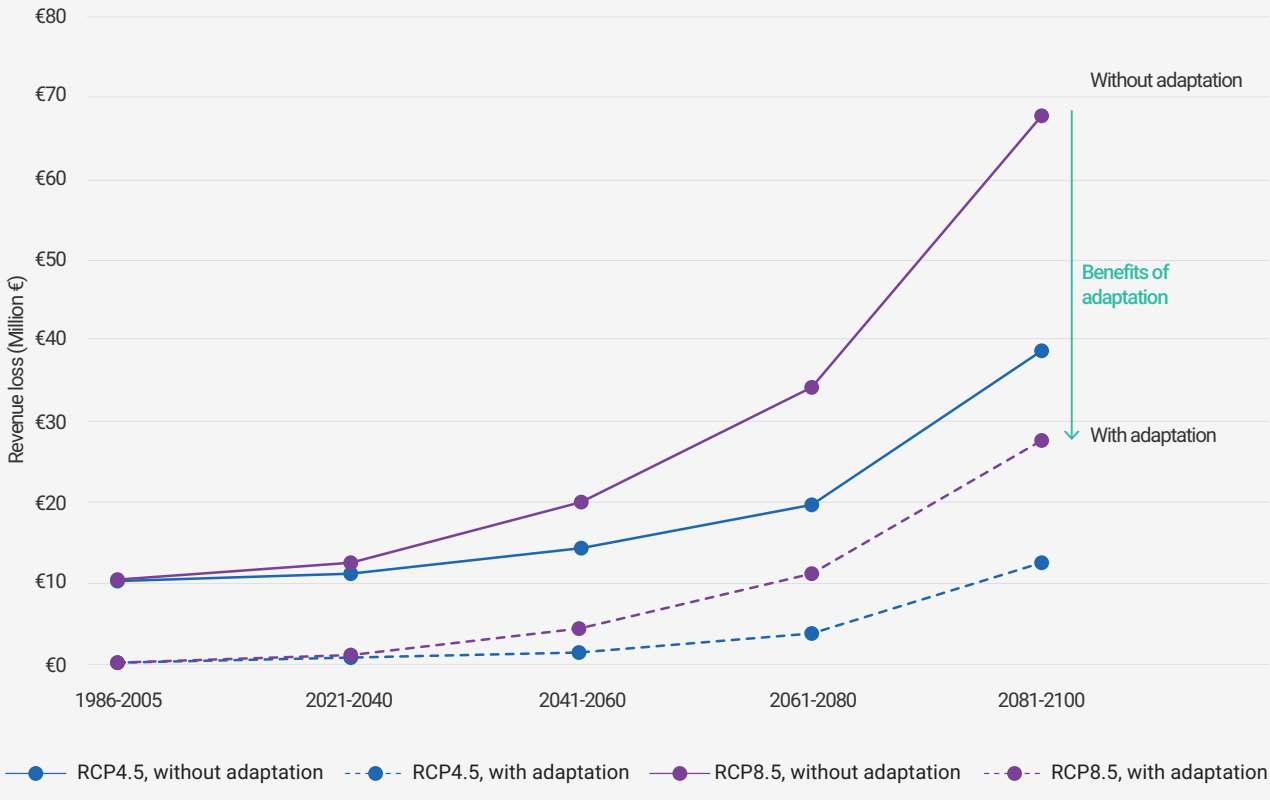
Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Riverside/ embankment protection	**Flooding** – damage and destruction of bridges, erosion and possible embankment failure, erosion of riverbanks and destruction of jetties, mooring points and ports.	Scale of investment dependent on scope and scale of high-risk areas. Protections including revegetation, anchors and regrading. Applicable to governmental departments, port authorities and the relevant industry. This could, for example, be financed through long-term loans, project finance, PPPs or be supported by public sector funding, e.g., nature-based components.	• Reduced vulnerability to flooding (avoided losses). • Improved water quality through reduction of debris and sediments (cost savings). • Reduced soil erosion and damage to infrastructure assets (avoided losses). • Reduced recovery time following the event (avoided losses).

Examples of Investments in Transport Sector

Adaptation Investment Prioritisation for the Port of Cotonou in Benin

Under the Africa Adaptation Acceleration Program, GCA has supported the AfDB and the Port Autonome de Cotonou, Benin, to enhance the climate resilience of the Port of Cotonou within the US$ 106.5 million investment from AfDB and other partners in the Port of Cotonou Renovation, Modernization and Expansion Public Private Partnership Project. GCA's support enabled the development of a detailed climate risk assessment that quantified the impacts of climate hazards on port assets and operations. The project included the appraisal of economically viable climate adaptation solutions, including physical, social and institutional interventions. Besides the benefits in reducing the impacts of climate change, these solutions were also aimed at improving the livelihoods of Cotonou's fishery community.

The adaptation investments prioritised are expected to increase cargo volume handled annually from 10.1 to 13.5 metric tons, fostering the import/export of agricultural inputs and farm produce, contributing significantly to GDP growth in Benin, where port revenues account for 45% of the economy. Furthermore, the adaptation investment rationale developed through this project was critical to supporting the AfDB and the Port Autonome de Cotonou to access a total amount of US$ 18.3 million from the Canada-African Development Bank Climate Fund to finance the implementation of adaptation and resilience investment options prioritised.



Source: Adapted from GCA (n.d.) and AfDB (2023).

Increasing Flood Resilience for the Dar es Salaam Bus Rapid Transit System in Tanzania

The Dar es Salaam Bus Rapid Transit (BRT) project in Tanzania aims to improve urban mobility and economic resilience in the face of climate change. Dar es Salaam faces severe infrastructure pressures due to rapid population growth and frequent hazard events, particularly flooding, with damages to transport infrastructure projected to reach US$ 104 million per year by 2080. Furthermore, additional costs from disruptions to the transport system are estimated to be between US$ 5.6 and 25 million per event for a 2 mm/hr rainfall event and between US$ 54 and US$ 130 million for a 14 mm/hr rainfall event.

The city's public transport system, primarily consisting of privately-owned minibuses, is overburdened and under-maintained, contributing to high congestion and long travel times. The BRT system, proposed in the Government of Tanzania's transport masterplan, aims to provide a high-quality, cost-effective public transport solution with dedicated lanes, off-board fare collection, and central reservation bus terminals. The project is structured as a PPP to achieve value-for-money and leverage private sector expertise. Phase 1 of the BRT system, operational since 2016, covers a 21 km route and includes trunk and feeder buses, terminals and stations. Subsequent phases are under development, totalling 130 km of dedicated bus lanes.

The Resilient Transport Strategic Assessment highlighted the financial implications of future climate scenarios, emphasising the need to implement adaptation solutions that address flood risks. Measures prioritised in the project included raising sections of the BRT route and relocating stations and facilities, as well as indicating flood-prone areas where communities and households were particularly at risk. The PPP structure of this project allowed for the allocation of climate risk between public and private parties, ensuring that resilience considerations are integrated into ongoing infrastructure planning.

Source: Adapted from GCA (2023a).

Housing and Commercial Real Estate

Table 15: Examples of climate hazards and impacts in the housing and commercial real estate sector by location

Climate Hazards and Impacts	Examples by Location
Flooding and Sea Level Rise	
Damage to buildings, particularly in low-lying areas, results in business disruptions. **Loss of property** in high-velocity flows results in repair and rebuilding costs and relocation of business operations or housing. **Reduced property value** due to the increasing risk of inundation. **Increased risk of inundation** during high tide and storm surges leads to greater repair and maintenance costs.	According to the National Disaster Management Authority, the 2021 floods in Pakistan have damaged more than 8,400 houses, 239 bridges and nearly 700 kilometres of roads (UN, 2025a). In May 2024, the state of Rio Grande do Sul in Brazil suffered unprecedented rainfall, displacing 775,000 households (International Displacement Monitoring Center, 2025) Under medium- and high-emissions scenarios, without adaptation, damages from sea-level rise and coastal extremes to 12 major African coastal cities could average US$ 65 billion and US$ 86.5 billion by 2050, respectively (Trisos et al., 2022).

Climate Hazards and Impacts	Examples by Location
Exceedance of sewer system capacity leads to contamination of local water bodies and the spread of illness and disease. **Recurrent floods cause forced migration** and displacement of communities.	Flood and cascading landslides events in August 2017 in Sierra Leone led to damage to 901 buildings (residential, mixed-use, public and commercial) and a total estimated damage of US$ 14.4 million (GFDRR, 2017a). In 2023, parts of Kenya, Somalia and Ethiopia experienced widespread and severe flooding, with more than 350 deaths and 2.4 million displaced people (WMO, 2024b).
Wildfires	
Damage and destruction of building infrastructure leading to repair, replacement or rebuilding costs. **Damage to housing causes displacement and homelessness** and leads to a need for disaster recovery aid. **Damage to the building façade and windows** due to extreme heat from fires. **Smoke and ash** due to fires lead to increased repair and maintenance costs.	The January 2025 wildfires in California caused widespread damage to properties, with estimated losses between US$ 76 and US$ 131 billion (and insured losses of only US$ 45 billion) (University of California, Los Angeles, 2025). In 2023, wildfires caused over EUR 1.66 billion in damages to households in Greece, EUR 871 million in Spain, and approximately EUR 4.1 billion in European countries (Scope, 2023). In South Africa, the 2017 wildfires in Knysna led to property losses of 1,059 formal buildings and 385 informal buildings and a burnt area of 19,316 hectares. A 2021 wildfire in Cape Town led to 11 buildings, including libraries and historic buildings, being completely destroyed (Quiroz et al., 2023).
Extreme Winds	
Potential structural damage to buildings, in addition to roof and façade damage, leads to an increase in repair and replacement costs. **Damage to equipment and machinery** on building roof (e.g. HVAC). **Significant damage and destruction** to informal settlements and substandard housing.	Cyclone Idai in 2019 damaged 3% of all households in Zimbabwe with an estimated repair cost of up to US$ 220 million (GFDRR, 2019).

Table 16: Examples of adaptation solutions in the housing and commercial real estate sector

Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Rainwater harvesting and reuse technologies	• **Flooding** – damage due to intense rainfall events. • **Drought** – lack of water availability.	Medium-scale investment for the specific building to which it is applied. Can be combined with other technologies for the reuse of grey water for toilets and watering of gardens, among other uses. This could, for example, be financed through equipment loans or term loans.	• Reduced water consumption (cost saving). • Reduced and/ or delayed water runoff in urban areas (avoided losses). • Increased circularity/ sustainability rating of the building for Leadership in Energy and Environmental Design (LEED) certifications (cost savings).
Home adaptation upgrades (structural upgrades, building façade enhancements, water-resistant materials, insulation materials)	• **Flooding –** damage due to intense rainfall events • **Extreme heat – transforms** dwellings into dangerous, unventilated and overheated spaces • **Wind**	Adaptation home loans can unlock demand for adaptation by converting high upfront costs into affordable repayments for individual households. This could, for example, be financed through green home upgrade loans.	• Improve robustness to wind and flood events • Reduce heat absorption, provide immediate thermal comfort • Reduce structural rot and mould to improve family health
Flood barriers for commercial buildings	• **Flooding** – damage due to intense rainfall events.	Small- to medium-scale investments depending on whether it is applied to a single building or to a portfolio of assets. This could, for example, be financed through green construction loans or term loans.	• Reduced damages from flooding events (avoided losses). • Reduced costs to replace damaged assets and disruptions to the asset operations (cost savings).

Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Incorporate climate risk solutions into building design and equipment to leverage green certifications.	**All hazards** – damage and ongoing operation, financial losses, and health and safety risk of occupants.	Large-scale investment to integrate new technologies and constructions methods that reduce water and energy consumption, among others, to reduce impacts of climate change. This could, for example, be financed through green construction loans or term loans.	• Improved longevity and reduced repair and maintenance costs of infrastructure (cost savings). • Improved resilience of properties (avoided losses). • Better quality outcomes for building users (co-benefits). • Improved efficiency of resource (energy, water, waste) consumption (cost savings).

Examples of Investments in Housing and Commercial Real Estate Sector

LEED Certification for a Commercial Building in Zambia

Developed by the United States Green Building Council (USGBC), the Leadership in Energy and Environmental Design (LEED) rating system is widely used globally to assess the sustainability of buildings. Its objective is to provide a framework to promote more efficient and cost-saving buildings that prioritise environmental, social and governance benefits and address the impacts of climate change. Certifications or ratings such as LEED are important for FIs as they help to manage and measure real estate performance, reduce operational and maintenance costs, and provide reputation benefits by implementing industry best practices.

To be awarded a LEED Certification, the building needs to fulfil several criteria that evaluate the performance against carbon, energy, water, waste, transportation, material, health and environmental quality. It can be evaluated across the different stages of the project, from design and construction to operations and maintenance. The certification is provided following a robust assessment and review panel that results in a final scoring level of LEED certification: Certified (40-49 points), Silver (50-59 points), Gold (60-79 points), and Platinum (80+ points).

The Evexia building, located in Lusaka, Zambia, is the first building in Africa to receive a LEED Gold Certification. Its north-south-facing orientation optimises sunlight within the facilities of the building and integrates vertical and horizontal shading. Furthermore, the building incorporates water and energy efficiency measures to reduce the consumption of utility services and improve its sustainability.

Source: Adapted from EBRD (2019), Henderson (2020).and USGBC (n.d.).

Promoting Energy Efficiency of Public Buildings in Romania

The EBRD has committed a EUR 29.9 million loan to the city of Brașov, Romania, to fund energy-efficiency upgrades in up to 20 public buildings, including schools and municipal offices, to improve thermal insulation, install heat pumps, and modernise technical systems. This investment marks Brașov's entry into the EBRD's flagship Green Cities Programme, enabling the city to develop a Green City Action Plan that prioritises future climate and environmental initiatives. With buildings accounting for the largest portion of EU energy use and over a third of its emissions, the project aims to reduce energy and resource consumption, cut carbon emissions, and enhance thermal comfort and safety for building occupants, in line with EU climate commitments. Energy efficiency renovations bring about substantial climate change adaptation benefits; in this case, the main benefits relate to increased resilience of assets and users to extreme temperatures, thanks to increased thermal comfort, and to flooding and heavy rains, with the works encompassing waterproofing and general structural improvements.

