CLIMATE POLICY INITIATIVE

Emerging solutions to drive private investment in climate resilience

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Disclaimer

This working paper examines projects from a selected group of Development Finance Institutions to take stock of existing experiences in engaging and supporting private investment in climate resilience. It is not intended to be comprehensive or to provide final answers, but rather to foster knowledge sharing and stimulate discussion, including on research needs to be explored in future studies. The assessment presented is mainly based on the review of project documents and publicly available information.

Descriptors

Sector	Climate resilience; Adaptation	
Region	Global	
Keywords	Climate Resilience; Adaptation; Climate Change Risks Management; Infrastructure; Water; Agriculture; Development Finance Institutions; Climate Finance	
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Our work helps nations grow while addressing increasingly scarce resources and climate risk. This is a complex challenge in which policy plays a crucial role.

Executive Summary

Climate change is expected to increase risks to businesses, infrastructure, assets and economies. Understanding how to involve the private sector in responding to these risks – or encouraging them to take advantage of the new business opportunities that may arise from changing climate conditions – is crucial to catalyze greater investment in activities that increase countries, businesses, and communities' resilience.

This working paper provides emerging insights from the experience of seven Development Finance Institutions (DFIs) in driving private sector investment in climate resilience, and from a workshop on strategies and business models that could help to scale up current efforts. It examines a subset of projects developed by five multilateral, one bilateral and one national development bank over 2011-2014, in both developed and developing countries. In particular, it looks at the tools and approaches designed by these DFIs to address pre-investment and investment stage barriers holding back private investment in measures that would enhance the resilience of infrastructure, water-intensive industries and agriculture. These are the sectors where DFIs have focused their private sector-oriented interventions. It aims to provide governments, their agencies and DFIs with an overview of the strategies employed so far and to identify opportunities to further scale up private investment in climate resilience.

Key Lessons Learned

The projects assessed show that DFIs have employed a variety of approaches to tackle pre-investment and investment stage barriers preventing private action in climate resilience. Grants or concessional loans from donors often supported multilateral DFIs to develop pilot projects, provide technical assistance or give access to finance at longer and more affordable terms, thereby encouraging private investment in climate-resilient projects that are capital intensive, have long payback periods, or carry first-mover risks.

The study highlighted the following lessons.

- A combination of policies, regulations, and longer-term debt from DFIs can trigger private investments in climate resilience. In high-income Western European countries, compliance with national or European regulations and pressure to meet changing market demand played a role in driving capital-intensive investments in water and wastewater infrastructures. The renewal of these ageing infrastructures provided an opportunity for water companies to integrate climate resilience in such assets. The European Investment Bank enabled private investment by providing access to longer-term debt finance, presently in short supply in EU countries. Longer-term finance better matches investors' financing needs given the high upfront investment and long, uncertain returns of such infrastructure projects.
- Technical assistance measures helped to stimulate demand for private investment by addressing knowledge gaps. They supported water-dependent businesses to identify opportunities for climate-resilient investments, and engaged local banks in the financing of water-efficient technologies. Inability to recognize and evaluate the materiality of climate change risks and a lack of knowledge on how to manage them represent key barriers to private investors in responding to climate change. This is particularly true for small and medium-sized enterprises (SMEs) in middle-income and developing countries. To overcome such constraints, and show the business case for investment, some DFIs (the International Finance Corporation [IFC] and the European Bank for Reconstruction and Development [EBRD]), engaged in consultations, carried out studies or business-tailored audits or provided other advisory services. In upper-middle-income countries, these activities helped to identify and evaluate climate change risks to water-dependent business

operations, and options for addressing them. In developing countries, they are helping DFIs to engage agribusinesses in better managing the climate change risks in their supply chains. In more than half of the projects in both groups of countries, filling knowledge gaps was the first step to stimulating demand for investments and designing suitable financing and climate resilience strategies. In Turkey, a market study helped to engage local commercial banks in providing finance for businesses to take up water-efficient technologies. In low-income developing countries, technical assistance and advisory services – carried out also thanks to donors' support – are helping to create the preconditions for private investment to happen.

- Technical assistance, provision of finance for on-lending, and credit enhancement measures are encouraging local financial institutions and non-bank entities to address the debt funding gaps preventing micro-, SMEs' from investing in climate-resilience. In developing countries some MDBs are building alliances with members of agricultural value chains (IFC, the Inter-American Development Bank [IDB] and the Asian Development Bank [ADB]), or engaging local financial institutions (IFC, IDB and EBRD) in on-lending to micro-, small-, and medium-sized enterprises. The development of such intermediated and targeted financing structures not only aims to strengthen the ability of these businesses to cope with the projected impacts of climate change, but also to develop the deal-flow and financiers' expertise in understanding, promoting and financing technologies and practices that can improve climate resilience. DFIs have also devised credit enhancement measures to address financiers' credit default risk perceptions and facilitate access to finance at terms better aligned with borrowers' investment needs.

Opportunities to Increase Private Investment in Climate Resilience

DFIs have made progress in designing approaches and business models to drive private investment in climate resilience. The number of private sector-oriented projects in DFIs portfolios has increased over the period analyzed (2011-2014), and the approaches used have evolved. However, several of the assessed DFIs are just beginning to develop their portfolios of private adaptation projects, and more remains to be done to integrate climate resilience in the financial system and unlock finance from a broader range of financiers and investors. DFIs, in fact, represent a limited share of overall investment flows.

The lessons learned from the DFI approaches assessed and discussions with investors, policymakers, and practitioners, suggest that identifying viable investment opportunities and developing project pipelines is the top priority for promoting private investment in climate resilience. There are four main opportunities to achieve this end:

- Governments should adjust regulatory frameworks to create stronger incentives for private investment. Well-designed frameworks can trigger private engagement in climate resilience. Non-existent or deficient frameworks can inhibit the incentives for investment by failing to put an adequate price on the risk of inaction and lowering the rate of return of possible climate-resilient investment opportunities.

  To this end, DFIs could engage more often in policy consultations with governments – an approach we identified only in one EBRD project in Tajikistan – and could facilitate dialogue between governments and business.

- Governments, their agencies, and DFIs, sometimes in partnership with private actors, can equip businesses with the information and tools they need to integrate climate information into investment decision making processes by:

- Promoting or supporting investment in the development and dissemination of business-relevant data and providing business-friendly impact assessment tools;
- Supporting cost-sharing approaches to facilitate and incentivize climate change risk assessment and support projects structuring; this is particularly relevant for micro and SMEs in middle-income and developing counties which typically have limited financial and technical capacity to carry out such assessments and develop bankable projects.

- DFIs and other public agencies can enhance collaboration with the financial system and between actors of supply chains as a means to foster private investors' engagement in climate resilience. Local banks, insurance companies, and agricultural supply chain actors can all play a role in this context.

  Local banks, in particular, are in a privileged position to engage businesses to scale up investment because they understand local barriers to investment. In particular, they can play a greater role in engaging with SMEs, which represent the majority of private sector enterprises and whose financial needs are typically too small to benefit from direct DFI support. Local banks' access to climate risk screening tools and know-how could help them to shape finance for resilience building. Regulators and stakeholders can also play a role in enhancing banks' awareness of the need to determine, assess and manage climate change-related risks in projects.

  Agricultural value chains are emerging as a vehicle to deliver climate resilience to a large number of micro- and small enterprises, and to lower financiers' risks and transaction costs. Such collaborative models could be further explored.

- DFIs can help to create the evidence base needed to encourage private sector interest in climate resilience by piloting approaches in middle-income countries for use in lower-income countries. Most DFI activities we identified targeted private actors operating in upper-middle-income countries. In these countries, which have a stronger private sector than lower-income countries and, therefore, more bankable opportunities, technical assistance and advisory services are driving investment.

  The decision of the Pilot Program for Climate Resilience's (PPCR) governing body in May of this year to open up the use of the Program's private sector set-aside to all the countries of the Climate Investment Funds present a noteworthy opportunity to support the creation of the evidence base needed to encourage private sector investment. This decision aims to overcome the geographic restriction limiting the use of the set-aside funds in PPCR low-income countries, where the formal private sector is generally small in size, technical capacity is limited and investment environments are challenging. In these countries, in fact, the conversion of project concepts into approved projects and investment has been limited or slow so far. Given the relative novelty of the topic for the private sector, the PPCR decision can help to pilot and test private sector adaptation approaches in middle-income countries to generate the experience and track record needed to identify and develop scalable and replicable business models for lower-income countries.

Finally, a sustainable scale up of investment in climate resilience will require efficient use of concessional resources from donors to reduce costs and risks. Our understanding about how to use public money effectively for climate action is increasing. However, open questions remain on how to best use limited public resources to drive private adaptation investments while avoiding the creation of unhelpful market distortions.

The evidence base on the optimal use of limited concessional public finance in private adaptation projects is limited and needs to be built.