Source: Adapted from EBRD (2025a).

Manufacturing

Table 17: Examples of climate hazards and impacts in the manufacturing sector by location

Climate Hazards and Impacts	Examples by Location
Flooding	
Damage to manufacturing facilities, machinery and inventory leads to costly repairs and production delays. **Manufacturing delays** resulting from delivery impacts and lack of access to raw materials and component parts exacerbate further supply chain disruptions.	Climate-related hazard, including flooding, are projected to cause 6.6-7.3% in fixed asset losses by 2035 and up to 9.9-12.8% by 2055 (WEF, 2025b). In Senegal, cereal milling and fruit processing factories are facing the impacts of drought events and flash floods caused by erratic rainfall events (United Nations Industrial Development Organization [UNIDO], 2018). Flooding events have also jeopardised the shipping and transport of packaging materials for the leading juice manufacturer, Sir Fruit, in South Africa, which impacts the company's revenues and diminishes the quality of products (UNIDO, 2018).
Droughts	
Impacts to water-intensive manufacturing processes, affecting production capacity and increasing operational costs. **Risks to energy generation impacting cost** of production and output capacity. **Manufacturing processes** reliant on clean water may be impacted by reduced water quality during drought.	The lack of water for energy generation is a key limiting factor for the development of the manufacturing sector (Klynveld Peat Marwick Goerdeler [KPMG], 2015). This limiting factor is exacerbated by the impact of droughts and other hazards on energy generation and distribution. Drought events in the Rhine River in 2018 blocked shipping in about 80% of days between June and December and led to EUR 5 billion of losses to Germany's economy due to disruptions to logistics supply chains for the chemical, oil, and raw materials industries (Deidda et al., 2025; European Commission, 2025).

Climate Hazards and Impacts	Examples by Location
Extreme Temperatures	
Reduced efficiency of machinery in extreme heat. **Increased cooling costs** to maintain manufacturing productivity. **Health risk to workers** due to heat-related illness reduces labour productivity. **Accelerated deterioration of machinery** leads to higher maintenance and repair costs.	Research from the WEF indicates that telecom companies globally can face US$ 510-563 million annually due to the impact of extreme heat to data centres (WEF, 2025b). Increasing temperatures affect manufacturing activity in Africa due to the failure or deterioration of equipment and an increase in poor work conditions. It is estimated that every 1°C increase in temperature can reduce industrial output by 2% (World Bank, 2021).
Extreme Winds	
Manufacturing halts or delays due to high-intensity winds impact productivity. **Damage to machinery and equipment** exposed to the storm.	According to FM Global, a global insurance company, more than 15% of commercial and industrial property insurance losses globally each year result from natural hazards – wind events like hurricanes and tornadoes are key drivers. In 2017 alone, their clients made 2,600 reports of wind-related losses (Mahan and Liserio, 2018). The Harmattan winds in West Africa, which carry dust and sand, can disrupt manufacturing operations by affecting machinery and equipment. Dust accumulation can lead to increased maintenance costs and downtime, besides presenting a health threat to workers. These winds are becoming more intense with climate change (The Conversation, 2025).

Table 18: Examples of adaptation solutions in the manufacturing sector

Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Closed-loop water systems to recycle water within industrial processes	• **Drought** – reduced demand for water resources and increased efficiency.	Medium to large-scale investments, depending on the size of the plant and complexity of the industrial process (e.g., treatment and quality of water needed to be reused).	• Reduced consumption of water resources (cost savings). • More efficient processes (cost savings).

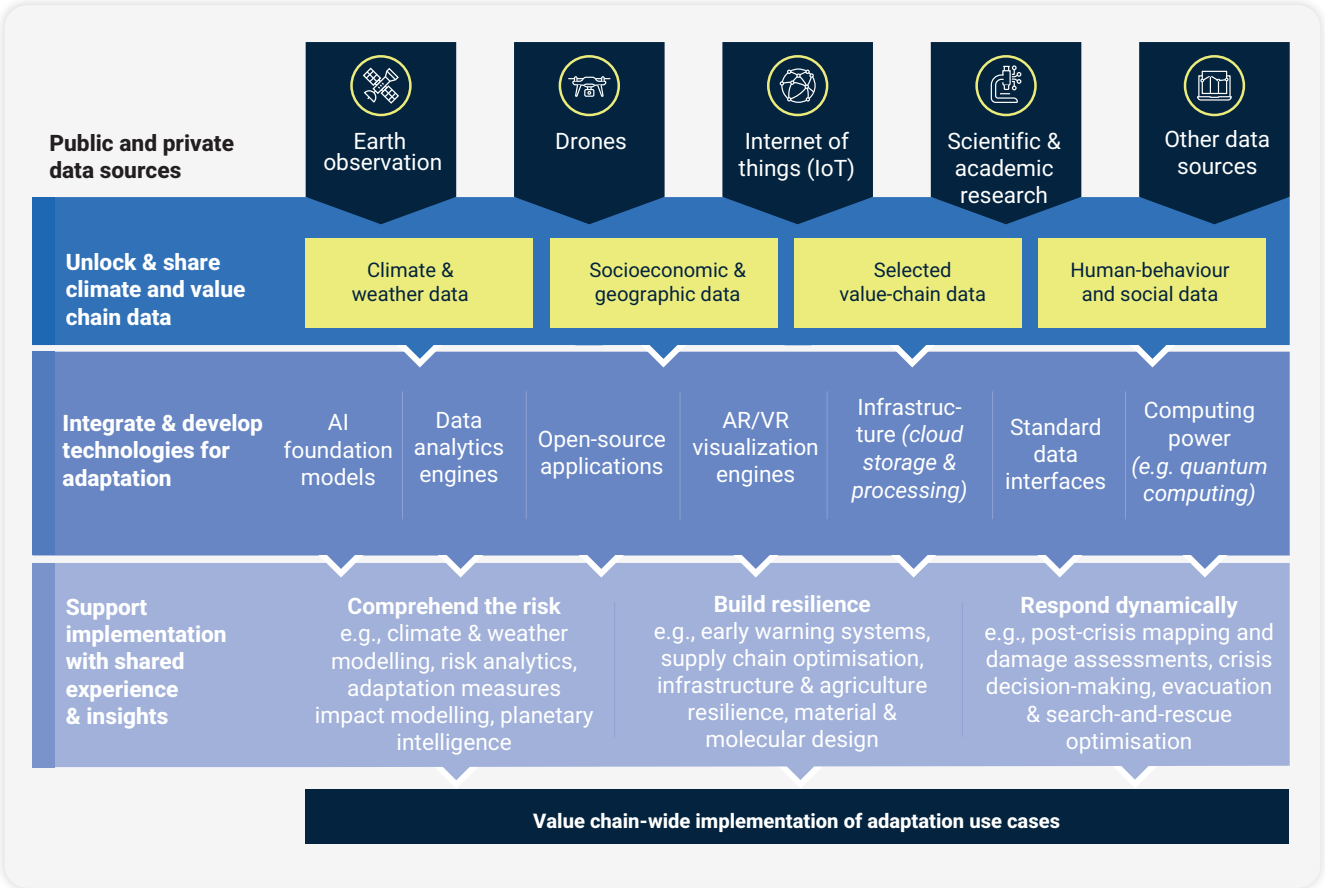
Adaptation Solution	Climate Hazards Addressed	General Type of Investment & Financial Products	Examples of Adaptation Benefits
Practices of material source reduction, reuse, recycling, recovery, treatment, and responsible disposal.	**All hazards** – supply chain disruptions and uncertainties due to flooding, extreme heat, and extreme winds.	Investment in capacity building and awareness through education materials, case-studies/ pilots, and training to inform and upskill businesses and industry in beneficial practices. This could, for example, be financed through working-capital loans, microloans, technical assistance grants, or embedded components within longer-term loans.	• Improving business continuity and reducing exposure and vulnerability to market volatility (avoided losses). • Potential reduced consumption of resources (raw materials, water, and embodied emissions) (cost savings).
Expand and diversify materials to more local, sustainable, and climate-resilient products to reduce vulnerability to fluctuating markets/ supply-chain disruptions.	**All hazards** – supply chain disruptions and market fluctuations.	Large-scale investment to find alternative sources of materials or to invest in R&D to create such alternatives. This could, for example, be financed through longer term loan and working capital loans.	• Improving business continuity and reducing exposure and vulnerability to market volatility (avoided losses). • Potential reduced consumption of resources (energy, water, waste) (cost savings).
Investments in the development of digital supply chains (e.g., real-time optimisation) for manufacturing to anticipate and reduce the impacts of disruptions.	**All hazards** – supply chain disruptions and market fluctuations.	Large-scale investment to develop and implement digital platforms to enable real-time monitoring of supply chain disruption, optimisation, and climate-driven demand forecasting. The application of artificial intelligence (AI) can also support in predicting equipment failure, scheduling repairs, and performing remote diagnostics in climate conditions. This could, for example, be financed through asset finance for digital infrastructure	• Reduced exposure to disruptions in global/ regional supply chains (avoided losses). • Improving business continuity and reducing exposure and vulnerability to market volatility (avoided losses). • Reduced GHG emissions due to the use of local materials.

Examples of Investments in Manufacturing Sector

Innovative Technologies for Climate-related Supply Chain Disruptions

IBM Watson has developed a supply chain platform to help manufacturers adapt to the disruptions caused by climate hazard events that uses real-time climate data and AI to predict and optimise adjustments to manufacturing operations. This platform has been applied by CEVA Logistics, which has operations worldwide, and has led to a 90% increase in the processing of information, no downtime during high-demand peaks, and a reduction in the delays caused by climate hazard events.

In Africa and the Middle East, climate-related physical risks can lead to between 5% and 15% of the manufacturing sector's EBITDA being at risk by 2050. The use of innovative technologies can enable a better use of climate and value chain data to optimise maintenance, replacement of equipment, work environment conditions, and disruptions to the value chain.



Source: Adapted from WEF (2024, 2025a).

Water Desalination for Industrial Use in Morocco

The EBRD is financing a major desalination initiative in Morocco to support industrial water security and climate resilience. The project involves a EUR 44 million loan to Société Marocaine de Dessalement for the construction and operation of a large-scale desalination plant in Jorf Lasfar, a key industrial hub. The facility will supply up to 75 million cubic meters of desalinated water annually to industries, reducing reliance on scarce freshwater resources.

This investment addresses Morocco's growing water stress, driven by climate change and recurrent droughts, while ensuring sustainable industrial growth. The project integrates energy-efficient technologies and aligns with Morocco's National Water Plan and climate adaptation goals. It also promotes private sector participation in water infrastructure and introduces best practices in environmental and social standards.

Source: Adapted from EBRD (2024).

Further Resources on Adaptation Opportunities

As noted at the beginning of this section, the adaptation solutions presented in the factsheets are not an exhaustive list. The intent was to provide examples applicable to the sector context that are related to the context of FIs and their clients. Even though further resources are provided at the end of this Module, this section concludes with additional references to adaptation opportunities that can serve as a reference for identifying and analysing adaptation investment opportunities.

References on adaptation solutions across sectors

The EBRD's Green Economy Financing Facilities (GEFFs) and the associated Green Technology Selector (GTS) provide an extensive overview of proven adaptation and mitigation technologies to support investments from FIs and their borrowers. The GTS is a practical tool available to both the EBRD's partner banks and the public to identify pre-approved green technologies. The online portal can be accessed at GEFF – Welcome to the Green Economy Financing Facility.

Climate Bonds Resilience Taxonomy by Climate Bonds Initiative is designed to provide clear guidance on what constitutes a climate-resilient bond investment. By defining activities, this taxonomy provides a Detailed list of eligible adaptation investments.

Consultative Group to Assist the Poor, a global partnership of multiple development institutions, provides examples of success stories and knowledge publications about applying financial solutions for adaptation. The website can be accessed at: Research and Publications Climate Resilience| CGAP.

United Nations Environment Programme (UNEP) Financial Initiative's (2016) Demystifying Adaptation Finance for the Private Sector includes multiple brief case studies of adaptation investment to address different climate risks across geographies.

The World Bank's (n.d.) Enabling Private Investment in Climate Adaptation & Resilience presents 12 best-practice case studies across geographies and sectors.

04

Matching Adaptation Needs and Financing Solutions

Climate change is already reshaping the economic landscape (WMO, 2024a). Some of the sectors most affected – agriculture, energy, water, transport, and housing – also represent a significant share of FIs' portfolios. While these sectors face growing climate vulnerabilities, they also present a compelling business opportunity for FIs that can adapt to meet their clients' evolving resilience needs. This chapter examines how FIs can tailor existing products to support climate adaptation and introduce innovative financial instruments specifically designed to finance adaptive solutions.

This chapter addresses the following questions:

- **How can FIs use their understanding of clients' needs to collaboratively identify and finance suitable adaptation solutions?**
- **What are the adaptation needs of FIs clients?**
- **How can FIs understand the available bankable adaptation solutions for each client?**
- **How can FIs adapt their existing financial products for adaptation?**
- **How can concessional finance allow FIs to adapt their existing financial products and develop new adaptation-focused blended finance products?**
- **How can new innovative finance products help FIs to take advantage of the adaptation opportunity?**
- **How can FIs adapt their lending programmes or create new innovative instruments for adaptation?**

Target Group: Corporate/Wholesale, SME and Retail Banking Departments; Credit, Product and Structured Finance Departments; Treasury and ALM Department.

How can FIs use their understanding of clients' needs to collaboratively identify and finance suitable adaptation solutions?

Sitting at the intersection between the financial sector and the real economy, FIs have a deep-rooted presence in local economies and long-standing relationships with clients. With branch networks and lending operations spanning across diverse geographies and sectors, each with varying levels of exposure and vulnerability to climate risks, FIs have first-hand visibility into how climate impacts are manifesting across different segments of the economy. These range from households and SMEs to larger enterprises. Combining historical lending data and insights from ongoing client interactions with climate risk models can provide valuable insights into the specific risks and resilience gaps faced by different client segments, from smallholder farmers to infrastructure project companies. By leveraging this local intelligence, FIs play a central role in translating climate risk data and insights into practical, demand-driven adaptation finance solutions.

Using this understanding, FIs can play a catalytic role in helping their clients, especially in climate-exposed sectors like those mentioned earlier, build resilience to climate change. Stimulating the implementation of adaptation solutions begins with embedding climate risk assessments into credit appraisal processes and engaging clients on the long-term sustainability of their business models. Rather than viewing climate risk exposure purely as a financial threat, FIs can use client engagement as an opportunity to offer advisory services, technical support, or partnerships that promote adaptation solutions, all in the service of safeguarding their return in both the short- and the long-term.

Ideally, the need and motivation for implementing climate adaptation solutions would come from clients themselves. However, in practice, only larger corporates typically have the internal resources, technical expertise and strategic planning capacity to assess climate risks and proactively develop adaptation-focused business strategies. For many clients, particularly individuals, households and MSMEs, there is a significant awareness and capacity gap. FIs, with visibility across businesses and sectors, are well placed to fill this gap. This might involve mapping climate exposure by region or sector, offering basic screening tools to assess climate risks, and running workshops or training sessions to build client capacity around adaptation planning. By equipping clients with the knowledge and tools to recognise climate risks in their own businesses, FIs both generate demand for adaptation finance and strengthen the long-term viability of their client base. Whilst this process of client engagement is explored more fully in Module 5, recognising the role of FIs as relationship managers is crucial to matching clients' needs to financing solutions. Overall, FIs stepping in as both financiers and facilitators who are well-positioned to identify climate-related vulnerabilities in client operations and work collaboratively to uncover adaptation opportunities is essential.

Matching adaptation finance with the needs of clients involves several phases (see **Figure 8**). First, understanding the diverse and specific adaptation needs of clients such as smallholder farmers, MSMEs and large corporates requires comprehensive data collection and analysis. Each group has unique adaptation requirements, ranging from improved irrigation systems to climate-resilient infrastructure. The upside is that FIs already gather much of this information as part of their credit assessment processes. Second, identifying suitable financial solutions that address these needs can seem complex, given the variety of available products like green bonds, debt financing, and risk insurance. However, many existing products need only limited tweaking to become adaptation focused. For new products, once research and product development have been completed, a shortlist of pre-vetted adaptation activities can be created, which can speed up and streamline these processes.

Figure 8: Matching adaptation needs, solutions and financing products: A three-step process

Source: Authors.

The rest of this chapter covers client types and needs and introduces financial products for adaptation.

Module 5 will then cover how to scale up adaptation within an FI's activities.

What are the adaptation needs of FIs clients?

FIs service a broad range of clients, each with different characteristics that need to be considered when considering adaptation financing. The first step in being able to offer financing for adaptation opportunities includes understanding the needs of an FI client.

Table 19 below outlines the main types of clients and their characteristics before they are explored in more detail.

Table 19: Key financial institution clients and their characteristics

Client Type	Examples	Characteristics	Lending Considerations
Individuals, Households	Urban & rural residents	Often informal, often climate vulnerable.	Need microfinance or consumer products
Smallholder Farmers	Individual or family farms	Often informal, often climate vulnerable. Cash flow may vary by season. Low access to finance.	Low ticket sizes, group lending, and mobile disbursement
SMEs/ Cooperatives	Garment, retail, farmer and transport cooperatives, agricultural construction and hospitality SMEs	More formal, often climate vulnerable. More consistent cash flow.	Seasonal cash flow, collateral support via equipment or receivables
Service Providers	Contractors, tech providers, logistics firms, climate tech start-ups	More formal, increased access to finance, often climate vulnerable. More consistent cash flow (except start-ups).	Opportunity for supply-chain financing

Client Type	Examples	Characteristics	Lending Considerations
Corporates (Mid to Large)	Agribusinesses, manufacturers, and real estate developers	Formal, increased access to finance, often climate vulnerable. More consistent cash flow.	Eligible for structured or project finance
Infrastructure project companies	PPP Project Companies	Formal, increased access to finance, often climate vulnerable. More consistent cash flow.	Structured or project finance
Municipalities/ Utilities	Water boards, transport authorities	Formal, increased access to finance, often climate vulnerable. More consistent cash flow.	Often need blended or concessional finance, due to 'public good' nature of investments and limited revenue potential

Source: Authors.

Individuals and Households: Retail lending refers to the process by which FIs, such as banks and credit unions, provide loans to individual consumers and households rather than SMEs, larger businesses and governments. Clients often use the proceeds for home purchases or personal expenses. It is worth highlighting that many activities carried out by retail clients may already be adaptive, for example upgrading domestic water storage systems. Within the real estate sector, retail lending offers an opportunity to promote climate-resilience by offering climate-resilient mortgage products and insurance-linked loans, which can help homeowners and businesses protect their properties and assets from climate risks (see **Box 3**).

Box 3: Residential energy efficiency financing by financial institutions

For instance, in Turkey, the Turkish Residential Energy Efficiency Financing Facility (TuREEFF) incentivised borrowers to invest in energy-efficiency and climate resilience home upgrades. The facility totalled US$ 300 million in funding by combining an EBRD commercial loan with a limited amount of donor-funded concessional funding by the Clean Technology Fund, which was channelled through commercial banks. The banks were then able to on-lend to private sector residential stakeholders, including homeowners, construction SMEs, and vendors of high-energy efficient climate resilience appliances and materials. The facility supported loans for investing in more energy-efficient and climate-resilient houses; improving the energy performance and thermal comfort of the existing buildings; and supporting mortgages of buildings with a B or above energy class.

Similarly, in the United Kingdom, Santander Bank offers discounted-rate mortgages for properties with high Energy Performance Certificate ratings (a measure of thermal efficiency) (Santander, 2024). Eligible homeowners remortgaging an A or B-rated property can access a 0.10% interest rate reduction compared to standard remortgage rates.

Smallholder Farmers: Smallholder farmers are central to agricultural systems across emerging markets, where they are estimated to produce over one-third of the world's food and make up the majority of agricultural producers in many low- and middle-income countries (Food and Agricultural Organization, 2021). They are also highly vulnerable to the effects of both chronic and acute climate hazards and often have low **adaptive capacity** due to low information access and limited access to capital. Adaptation solutions for smallholder farmers may include Digital Climate Advisory Services, including weather and seasonal forecasts and farmer-to-farmer training; index-based crop or livestock insurance (e.g. drought or flood-triggered payouts); irrigation infrastructure and modernisation of technologies (including just-in-time irrigation); and climate-resilient seeds and crop diversity. For a more extensive list of suggested adaptation solutions, please refer to Chapters 2 and 3 of this Module. While many smallholder farmers may be excluded from mainstream borrowing due to limited credit histories, FIs offering microloans or other specifically tailored programmes to such clients may be well-placed to offer adaptation products, such as loan programmes coupled with technical assistance. Given that smallholder farmers are a priority target group for DFIs, such programmes would enhance access to concessional funding and lower the risk profile of those loans.

Box 4: Microfinance for Ecosystem-Based Adaptation in the Andean region

The Microfinance for Ecosystem-based Adaptation (MEBA) initiative illustrates how specialised financial services can accelerate climate resilience by enabling vulnerable households to invest in nature-based solutions. Operating in rural and peri-urban areas of Colombia and Peru, MEBA focuses on communities whose livelihoods depend directly on fragile Andean ecosystems and who face disproportionate exposure to climate-related risks such as drought, soil degradation and erratic rainfall patterns.

MEBA partners with microfinance institutions (MFIs) to design and deploy tailored credit, savings, and technical assistance products that support ecosystem-based adaptation (EbA). These financial products enable smallholder farmers, micro-entrepreneurs, and low-income households to invest in activities that both restore ecosystem functions and strengthen economic resilience. Typical investments include agroforestry systems, soil and water conservation measures, **silvopastoral practices**, improved irrigation, sustainable livestock management, and diversification into climate-resilient crops and value chains.

A core innovation of MEBA is its integration of ecosystem-focused technical assistance with microfinance delivery. Partner MFIs receive capacity-building support to assess EbA investment opportunities, incorporate climate risk into credit methodologies, and train loan officers to identify and promote climate-resilient practices. Clients, in turn, gain access to finance and advisory services that help ensure adaptation investments are appropriate, profitable and ecologically sound.

The programme has demonstrated that even small loans, when paired with technical support and targeted toward nature-based solutions, can have outsized adaptation impacts. Participating households report increased productivity, reduced vulnerability to climate shocks and strengthened income stability. At the landscape level, EbA investments contribute to improved watershed management, soil fertility and biodiversity conservation, generating co-benefits that extend beyond individual clients.

MEBA shows how MFIs can act as powerful conduits for climate adaptation finance, reaching populations often excluded from formal banking and directing capital toward sustainable, ecosystem-based solutions. By aligning financial incentives with ecosystem stewardship, the initiative provides a scalable model for mobilising climate finance in biodiverse and climate-vulnerable regions around the world.

Source: UNEP Financial Initiative (2022).

Agricultural SMEs: Given the climate vulnerability of the agriculture sector and its central role in global food supply chains, agricultural SMEs represent a significant opportunity for FIs to build climate resilience across their portfolios. FIs could consider climate-resilient agricultural loans to SMEs to support investments such as drip irrigation systems, drought-resistant seeds, agroforestry and conservation agriculture, as well as programmes to improve market access and distribution of agricultural produce more generally. In addition, FIs may consider retail lending for adaptive livestock practices, such as the construction of climate-resilient shelters, water sources for animals, or improved fodder storage. For a fuller assessment of adaptation solutions in the agricultural sector, please refer to Chapters 2 and 3.

FIs may also include tailored climate insurance products as part of a broader offering. Parametric or index-based insurance products, in which an immediate payout is triggered by reaching a predetermined threshold in weather conditions or vegetation quality, reduce vulnerability to shocks. For instance, the United Nations Development Programme (UNDP, 2025), through its "Promoting Index-Based Weather Insurance for Small Holder Farmers in Burkina Faso", provides an index-based weather insurance system for 20,000 households as part of a wider resilience package that includes access to credit and improved climate-resilient agricultural tools, technologies, and inputs.

Service Providers: FIs can support the provision of adaptation technologies by extending supply-chain financing to service providers such as contractors, technology providers, and logistics firms. These service providers play a critical role in supporting other adaptation measures, for example, companies that install irrigation systems, build climate-resilient infrastructure, or deliver drought-tolerant agricultural technologies. However, they often face cash flow constraints that hinder their ability to scale up operations or serve new clients. Through tailored financial products, such as invoice financing, purchase order financing, or equipment leasing, FIs can inject much-needed liquidity into these segments.

Corporates (mid to large): FIs finance corporate clients for a variety of activities. Midsize firms typically require financing for working capital, business expansion, equipment purchases, and operational needs, while larger corporations often seek funding for infrastructure development, mergers and strategic investments. FIs with proactive adaptation-focused lending strategies may offer various credit products, including term loans, lines of credit, trade finance, and sustainability-linked loans, to support climate-resilient activities.

Box 5: Banco de Crédito del Perú and corporate adaptation lending in Latin America

As climate risks intensify across Latin America, FIs are increasingly directing capital toward corporate clients whose operations, supply chains and infrastructure face escalating climate-related disruptions. Banco de Crédito del Perú (BCP), the country's largest commercial bank, has emerged as a leading example of how FIs in emerging markets are embedding climate resilience into corporate finance operations.

BCP has developed a suite of green and resilience-linked credit products targeting medium and large corporates, particularly in climate-exposed sectors such as agribusiness, energy and logistics. Many Peruvian corporates operate in regions susceptible to El Niño-driven flooding, prolonged droughts, landslides, and water scarcity risks that have historically constrained productivity and increased operational volatility. To address these vulnerabilities, BCP integrates climate risk screening into its corporate due diligence processes and offers preferential financing for investments that strengthen climate resilience.

For example, BCP has extended long-term credit to leading agribusiness exporters to modernise irrigation systems, invest in precision agriculture technologies, and develop climate-secure storage facilities that mitigate harvest losses during extreme weather events. These investments safeguard production continuity and preserve critical ecosystems through improved water efficiency and reduced land degradation. In addition, BCP has supported corporate investment in drought-resilient crop varieties and watershed protection initiatives, recognising the interdependence between ecosystem health and long-term business viability.

BCP has also financed infrastructure resilience among logistics and transport companies whose operations are disrupted by climate-induced landslides and transport corridor interruptions. By providing tailor-made project finance for road reinforcement, flood-safe warehousing, and early-warning system integration, the bank helps corporates maintain supply chain continuity in the face of extreme weather events. These investments reduce downtime, lower repair costs, and enhance market reliability, ultimately strengthening national competitiveness.

Through these climate-focused corporate lending practices, BCP demonstrates how FIs can catalyse large-scale private sector adaptation. By embedding climate resilience into corporate loan products, banks like BCP play a pivotal role in safeguarding economic stability, promoting sustainable resource management, and enabling businesses to thrive despite increasing climate uncertainty.

Source: UNEP (2020).

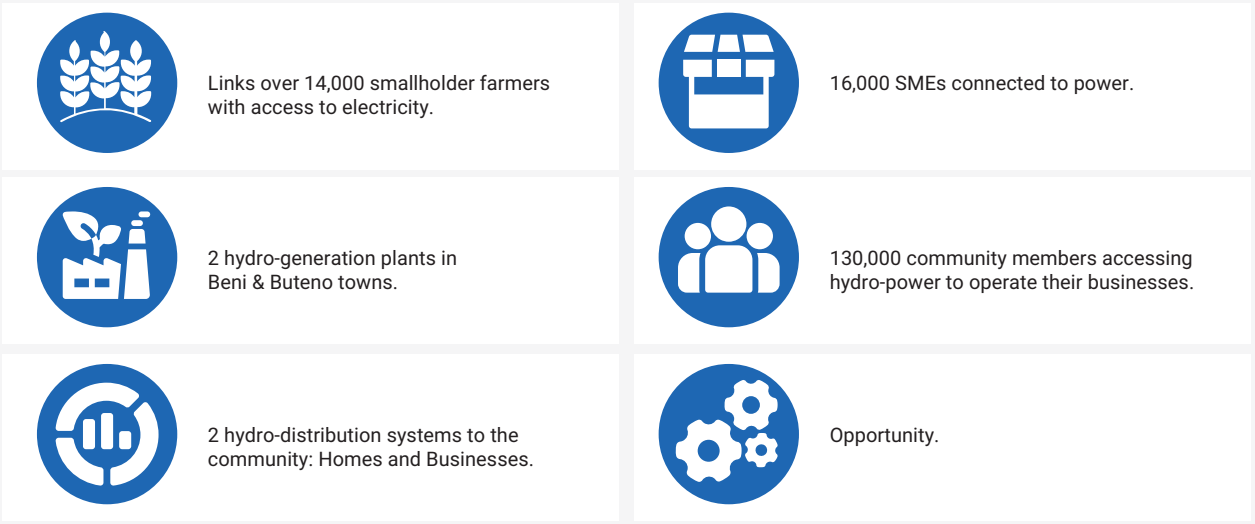
Box 6: Equity Bank 'Africa Recovery and Resilience Plan'

In 2022, Equity Group launched a US$ 6 billion stimulus package to support MSMEs in six African countries as part of its Africa Recovery and Resilience Plan (ARRP). Whilst the programme also aims to drive higher productivity and stimulate intra-continental trade, it explicitly aims to enhance climate resilience among agriculture, manufacturing and logistics, and trade and investment MSMEs.

Beneath the overarching programme, the bank offers a range of financial products that increase resilience for companies. For instance, for smaller agricultural SMEs, the bank partnered with CFAO Group to provide up to 80% financing on various agricultural products and inputs (Khusoko , 2022). More recently, having been granted a general insurance licence, the bank now offers crop insurance, both index-based weather insurance and multi-peril insurance for crops (Equity Group Holdings, 2025).

Investing in climate-resilient infrastructure is also a key tenet of the ARRP. An example of this is the provision of project finance to ENK, a hydroelectric company located in North Kivu in the Democratic Republic of Congo, via its subsidiary Equity BCDC. ENK produces and supplies hydroelectricity to remote areas across Beni and Butembo. Provision of reliable renewable energy supports the development of local industries, businesses and households. The company has been in operation since 2018 and is the only electricity provider in the region. It operates the two hydroelectric power plants of 2.8 MW and 12 MW that supply the cities of Beni and Butembo in the province of North Kivu.

Contribution to ARRP



Along with reducing greenhouse gases through the provision of renewable energy, Equity Bank's lending to ENK has fostered resilience by enabling businesses to operate effectively. Moreover, the shift to electricity has significantly reduced the reliance on charcoal production as an energy source, alleviating pressure on the local forest ecosystem.

Source: Equity Group Holdings (2022).

Given the larger capital requirements of such clients and the limited market familiarity with structuring profitable adaptation-focused projects, FIs may be able to partner with development actors who can offer guarantees or first-loss capital. For instance, GreenMax manages the Green for Access First Loss Facility (G4A), which, together with the IKEA Foundation, Clasp, and P4G Platform, acts as a risk mitigation instrument for local FIs in Africa to facilitate local currency lending to the energy access sector (GetInvest, 2025).

Infrastructure Project Companies: Large-scale, long-term infrastructure and industrial projects are often financed based on non-recourse or limited-recourse project finance structures, meaning that the financing is primarily based on the projected cash flows of the project itself, rather than the balance sheets of the project sponsors. In this arrangement, the project's assets, rights and interests are held as collateral. Repayment to lenders is sourced from the revenue generated by the project. FIs can be part of infrastructure finance transactions, for example, by providing a construction loan or buying into a project bond. Often, FIs will not be the lead arranger or lead lender, but rather will be co-financing projects, meaning they can rely on the due diligence that other institutions are undertaking.

Infrastructure projects provide a unique opportunity to manage climate risks and promote adaptation due to their long lifetimes. FIs can insist that project preparation includes climate risk assessment and that revenue projections consider the impact of climate on user payments. For example, in the water infrastructure sector, detailed adaptation solutions could include expanding water storage capacity, improving water conveyance infrastructure, and investments in meteorological and hydrological services to enhance data collection and improve forecasting capabilities and multi-hazard early-warning systems. For a fuller assessment of adaptation solutions in the infrastructure sectors, please refer to Chapters 2 and 3 of this Module.

How can FIs understand the available bankable adaptation solutions for each client?

2. Understand the available adaptation solutions

Chapter 3 provides an overview of potential adaptation solutions across sectors. To point to one out of many, a small-scale agricultural SME client experiencing repeated droughts could invest in expanding irrigation infrastructure to reduce dependency on rainfall-fed agricultural technologies. **Table 20** shows some of those adaptation needs described in Chapter 3 and the potential financial products which could be offered to fulfil those needs.

Table 20: Examples of climate adaptation financing opportunities by sector

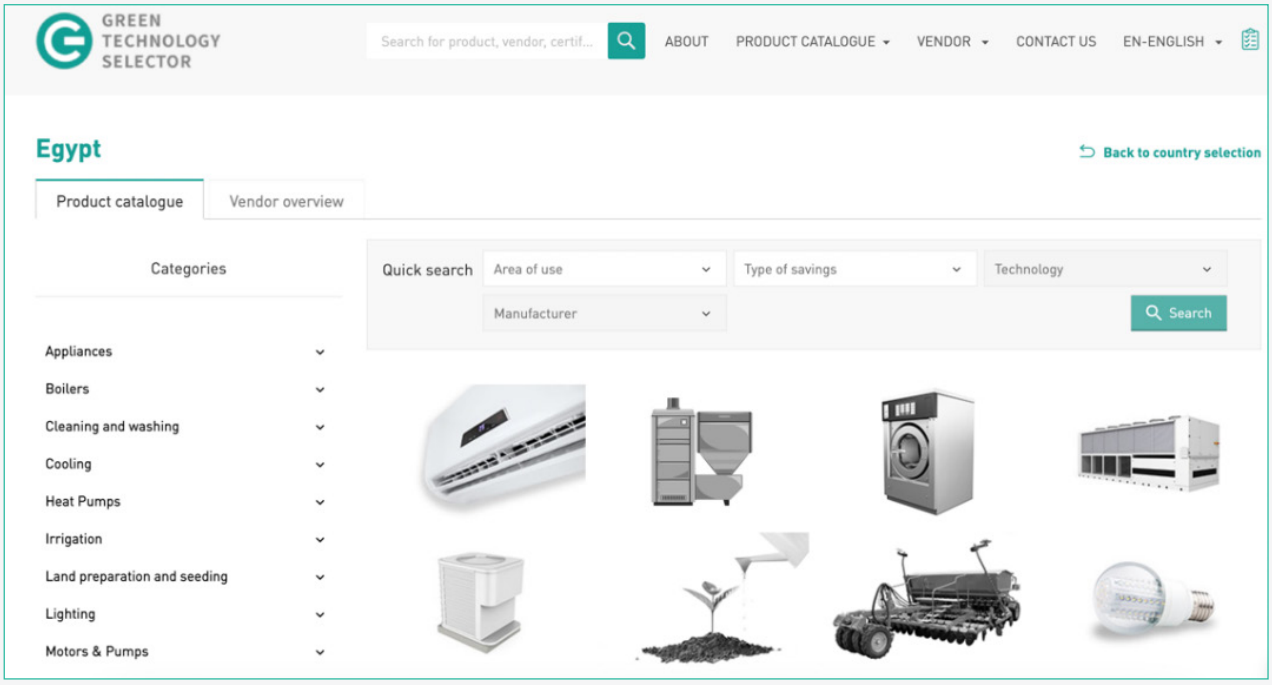
Sector	Need	Potential Product	Type of Client
Agriculture	Drought-resistant inputs, irrigation	Asset finance, agricultural credit	Individuals, SMEs
	Post-harvest storage, cold chains	Term loans, equipment leasing	SMEs, Corporates
	Climate risk protection	Bundled loans with insurance	Smallholder farmers, SMEs, Corporates
Forestry	Sustainable timber or agroforestry	Long-term loans	SMEs, Corporates
	Community reforestation	Microloans, blended finance	SMEs
	Ecosystem restoration	PPP or project finance	SMEs
Energy	Solar irrigation, pumps, and cold storage	PAYG asset finance	Individuals, SMEs, Corporates
	Backup power for health/ agrifacilities	Term loans or leasing	SMEs, service providers
	Microgrids for rural areas	Project finance with a concessional layer	SMEs, Utilities
Water	Community water harvesting, filtration	Microloans, co-op lending	Individuals, SMEs
	Climate-resilient urban water infrastructure	PPP or public sector finance	Municipalities
	Water-efficient agritech	Equipment loans	SMEs, Corporates
Transport	Resilient roads & logistics	Project finance or PPP loans	Municipalities, infrastructure project companies
	Climate-ready transport fleets	Equipment finance	SMEs, corporates
Housing & Commercial Real Estate	Resilient affordable housing	Mortgage products, concessional housing upgrade loans	Households, Corporates
	Flood/fire resilient construction	Term loans, green construction loans	Households, Corporates, SMEs
Manufacturing	Water reuse systems, climate-proofed plants	CAPEX loans, equipment finance	Corporates
	Energy resilience (e.g., solar backup)	Leasing, energy loans	SMEs, Corporates

Source: Authors.

Given the myriad opportunities for different clients that could meet the definition of adaptation, FIs could develop a short list of pre-vetted activities that can qualify for adaptation-tagged finance. An example of this is the EBRD's Green Technology Selector, a publicly available online platform that helps accelerate the deployment of green technologies by streamlining investment decision-making. The platform shows over 39,000 green technologies that have been pre-approved as 'green' and therefore are eligible for the EBRD financing programmes via local partner FIs. FIs wishing to streamline the approval of 'green' or adapted investment could create a similar resource for the fast approval of pre-vetted technologies. The GTS is explored further in the the box below.

Box 7: The European Bank for Reconstruction and Development Green Technology Selector

The EBRD's GTS (EBRD, 2025d), part of the GEFFs, is an online platform that helps accelerate the deployment of green technologies by streamlining investment decision-making. The platform shows over 39,000 green technologies that have been pre-approved as 'green' and therefore eligible for the EBRD financing programmes via local partner FIs. More than 2600 vendors have also been pre-approved to sell these products.



High-performing green technologies mean that products comply with the Performance Criteria the EBRD prescribed for the selected country. Performance criteria are defined per technology category and per country. They require a performance improvement of at least 20% beyond a baseline of typical replacement technologies that reflect local market developments, including technology costs and market maturity, thereby only promoting the higher-performing segment of technologies available in local markets.

Source: EBRD (2025d).

How can FIs adapt their existing financial products for adaptation?

Many adaptation solutions align closely with financial instruments that are already familiar to FIs, such as mortgage products, term loans, working capital loans, project finance or leasing products. However, to effectively support climate resilience, these instruments often need to be tailored to reflect the unique characteristics and risks associated with adaptation investments. For example, longer repayment periods may be necessary to account for the delayed return on investment typical of resilience-building interventions. Grace periods should be structured to align with seasonal or climate-dependent cash flow cycles, particularly for borrowers like smallholder farmers or tourism enterprises whose incomes are tied to harvests or seasonal patterns. In many cases, concessional capital or blended finance, such as first-loss guarantees or low-interest co-financing from development partners, can help de-risk this atypical or longer tenor lending for FIs and make terms more affordable for borrowers.

These adjustments do not require a fundamental reinvention of financial products but rather a more nuanced understanding of climate-related risks and returns, coupled with the operational flexibility to adapt lending practices to meet them. As such, FIs that can internalise these adjustments are better positioned to unlock both impact and commercial value in emerging adaptation finance markets. **Table 21** lists common financial products offered by FIs and suggests adaptation adjustments.

Table 21: Conventional financial products and adjustments for adaptation

Product Type	Description	Suitable for	Adjustments for Adaptation
Microloans	Small loans with limited collateral	Farmers, households	Micro-loans could be offered for pre-vetted activities that support climate-resilient livelihoods, such as drought-resistant agriculture, small-scale water harvesting systems, or flood-resistant home improvements. Similarly, allowing sign-off of financing of pre-vetted climate-resilient inputs through partnerships with agricultural input providers can ease the administrative burden. Consider offering technical assistance and partnering with NGOs or agri-extension services to help clients adopt climate-smart practices. Grace periods or repayment terms could be linked to seasonal income (e.g., post-harvest) and can also accommodate climate variability.
Mortgages	Long-term loans for home ownership	Households	Climate-resilient mortgages can include financing for structural improvements that reduce a home's vulnerability to climate risks. These upgrades can be bundled into the mortgage either at origination (e.g., through additional principal) or via a dedicated resilience renovation loan. Improvements may include shoring up foundations or flood barriers in flood-prone areas, or solar shading and energy-efficient cooling technologies for heat-stressed areas.

Product Type	Description	Suitable for	Adjustments for Adaptation
Term Loans	Fixed-amount loans for CAPEX or equipment	SMEs, corporates, some households, municipalities/ utilities	Term loans could be designed for medium- to long-term investments in adaptation infrastructure, such as climate-resilient irrigation systems. To increase uptake, terms could include concessional interest rates or be paired with risk-sharing mechanisms like partial guarantees from DFIs or climate funds.
Working Capital Loans	Short-term liquidity support	SMEs, cooperatives, service providers	Working capital loans could be adjusted for SMEs in climate-sensitive sectors (e.g., agriculture, industry, water management) to cover the cost of inputs that enhance resilience, like organic mulch, climate-resilient seeds or weather-indexed insurance premiums. Seasonal repayment schedules and bundling with technical services could further enhance effectiveness.
Insurance Products	Protection from financial loss	All	Insurance products can be adapted to become adaptation aligned. For instance, providers can take an index-based model for crop insurance, ensuring immediate payouts when an extreme weather event that passes a pre-determined threshold occurs. Similarly, business continuity insurance may be adapted by offering lower premiums to businesses that invest in their own adaptation to climate hazards, e.g., flood protection.
Project Finance	Structured financing for large infrastructure or industrial projects	Municipalities/ utilities, large corporates, infrastructure project companies	Adaptation-aligned project finance can be used to support large-scale infrastructure that improves systemic climate resilience by mandating that climate risk assessments and adaptation options be incorporated as part of financing terms, and that nature-based solutions are considered in the project design.
Leasing/ Asset Finance	Equipment financing, PAYG options	Farmers, SMEs	Institutions could offer longer lease tenures, flexible terms, or residual value guarantees to reflect the slow-yielding but high-impact nature of adaptation assets. Technical vetting of leased equipment to ensure its resilience impact could also be integrated.

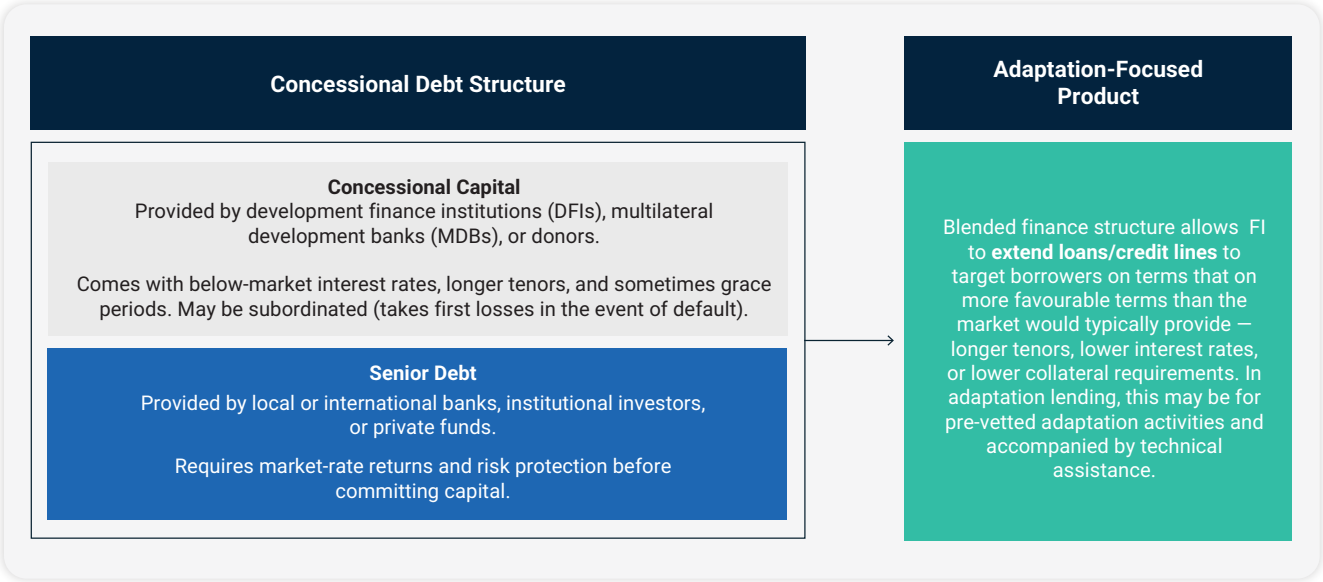
Source: Authors.

How can concessional finance allow FIs to adapt their existing financial products and develop new adaptation-focused blended finance products?

Although concessional finance is not a prerequisite for creating an adaptation finance programme, it can play a useful catalytic role by enabling FIs to adjust existing financial products, such as offering lower interest rates, longer maturities, and lower collateral requirements, without sacrificing return on investment. In the medium to long term, adaptation investments can achieve financial viability without concessional backing. The sections below detail some of the conventional blended finance structures commonly used.

Blended Adaptation Credit Lines: Blended adaptation credit lines leverage concessional capital and combine it with commercial capital to reduce risk and improve affordability for climate-resilient investments, as shown in **Figure 9**.

Figure 9: Concessional debt structure

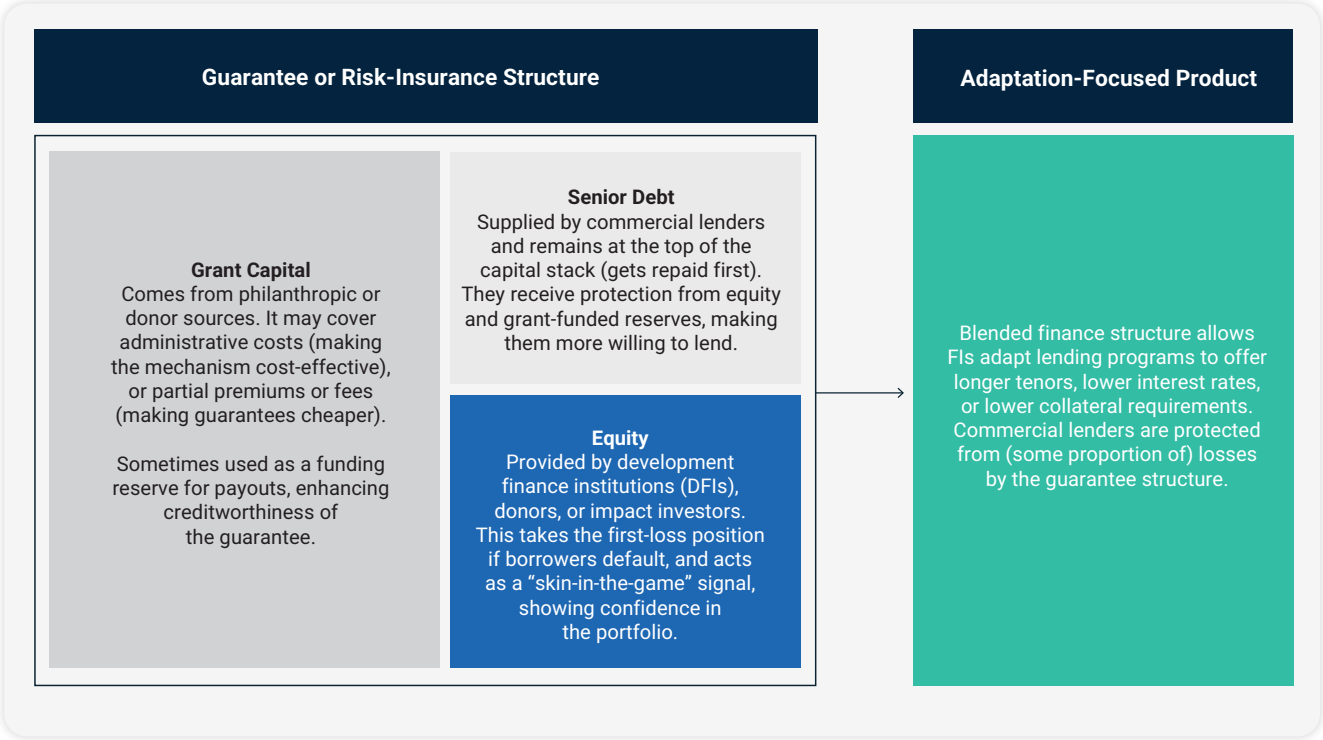


Source: Authors.

These credit lines can be structured in various ways, most commonly with concessional finance or flexible debt, which are used to lower the risk profile of the lending programme. This allows the lender to offer clients lower interest rates on conventional loans. In practice, a commercial FI might use this kind of structure to offer preferential rates to pre-determined adaptation activities.

Guarantee or Risk-Insurance Funds. One approach uses guarantees, such as partial credit risk guarantees, or portfolio guarantees, to shield the FI from higher risks associated with adaptation-related lending, as shown in **Figure 10**. As discussed earlier in the chapter, adaptation often still faces higher perceived risks compared to conventional lending. FIs may view these projects as untested, subject to regulatory uncertainty, or dependent on climate scenarios that are difficult to model. These risk perceptions translate into higher capital costs, more stringent collateral requirements, or outright credit rationing, ultimately limiting the flow of finance into critical adaptation measures.

Figure 10: Guarantee structure



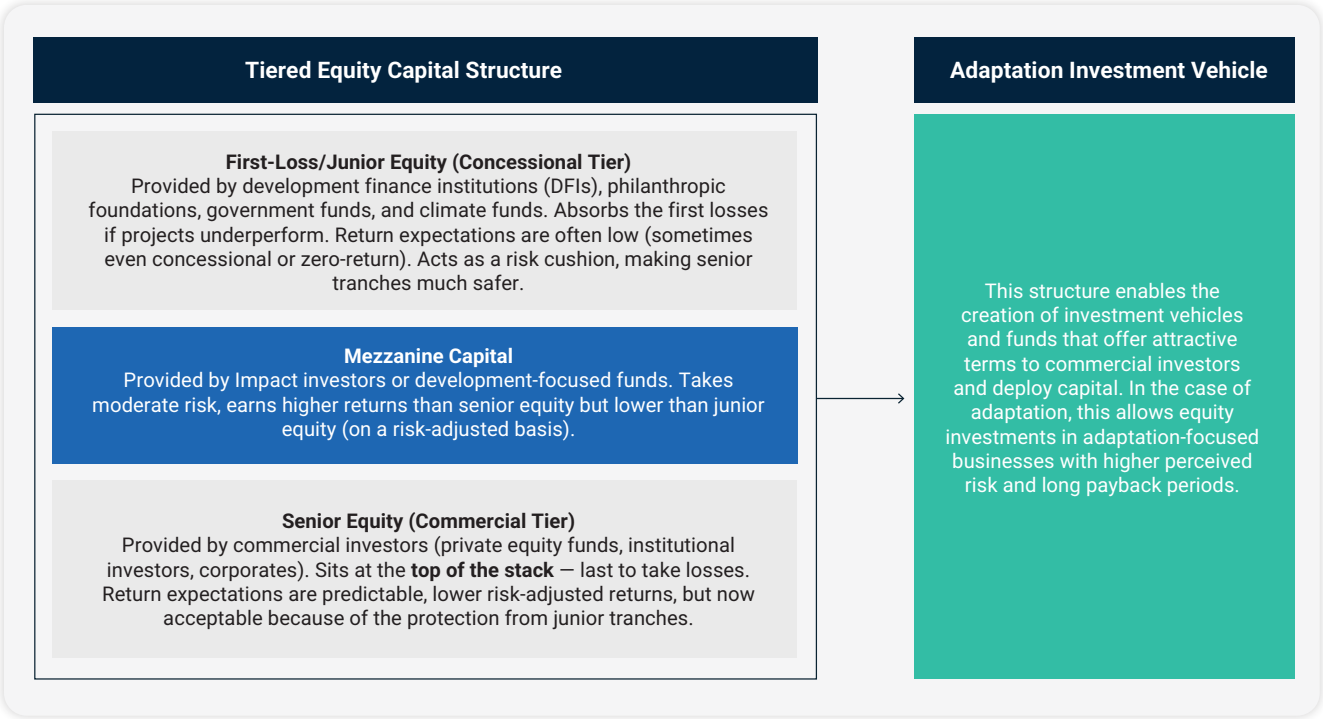
Source: Authors.

Partial credit risk guarantees and portfolio guarantees are powerful risk-sharing mechanisms designed to address these barriers by reducing the effective credit risk borne by lenders. While guarantees may be structured in different ways, common structures may include partial risk or portfolio guarantees, as shown in **Figure 10**. Partial credit risk guarantees cover a pre-agreed portion of the principal and/or interest in case of default. For example, such a guarantee might cover 50% of the loan amount, meaning that if the borrower defaults, the guarantor reimburses the lender for half of the loss. Portfolio guarantees go a step further by covering a pool of loans rather than individual transactions. This allows lenders to scale up their exposure to adaptation investments while maintaining a diversified risk profile.

For instance, GuarantCo issued its first-ever portfolio guarantee to CRDB, covering 116 billion Tanzanian Shilling (~US$ 50 million) across infrastructure-linked loans, including energy, telecoms, and transport. This risk-sharing partnership allowed the bank to extend more investment without breaching national regulatory and capital limits. GuarantCo (2025) has since closed multiple portfolios guarantee transactions in Togo and Côte d'Ivoire.

Tiered Capital Structures for Equity. A second option is to use tiered capital structures for equity investment, as shown in **Figure 11**, where concessional capital takes a subordinated position, improving the risk-return profile for senior lenders in equity investments. These blended structures can be tailored for different sectors, such as agriculture, water management, or housing, and may be accompanied by technical assistance to strengthen client capacity and pipeline development.

Figure 11: Concessional equity structure



Source: Authors.

In a tiered structure, capital is divided into different tranches, each with its own level of risk and expected return. Common tiers include:

- First-loss/Junior Equity (Concessional Tier): Often provided by development banks, philanthropic foundations, or climate funds. This tranche absorbs initial losses if the investment underperforms, effectively "shielding" more senior investors.
- Mezzanine Capital: A middle layer that earns moderate returns and takes on moderate risk.
- Senior Equity: Commercial investors participate in this tranche, which is the safest position in the structure. They are the last to take losses and usually receive more predictable returns.

This hierarchy ensures that risk is absorbed sequentially, with concessional investors taking the first hit and commercial investors having greater downside protection.

DFIs climate funds and multilateral agencies often offer grant capital, or soft loans, specifically designed to catalyse private sector investment in climate-resilient sectors. Commercial banks can engage these institutions through co-financing arrangements or strategic partnerships to create dedicated adaptation products, resilience bonds, or climate-smart lending facilities. Some sources of concessional capital are outlined in **Table 22**.

Table 22: Sources of adaptation finance

Source Type	Description	Examples
Multilateral and Bilateral DFIs	According to recent data, most adaptation finance for emerging markets comes from MDBs and bilateral donors, with around 80% of adaptation finance flows originating from these institutions (CPI, 2024a), making them the largest source of adaptation funding for emerging markets.	• MDBs (AfDB, Asian Development Bank, Asian Infrastructure Investment Bank, Council of Europe Development Bank, EBRD, European Investment Bank, Inter-American Development Bank Group, Islamic Development Bank, New Development Bank, and World Bank Group) • KfW • Development Bank of Southern Africa (DBSA)
Multilateral Climate Funds	MCFs established through international agreements or for a specific mandate provide financing for adaptation either through grants or market-linked instruments. While MCFs contribute a smaller amount than DFIs, they often target funding towards least developed countries (LDCs) and with a focus on adaptation.	• GEF • GCF • Adaptation Fund • Climate Investment Funds (CIF)
Green Banks and National Climate Change Funds	Green Banks (or Climate Finance Facilities) are national, country-driven, dedicated, catalytic FIs designed to address domestic market gaps, take ownership of climate finance, and crowd-in private investments in low-carbon and resilient projects.	• Chilean Clean Development Mechanism Promotion Office & Green Fund Initiatives • The Climate Finance Facility of the DBSA • Fondo para el Cambio Climático – Climate Change Fund • The Rwanda Green Fund • People's Survival Fund, Philippines

Source Type	Description	Examples
National Development Banks	NDBs are state-owned or government-sponsored FIs with a primary mandate of providing long-term and concessional capital to high-risk sectors and industries that are underserved by private commercial banks but are contributing to the country's development agenda.	• Banco Nacional de Desenvolvimento Econômico e Social, Brazil • Nacional Financiera, Mexico • Vietnam Development Bank • DBSA • Small Industries Development Bank of India • PT Sarana Multi Infrastruktur, Indonesia • Banque Agricole du Niger

Source: Adapted from (CPI, 2025).

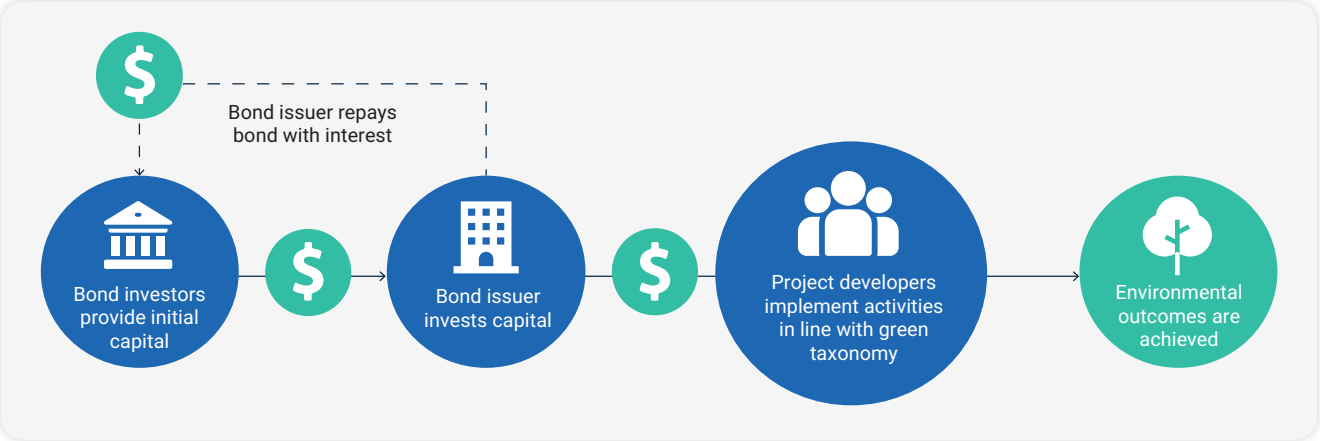
How can new innovative finance products help FIs to take advantage of the adaptation opportunity?

Innovative finance products can play a catalytic role in enabling FIs to tap into the growing opportunity presented by climate adaptation. While traditional financial products often struggle to address the unique risks, timeframes and returns associated with adaptation, newer instruments, tailored to these realities, can help FIs expand into underserved markets and take advantage of the adaptation opportunity. Module 5 explores implementing adaptation strategies within an FI, including within product development teams. Some tried-and-tested innovative products, including their financial structure, are explored in detail below.

Bond Instruments: A bond is a fixed-income instrument representing a loan from investors to an issuer, typically a government, municipality, corporation, or development institution. The standard bond structure includes an issuer, the entity borrowing the capital (e.g., government, corporation), which issues debt or "the principal", the amount borrowed, which is repaid at maturity. The use of proceeds may be general-purpose or earmarked for specific projects, and the issuer usually makes periodic interest payments to bondholders. Traditional bonds focus solely on credit risk and financial return. However, climate and sustainability-linked bonds now embed environmental or disaster-related factors into their structure or use of proceeds.

- **Green Bonds:** Green bonds are debt instruments where proceeds are earmarked for projects with environmental benefits, such as renewable energy, energy efficiency, clean transport or water management. The use of proceeds should be aligned with frameworks, like the International Capital Market Association (ICMA) Green Bond Principles, and supported with a second-party opinion or certification (see **Figure 12**). Issuers should be aware of national green taxonomies, as well as relevant global taxonomies such as the EU Green Bond Standard, which is widely used to define eligible sectors and technologies globally.

Figure 12: Green bond mechanism



Source: Adapted from EnviroAccounting (2025).

Box 8: ReNew Power Green Bond in India

In 2017, ReNew Power, one of India's largest renewable energy independent power producers, issued a landmark US$ 475 million green bond, becoming one of the country's earliest corporate issuers to tap international capital markets for climate-aligned investment. The proceeds were earmarked for refinancing debt on operational wind and solar assets across several Indian states, enabling the company to scale up its renewable energy portfolio while strengthening its balance sheet. The bond was issued under ReNew's Green Bond Framework, aligned with the Green Bond Principles, and received a second-party opinion from Sustainalytics confirming the environmental credentials of the eligible assets.

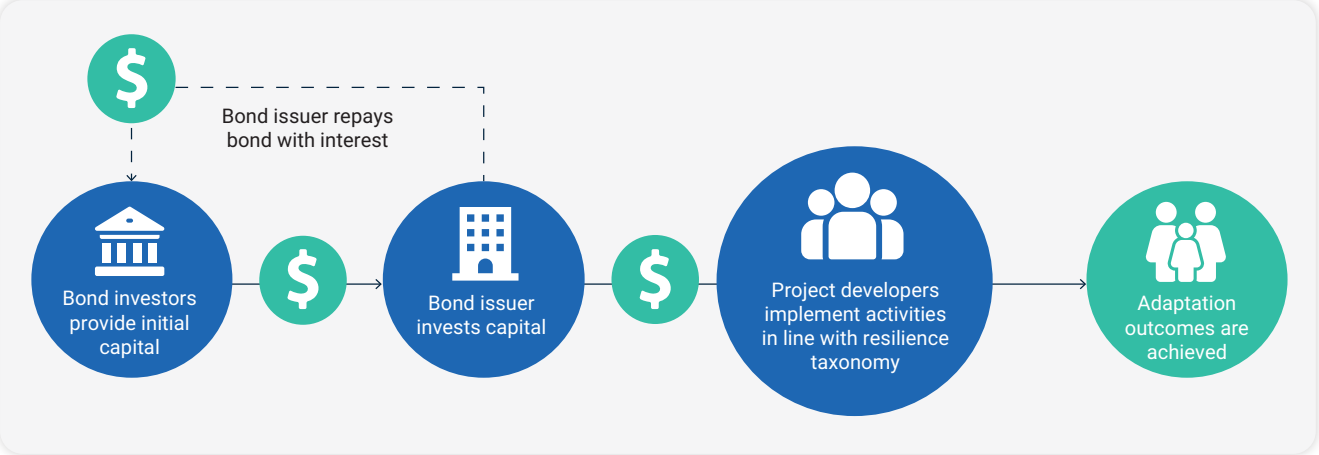
The ReNew green bond was issued as a high-yield, senior secured, five-year note, attracting strong interest from global institutional investors, including major climate-focused funds. The coupon of 6.67% reflected both ReNew's credit profile and growing investor confidence in India's clean energy sector. Security features included a pledge of project cash flows and collateral over renewable energy assets, helping mitigate investor risk and support competitive pricing.

The structuring process required extensive preparation, including asset ring-fencing, establishment of reporting protocols, and alignment with international certification standards. The issuance was oversubscribed, underscoring significant demand for emerging-market green infrastructure exposure. ReNew's transaction played a catalytic role in deepening India's green bond market, which has since become one of the most active in Asia. It demonstrated the ability of Indian renewable energy companies to mobilise large-scale private capital and provided a replicable model for subsequent issuances by utilities, infrastructure developers, and financial institutions.

Source: Climate Bonds Initiative (CBI, 2018).

- **Sustainability-Linked Bonds:** Sustainability-linked bonds (SLBs) tie the bond's financial characteristics, such as the coupon rate, to the issuer's achievement of predefined sustainability performance targets. Unlike green bonds, SLBs are not restricted to financing specific eligible projects; instead, they incentivise organization-wide improvements in areas such as emissions reduction, energy efficiency or climate resilience. The EBRD has been an active supporter and investor in SLBs across emerging markets, for example, participating in Komercijalna Banka's sustainability-linked bond in Serbia, which linked coupon adjustments to greenhouse gas reduction targets, and supporting Iberdrola's sustainability-linked instruments in Eastern Europe. These transactions demonstrate how SLBs can catalyse more ambitious corporate climate commitments while mobilising private capital.
- **Climate Resilience Bonds:** Climate resilience bonds finance projects that reduce vulnerability to climate impacts, like project developers including flood defences or agricultural corporations investing in drought resilience (see **Figure 13**).

Figure 13: Resilience bond mechanism



Source: Adapted from EnviroAccounting (2025).

Box 9: InvestHER Climate Resilient Bond

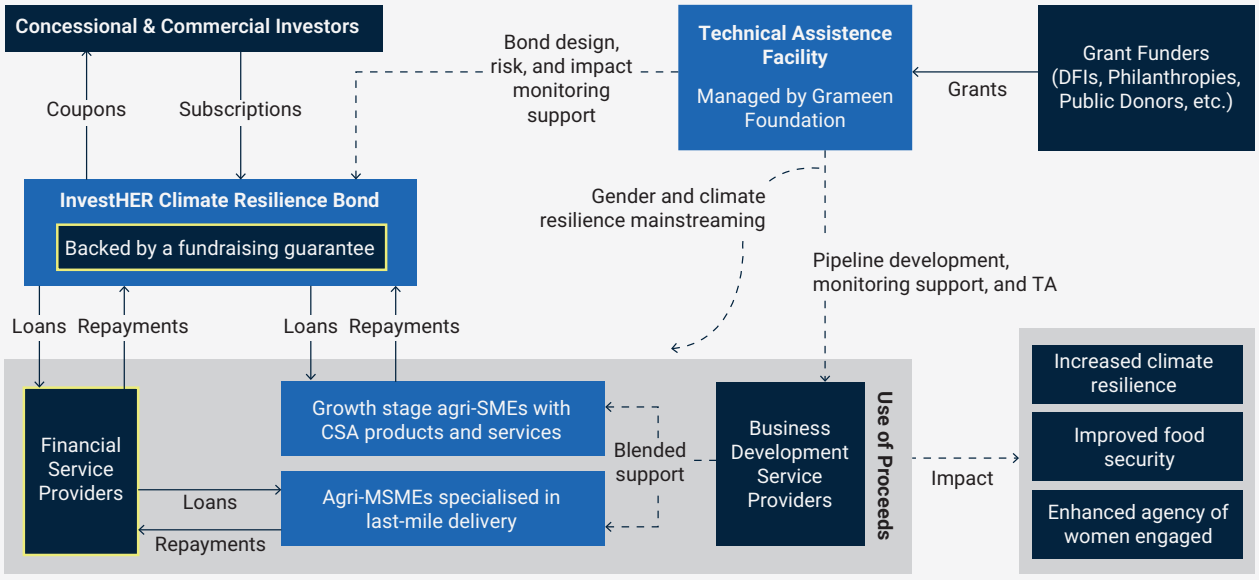
The InvestHER Climate Resilient Bond is Uganda's first gender-focused climate bond. The bond aims to strengthen sustainable agrifood systems. Grameen Foundation, a US-based non-profit with operations in Africa, designed the InvestHER Climate Resilience Bond initiative in Uganda, aiming to raise US$ 25 million in local currency to fund growth-stage agri-SMEs offering climate-smart agricultural (CSA) products, services, and technologies, enabling them to expand their operations in rural communities. In addition, financial service providers (FSPs) will borrow from the bond issuer to on-lend to primarily rural women-led agri-MSMEs, fostering climate-resilient outcomes.

The core mandate of the InvestHER Climate Resilience Bond is to build the climate resilience of women in agrifood systems. Examples of CSA practices and technologies that enhance the resilience of women farmers include organic fertilisers, solar-powered irrigation pumps, climate-resilient crop varieties (like cassava) and cold storage facilities.

The InvestHER bond contributes towards the climate resilience of women through three mechanisms:

1. **Bond proceeds will fund the rural expansion of women-owned or led growth-stage agri-SMEs that engage in CSA, enabling them to scale operations and reach more women farmers**. By expanding female agent networks and implementing marketing strategies like demonstration plots and farmer field days that integrate gender considerations (e.g., childcare), women-owned or led growth-stage agri-SMEs can effectively promote CSA among women farmers.
2. **Lending to FSPs and developing women-focused financial products for agri-MSMEs improves access to finance, enabling women entrepreneurs, who often prioritise sustainability, to invest in climate-smart practices**. With increased access to finance, women farmers can adopt resilient technologies, maintain productivity, and secure their livelihoods.
3. **Providing technical assistance (TA) to growth-stage agri-SMEs, FSPs, and through business development service providers, promotes gender sensitive practices and CSA.** By integrating CSA, women farmers can better manage climate risks to secure their livelihoods and contribute to long-term agricultural sustainability.

Figure 14: Instrument design



Structured as a revenue bond, resilience is enhanced by offering flexible repayment schedules that align with the income patterns of women in agriculture, such as those based on harvest and production cycles. The bond includes a structured TA programme for agri-SMEs, including training to develop or enhance supply chains that incorporate CSA.

The bond will be issued in two tranches (with the same rating), with one being commercial and the other concessional. Over the course of five years, it aims to reach at least 3,828 women-owned or led agri-MSMEs in Uganda, providing loans, either directly or indirectly through FSPs, for activities to improve the climate-resilience of agriculture, covering approximately 470,000 hectares of farmland.

Source: Azhar (2024).

While the use of proceeds in resilience bonds is earmarked for adaptation investments, there is less consensus on resilience taxonomies than standard green bonds, reflecting their relative novelty. To advance market clarity, the CBI has released the Climate Bonds Resilience Taxonomy, covering sectors such as resilient agrifood systems, infrastructure, and social systems. Complementing this, the Climate resilience principles, developed by CBI with significant input from the EBRD and GCA, provide a conceptual and methodological framework for identifying credible resilience investments. In addition, the Guide for Issuers on Climate Resilience Bonds, jointly published by GCA and the EBRD, offers practical, step-by-step guidance for structuring, assessing and reporting adaptation-aligned bond issuances. Together, these initiatives are helping to build greater coherence and transparency in the rapidly evolving resilience finance market.

Box 10: The European Bank for Reconstruction and Development's Climate Resilience Bond

In 2019, the EBRD issued the world's first climate resilience bond, marking a major milestone in the development of adaptation-focused capital market instruments. Unlike green bonds, which traditionally finance mitigation projects such as renewable energy or energy efficiency, the climate resilience bond was explicitly designed to raise capital for investments that enhance the resilience of communities, businesses and infrastructure to climate impacts. Since 2019, the EBRD (2025c) has issued 13 climate resilience bonds totalling the equivalent of EU 1.2 billion, under the EBRD's Green Bond Framework and aligned with the ICMA Green Bond Principles, with a dedicated methodology for identifying and tracking climate resilience investments.

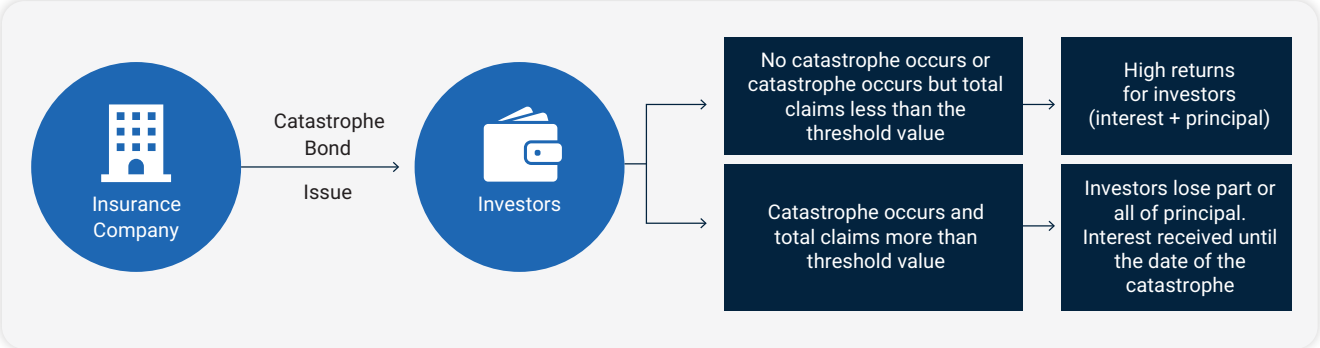
Proceeds from the bond support a diverse portfolio of resilience-building activities across the EBRD's countries of operation, including climate-resilient water supply systems, sustainable irrigation, flood and coastal protection infrastructure, resilient transport networks, and enterprise-level adaptation measures. The EBRD leverages its extensive climate risk assessment experience to ensure that financed projects address clearly identified physical climate risks and deliver measurable resilience outcomes. This rigorous approach, anchored in project-level climate vulnerability assessments, has positioned the bond as a benchmark for adaptation finance transparency and credibility.

The climate resilience bond has also demonstrated strong investor appetite for adaptation-focused instruments, attracting orders from environmentally and socially responsible investors globally. It provided proof of concept that adaptation and resilience investments can be effectively structured, monitored, and communicated to capital markets. Building on this pioneering issuance, the EBRD has continued to mainstream climate resilience across its investment portfolio and has supported the broader market through guidance materials, taxonomies and methodologies for assessing and reporting climate resilience benefits.

Source: Development (2020) and ERBD (2025c, n.d.).

- **Catastrophe Bonds:** Catastrophe bonds, as shown in **Figure 14**, are insurance-linked securities that transfer natural disaster risk from an insurer to capital markets. These products are typically issued by insurance companies or governments. Investors bear the risk of a defined event (e.g., hurricane, flood); if it occurs, the issuer can use bond proceeds to respond, and investors lose some or all their principal. Payouts are triggered by predefined conditions (e.g., a Category 5 cyclone hitting a region) where the threshold of a weather event is met. These products carry a high-risk profile and are often backed by multilateral development partners.

Figure 15: Catastrophe bond structure



Source: Authors.

How can FIs adapt their lending programmes or create new innovative instruments for adaptation?

This requires both rethinking existing lending programmes and creating entirely new instruments designed with resilience in mind. Traditional credit lines can be made fit for purpose by integrating climate risk assessments into credit appraisal processes, extending maturities and adjusting repayment schedules to match the long-term cash flows typical of adaptation investments, and using blended finance structures to share risk. Guarantees, subordinated debt, and first-loss equity tranches can be deployed to de-risk lending to vulnerable sectors such as agriculture, water and housing, encouraging banks to expand their portfolios and offer more affordable terms. Pairing lending with technical assistance helps clients strengthen their own adaptive capacity, improving loan performance and reducing systemic vulnerability over time.

FIs can also by design new financial products and capital market instruments specifically aimed at promoting adaptation. Tiered equity funds can mobilise commercial investors into climate-resilient infrastructure or agribusiness by providing concessional first-loss capital to protect senior tranches. Sustainability-linked loans with adaptation key performance indicators can reward borrowers with lower interest rates or grace periods once they adopt climate-smart practices. At the same time, insurance-backed credit products can automatically restructure repayments when climate shocks occur. The issuance of green bonds earmarked for adaptation investments can also broaden the pool of investors willing to support resilience projects.

05 Additional Resources

Further sources on climate adaptation solutions and investments

Reports

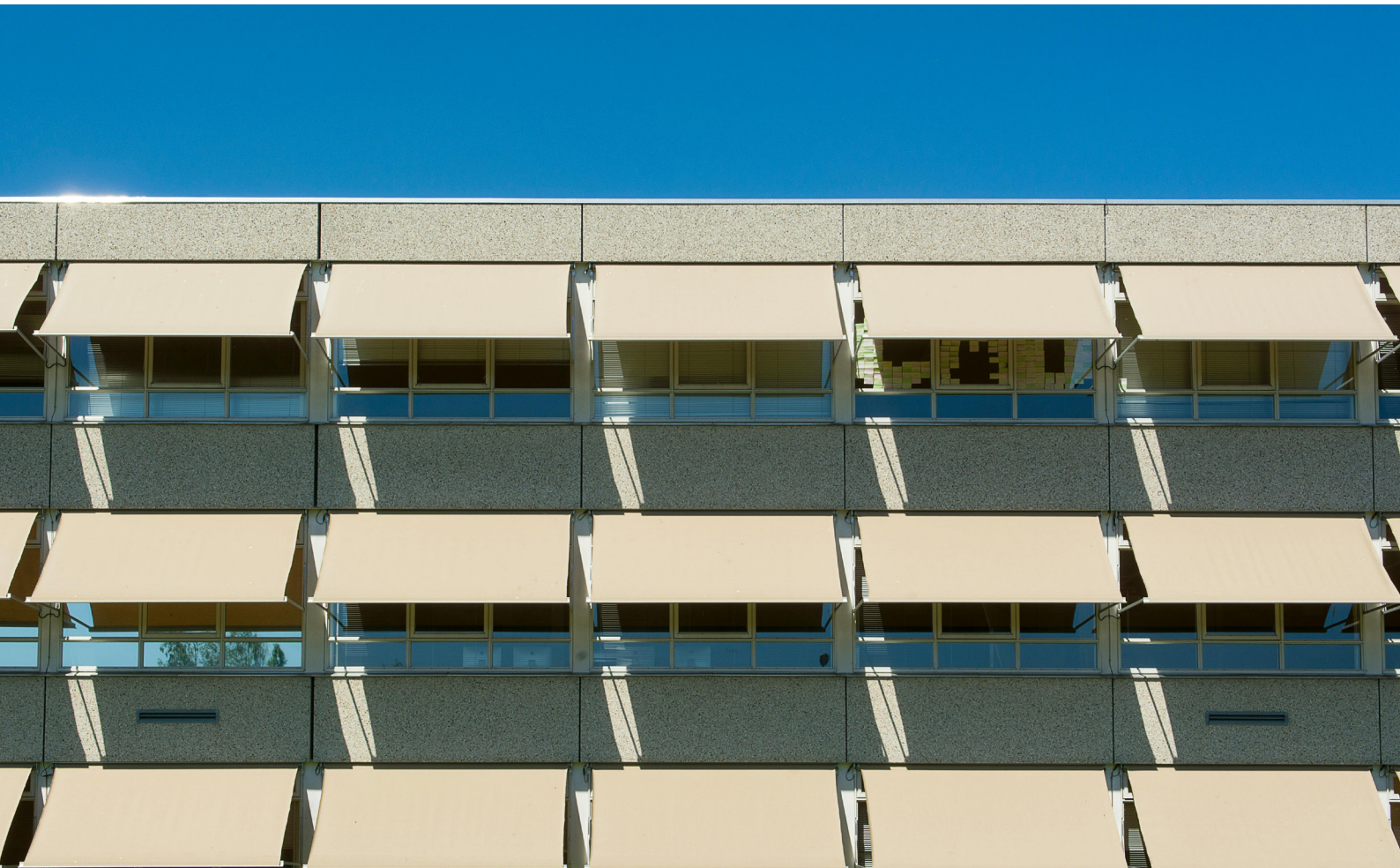
- GCA in collaboration with CGAP, CGIAR, FSD Africa and Pegasys, conducted market studies to identify adaptation and resilience investment opportunities that are technically maturing and potentially attractive to private sector financiers in Tanzania, Kenya, Zambia and Democratic Republic of Congo. Through the investment briefs targeted at African commercial FIs, the studies illustrate country-level market size and financial returns for nine selected adaptation solutions across agri-food systems, manufacturing, housing, energy and green infrastructure."
- United Nations Environment Programme (2020) has established the "Microfinance for Ecosystem-based Adaptation" (MEBA) project that provides fact sheets of adaptation options, climate hazards they address, considerations for implementation, costs, and benefits of solutions across the Agriculture, Forestry, and Water sectors.
- Standard Chartered, KPMG, and United Nations Office for Disaster Risk Reduction (2024) have developed a set of technical guidelines for (private) investors to identify adaptation investment opportunities and how to prioritise adaptation solutions that will have the most impact.
- UNEP Copenhagen Climate Centre has developed a framework to support the development of Technology Needs Assessments and Action Plans, with a focus on technologies to reduce GHGs (climate mitigation) and increase resilience to climate impacts (climate adaptation). More information can be found at https://tech-action.unepccc.org/
- The IIGCC Climate Resilience Investment Framework helps investors develop adaptation and resilience plans and use available levers to manage financially material physical climate risks.

- The WRI study Strengthening the Investment Case for Climate Adaptation: A Triple Dividend Approach shows that applying the Triple Dividend of Resilience framework reveals adaptation investments can deliver over US$ 10.50 in benefits per US$ 1 invested, with 20–27% returns, making a strong case for scaling adaptation finance and improving appraisal methods. A summary of the key lessons can be found in the report The Compelling Investment Case for Climate Adaptation.
- Advancing Adaptation: Mapping Costs from Cooling to Coastal Defenses from McKinsey Global Institute presents a first-of-its-kind granular, pixel-level analysis of current and future adaptation costs through 2050, assessing 20 measures across heat, wildfires, drought, and flooding. The report shows how these measures can be applied across diverse economies to provide broad-based climate hazard protection.
- The GIC, Bain & Company report Sizing the Inevitable Investment Opportunity: Climate Adaptation reviews scientific and industry studies to identify key adaptation solutions relevant to private investors and estimate the current and future scale of investment opportunities across emerging and established solution categories.
- The Systemiq report Returns on Resilience: Investing in Adaptation to Drive Prosperity, Growth and Competitiveness assesses the economic and financial returns on resilience investments for communities, companies and countries, analysing a large volume of data and case studies from different regions of the world.
- The Global Tool for Nature-based Solutions (NbS) by Russell et al. addresses data gaps by assessing and pricing climate risks, quantifying the protective value of nature-based assets, and identifying NbS investment opportunities, providing actionable data to help policymakers and investors integrate NbS into planning and mobilise adaptation finance.

Case Study Examples

- GCA's project page provides an overview of several public and private sector projects supported by GCA in Africa and South Asia that involve the appraisal of adaptation solutions to tackle the impacts of climate change. These projects include the agriculture, water, transport and other sectors. More information can be found at https://gca.org/gca-project-portal/
- The Asian Infrastructure Investment Bank's (AIIB) Program for Development and Resilience for the Southern Region Project in Brazil finances flood protection, urban drainage, and broader climate adaptation measures, alongside support for businesses to maintain operations through relocation, retrofitting, and diversified supply chains. The project is a sovereign-backed on-lending facility implemented by Banco Regional de Desenvolvimento do Extremo Sul (BRDE). It has directed 30% of funds to disaster-affected municipalities and benefited around 800,000 people.
- AIIB's TKYB Climate and Digital Transition On-Lending Facility provides US$ 200 million in sovereign-backed financing to Türkiye Kalkınma ve Yatırım Bankası for on-lending to private firms, with at least 5% dedicated to adaptation projects that reduce physical climate risks and strengthen resilience in vulnerable sectors. Investments target climate-resilient infrastructure, water resource management, disaster risk reduction, nature-based solutions, and structural reinforcement. The facility supports Türkiye's NDC and net-zero 2053 goals and strengthens private sector climate resilience.
- Standard Chartered completed its first labelled adaptation finance deal for a corporate client by providing bank guarantees to support the trade of extreme weather-resilient solar modules for PV farms in the US, UAE and Saudi Arabia, demonstrating its new Guide for Adaptation and Resilience Finance in action. The transaction highlights how adaptation finance can help build resilient infrastructure in response to the roughly US$ 2 trillion of global economic losses from climate-related extreme weather events over the past decade.

- Dalmore Capital integrates climate risk analysis across projects in its portfolio, including the acquisition of a Scottish Run of River Hydropower, where rainfall-based climate change factors were modelled under multiple scenarios and embedded into equity valuation models to quantify both risks and opportunities for energy output. In assessing the impact of climate change on North Sea Nearshore Wind Assets, Dalmore used Copernicus climate data to develop generation change factors and inform sensitivity testing, supporting strategic decisions such as offtake agreements and hedging to strengthen long-term resilience. As part of their investment with Connect Plus M25, proactively assessing and managing the M25 motorway's exposure to extreme weather and climate change led to Connect Plus M25 being awarded the FAST-Infra Label for its substantial contribution to Adaptation & Resilience.
- The TOKYO Resilience Bonds Framework, established by the Tokyo Metropolitan Government, supports the TOKYO Resilience Project, which sets out a vision for a climate-resilient Tokyo by the 2040s through comprehensive adaptation policies. Using a blended finance model, bond proceeds are exclusively allocated to measures addressing storm and flood damage linked to climate change. The initiative aims to protect lives and livelihoods while safeguarding Tokyo's role as Japan's capital and a global economic hub.
- The GAIA blended finance platform, led by MUFG Bank Ltd, FinDev Canada, Climate Fund Managers and the GCF, is an up to US$ 1.48 billion vehicle providing long-term loans for climate adaptation and mitigation projects across emerging markets, with at least 70% of investments focused on adaptation. Operating in 19 of the world's most climate-vulnerable countries, GAIA reached a US$ 600 million first close, mobilising public and private capital to expand access to previously unavailable sources of finance. The platform aims to scale high-impact, resilient infrastructure and climate solutions in developing economies.



06 Glossary

Unless otherwise specified, all the definitions are drawn from the IPCC (2023) Glossary.

Adaptation: In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.

Adaptive capacity: The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities or to respond to consequences (MA, 2005).

Exposure: The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected.

Greenhouse gases (GHGs): Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of radiation emitted by the Earth's surface, by the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapour (H2O), carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4) and ozone (O3) are the primary GHGs in the Earth's atmosphere. Human-made GHGs include sulphur hexafluoride (SF6), hydrofluorocarbons (HFCs), chlorofluorocarbons (CFCs) and perfluorocarbons (PFCs); several of these are also O3-depleting (and are regulated under the Montreal Protocol).

Gross Domestic Product (GDP): The sum of gross value added, at purchasers' prices, by all resident and non-resident producers in the economy, plus any taxes

and minus any subsidies not included in the value of the products in a country or a geographic region for a given period, normally one year. GDP is calculated without deducting for depreciation of fabricated assets or depletion and degradation of natural resources.

Hazard: The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources.

Maladaptation (maladaptive actions): Actions that may lead to increased risk of adverse climate-related outcomes, including via increased GHG emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future. Most often, maladaptation is an unintended consequence.

Mitigation (of climate change): A human intervention to reduce emissions or enhance the sinks of greenhouse gases.

Physical risks resulting from climate change can be event driven (acute) or longer-term shifts (chronic) in climate patterns. Physical risks may have financial implications for organizations, such as direct damage to assets and indirect impacts from supply chain disruption. Organizations' financial performance may also be affected by changes in water availability, sourcing, and quality; food security; and extreme temperature changes impacting organizations' premises, operations, supply chain, transport needs, and employee safety (TCFD, 2017).

Silvopastoral practices can be defined as the practices that promote the integration of grazing livestock, trees and forages to achieve an improvement in long-term productivity, increase tree growth, among others (University of Missouri, 2024).

Transition risks are related to extensive policy, legal, technology, and market changes to address mitigation and adaptation requirements for accelerating the transition towards a lower-carbon economy. Depending on the nature, speed, and focus of these changes, transition risks may pose varying levels of financial and reputational risk to organizations (TCFD, 2017).

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

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08 Practice Questions

The following set of 15 single-response, multiple-choice questions is designed to test understanding of key concepts covered in **Module 4: Where to Invest**. The questions are intentionally challenging and go beyond simple recall, requiring application, analysis and comparison of concepts. The questions cover the following chapters of Module 4:

- **Chapter 1: Climate Adaptation Ecosystem and the Role of Commercial Financial Institutions**
- **Chapter 2: Identifying Climate Adaptation Needs**
- **Chapter 3: Mapping Adaptation Opportunities Across Sectors and Locations**
- **Chapter 4: Matching Adaptation Needs and Financing Solutions**

Each question has **four answer options**, with only **one correct solution,** followed by an explanation clarifying the reasoning and key learning points.

1 Why is the public sector essential in financing climate adaptation efforts?

A. Because adaptation projects typically offer quick financial returns that attract public investors.

B. Because public institutions can absorb higher risks and fund long-term resilience projects that private investors often avoid.

C. Because adaptation finance is only relevant for government-owned infrastructure.

D. Because public funding eliminates the need for private sector involvement.

2 Why is private sector involvement in climate adaptation finance often limited?

A. Because adaptation projects typically offer fast and high returns that attract private investors.

B. Because adaptation benefits are often indirect, long-term, and difficult to monetize, making them less attractive to traditional investment models.

C. Because private institutions are mandated to fund only mitigation projects.

D. Because adaptation finance is fully covered by public and philanthropic sources.

3 Which option best distinguishes financing from funding in the context of climate adaptation projects?

A. Financing refers to long-term revenue streams, while funding covers short-term project design costs.

B. Financing is limited to public-sector contributions, while funding is provided by private investors.

C. Financing provides upfront capital for project implementation, while funding represents the sources that repay or sustain the project over time.

D. Financing and funding are interchangeable terms used to describe climate adaptation investments.

4 What role do commercial financial institutions play within the adaptation finance ecosystem?

A. They act mainly as end beneficiaries of adaptation funding.

B. They operate solely as donors providing concessional capital to governments.

C. They focus exclusively on financing large infrastructure projects without public-sector involvement.

D. They function as intermediaries that connect capital providers with real-economy clients and deploy blended finance at scale.

5 What is meant by the “triple dividend” of investing in climate adaptation?

A. Avoided losses, operational savings, and environmental and social co-benefits.

B. Increased profits, reduced taxes, and faster project delivery.

C. Higher interest rates, improved branding, and reduced insurance premiums.

D. Short-term gains, reduced reporting requirements, and simplified compliance.

6 Why is it important for financial institutions to understand and avoid maladaptation when financing climate adaptation measures?

A. Because maladaptation guarantees faster project delivery.

B. Because maladaptation improves short-term financial returns regardless of long-term impacts.

C. Because doing so helps ensure that adaptation investments genuinely reduce climate risks rather than unintentionally increase them.

D. Because it allows institutions to bypass climate risk assessments.

7 Why should financial institutions and clients identify which climate adaptation benefits can be monetized?

A. To improve project bankability by linking adaptation measures to measurable cost savings or revenue streams.

B. To focus only on environmental outcomes and ignore financial performance.

C. To avoid investing in projects with long-term benefits.

D. To ensure all adaptation benefits are intangible and difficult to assess.

8 How can climate adaptation measures also contribute to mitigation goals?

A. By focusing only on short-term infrastructure upgrades.

B. By reducing greenhouse gas emissions while improving resilience, such as through nature-based solutions or energy-efficient systems.

C. By avoiding all forms of energy use in adaptation projects.

D. By separating adaptation and mitigation to prevent overlap in project design.

9 Why do climate adaptation solutions differ across sectors, and how does this create opportunities for financial institutions?

A. Because each sector has unique vulnerabilities and climate exposures, financial institutions can tailor products and investments to specific needs.

B. Because all sectors face identical climate risks and require uniform solutions.

C. Because adaptation is only relevant for agriculture, not other sectors.

D. Because financial institutions should avoid sector-specific strategies to reduce complexity.

10 Why do the costs and benefits of climate adaptation investments vary across projects?

A. Because local conditions, resource availability, and climate risk intensity influence both implementation costs and the effectiveness of adaptation measures.

B. Because all adaptation projects use the same technologies and materials.

C. Because adaptation benefits are always guaranteed regardless of context.

D. Because climate adaptation is only relevant in high-income regions.

11 How can financial institutions identify bankable climate adaptation solutions tailored to different client needs?

A. By offering generic products without assessing sector-specific risks.

B. By requiring clients to independently identify and finance adaptation solutions.

C. By analysing client profiles and sector vulnerabilities, and using tools like pre-vetted technology lists to match needs with suitable financial products.

D. By focusing only on mitigation technologies and excluding adaptation measures.

12 How can financial institutions use their client relationships to help identify and finance climate adaptation solutions?

A. By relying only on external climate studies and avoiding direct client engagement.

B. By combining client-level insights, historical lending data, and climate risk models to design demand-driven adaptation finance solutions.

C. By focusing adaptation finance exclusively on large corporates with in-house expertise.

D. By separating climate risk assessment from credit appraisal and client advisory activities.

13 Why do financial institutions play a critical facilitation role for adaptation finance, particularly for households and MSMEs?

A. Because these clients typically have surplus capital to invest in adaptation independently.

B. Because adaptation finance products are only suitable for small-scale clients.

C. Because regulators require FIs to provide adaptation training to all clients.

D. Because many clients lack awareness, technical capacity, and tools to assess climate risks on their own.

14 Which of the following statements best explains why resilience bonds may present a greater challenge for financial institutions compared to green bonds when integrating climate adaptation strategies?

A. Resilience bonds are primarily focused on mitigation, which limits their applicability to adaptation strategies.

B. Resilience bonds require periodic interest payments to investors, unlike green bonds.

C. Resilience bonds lack standardised taxonomies, making it harder for FIs to assess eligibility and align with global frameworks.

D. Resilience bonds are not recognised by any international climate finance initiatives.

15 What is the primary mechanism by which catastrophe bonds transfer climate-related risk from insurers to capital markets?

A. By earmarking proceeds for mitigation projects aligned with green taxonomies.

B. By requiring investors to pay premiums to insurers in exchange for fixed returns.

C. By offering tax incentives to investors who fund adaptation infrastructure.

D. By triggering payouts to issuers when predefined disaster conditions are met, resulting in potential loss of principal for investors.

09 Question Solutions

1

Correct: B

Explanation: Adaptation projects often involve high upfront costs, uncertain returns, and long-term horizons. Public actors, such as governments, development banks and climate funds, play a key role by financing these efforts and helping mobilise private capital through risk-sharing mechanisms.

2

Correct: B

Explanation: Private investors often see adaptation as high-risk and low return due to unclear revenue models and long-term horizons. Unlike mitigation, adaptation projects usually deliver indirect financial benefits, making them harder to justify under conventional investment criteria.

3

Correct: C

Explanation: Financing supplies the upfront capital needed to design and implement adaptation projects, typically from investors or financial institutions. Funding refers to the longer-term revenue or repayment sources, such as public budgets, user fees or grants, that ensure the project's financial sustainability and ability to repay the financing.

4

Correct: D

Explanation: Commercial financial institutions sit at the centre of the adaptation finance ecosystem by bridging capital sources, such as investors, development finance institutions, and climate funds, with clients facing adaptation needs. Through blended

finance, risk mitigation instruments and extensive retail and SME networks, they help channel capital efficiently and mainstream adaptation into the financial system.

5

Correct: A

Explanation: The triple dividend refers to three key benefits of adaptation investments:

1. Avoided losses from climate-related disruptions,

2. Operational and economic gains from resilient infrastructure, and

3. Environmental and social co-benefits that enhance long-term value.

6

Correct: C

Explanation: Maladaptation can worsen climate risks or create new ones if adaptation measures are poorly designed or contextually inappropriate. FIs must understand this to avoid financing solutions that lead to long-term vulnerabilities or financial losses.

7

Correct: A

Explanation: Monetizable adaptation benefits, like reduced losses, increased yields or lower operating costs, strengthen the financial case for investment. They help clients access funding and allow FIs to assess creditworthiness and reduce perceived risk.

8

Correct: B

Explanation: Adaptation solutions like wetlands restoration, green urban spaces, and efficient water systems can also reduce emissions, making them beneficial for both resilience and climate mitigation. These co-benefits enhance the value and impact of climate investments.

9

Correct: A

Explanation: Climate risks vary by sector; agriculture may face drought, while transport may be vulnerable to flooding. Understanding these differences allows financial institutions to design targeted financial products and support resilient growth across diverse sectors.

10

Correct: A

Explanation: Adaptation costs depend on factors like local materials, technical capacity, and external market conditions. Benefits vary based on how well solutions reduce climate risks and how frequently those risks occur, making context-specific analysis essential for financial planning.

11

Correct: C

Explanation: FIs can use existing client data and sector insights to identify relevant adaptation needs, then match them with appropriate financial products. Tools like pre-approved technology platforms help streamline decision-making and ensure solutions are both climate-resilient and financially viable.

12

Correct: B

Explanation: Financial institutions have deep visibility into client operations through long-standing relationships, local presence, and lending data. By integrating these insights with climate risk modelling, they can identify specific resilience gaps and translate climate risk information into practical, client-focused adaptation finance solutions.

13

Correct: D

Explanation: Most households and SMEs face significant capacity and awareness gaps in understanding climate risks and planning adaptation measures. Financial institutions can fill this gap by offering risk screening tools, advisory support and tailored financial products, helping clients recognise vulnerabilities and generate demand for adaptation investments while strengthening long-term client viability.

14

Correct: C

Explanation: Resilience bonds are designed to finance adaptation projects (e.g., flood defences, drought resilience), but unlike green bonds, they suffer from a lack of standardised taxonomies. This makes it more difficult for financial institutions to evaluate project eligibility, align with global standards and ensure transparency. While green bonds benefit from well-established frameworks like the ICMA Green Bond Principles and CBI Taxonomy, resilience bonds are still evolving, with limited consensus on classification.

15

Correct: D

Explanation: Catastrophe bonds are insurance-linked securities that transfer the risk of natural disasters (e.g., hurricanes, floods) from insurers to capital markets. If a predefined event occurs, such as a Category 5 cyclone hitting a specific region, the bond is triggered, and the issuer receives the proceeds to respond to the disaster. In this case, investors lose some or all their principal, which is the core risk-transfer mechanism. This structure allows insurers and governments to access rapid funding for disaster response while shifting risk to investors.

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