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1. Introduction

Climate change is expected to increase risks to businesses, infrastructure, assets, and economies (IPCC, 2014). Extreme weather events and disasters are already damaging assets, disrupting supply chains, reducing productivity and revenues, and destroying livelihoods (see C2ES, 2013; Munich Re, 2012). Projected climate impacts will also likely hit the creditworthiness of companies (S&P, 2015), posing risks to financial institutions (IFC, 2010) and may affect companies' credit ratings (S&P, 2015).

In developing countries, costs involved in becoming more resilient to climate change are estimated to reach USD 150 billion per year by 2030, and USD 250 billion to USD 500 billion per year by 2050 in a 2°C scenario (UNEP, 2014). Adaptation costs and finance needs will rise more rapidly under a 4°C warming pathway (UNEP, 2014), both in developing and developed countries.

Increasing public and private investment in climate resilience is, therefore, critical to face the climate change challenge.[1] Development Finance Institutions (DFIs) are in a privileged position to foster private investment in climate resilience.

This paper provides emerging insights on the tools and approaches developed by a subset of DFIs' activities engaging the private sector in climate resilience. While many of the projects in their portfolios are at an early stage, bringing evidence on the instruments, approaches and levers DFIs have devised to engage private actors in this area can help inform future interventions. It can offer interesting insights to multilateral climate funds seeking to stimulate private sector participation, and also help policymakers provide a more supportive policy environment.

The private sector has the potential to significantly contribute to countries' adaptation efforts. This is because private owners and operators of climate-sensitive assets or business practices in sectors with social and economic relevance (for example, water and energy infrastructure, and agriculture), will have to become climate-resilient to avoid risks and respond to new market conditions.

Private actors, moreover, can enhance adaptation options by developing new climate-resilient products, technologies and services, as well as accelerating the replication of climate-resilient approaches.[2]

Nevertheless, although adapting to climate change can make business sense to safeguard business continuity, profits, or to take advantage of new market opportunities, a number of barriers can hinder companies' motivation, ability, and perspective on the need to take action (Agrawala et al., 2011).

Governments can provide an enabling environment that incentivizes and allows businesses to integrate climate change considerations in investment decision making (Agrawala and Fankhauser, 2008). DFIs can play a role in engaging private actors in identifying climate change risks and response measures. This is because by occupying an intermediate space between public aid and private investment, and having increased their private sector

[1] This study uses the words 'building climate resilience' / climate risk management and 'adaptation to climate change' interchangeably. Climate resilience refers to "the ability of a system [...] to anticipate, absorb, accommodate or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration or improvement of its essential basic structure and functions" (IPCC, 2012; 2007). As adaptation measures aim to reduce climate vulnerability, they can enhance climate resilience (Parry et al. 2007).

[2] See e.g. UNFCCC (2008); IFC (2010); GEF (2012); Biagini and Miller (2013).

financing and advisory activities,[3] they have the opportunity and responsibility to take a leading role in this area to fulfill their mandate.

Against this background, this working paper aims to:

- Outline the barriers to private investment in climate resilience, with an emphasis on the differences between developed and developing countries;
- Identify the approaches DFIs have developed to tackle these barriers, and where further action is needed;
- Discuss possible ways to stimulate greater private and public investment in climate resilience to foster debate on how to close the current climate change risk management gap.

This paper, which addresses a fast-evolving topic, also seeks to identify interesting investment cases and research needs for future in-depth analysis.

It is structured as follows: Section 2 details the barriers to private sector investment in climate resilience. Section 3 takes stock of the tools and approaches used by the DFIs we examined to drive private sector action in climate resilience. Section 3 reflects on possible actions to deepen private sector engagement in climate resilience. The Annex outlines the methodology used to select the DFIs and projects to analyze.

[3] Nelson (2010) and Perry (2011) state that over the past decade, several bilateral and/or multilateral IFIs have increased the volume of resources allocated to enabling and engaging with private businesses as well as the level and range of the financial and advisory services offered. See also IFC (2013).

2. Barriers to private investment in climate resilience, and the need for public intervention

Climate change poses risks to the operations, competitiveness, and profits of businesses, as well as to the value of tangible and intangible assets.[4] These risks can be both direct and indirect, and can be categorized into operational, strategic, and financial risks (see Figure 1).

Taking action against these climate change risks can bring significant commercial and competitive advantages to businesses.[5] For instance, the need for climate change risk management solutions such as water management, agricultural technologies, or insurance products, can create market opportunities.

However, policy, knowledge, as well as funding, revenue and risk coverage gaps, can affect the private sector's ability and incentive to invest in climate resilience. Self-interest should incentivize businesses to undertake measures that reduce their climate vulnerabilities, or to harness potential opportunities that may arise from a changing climate.[6] However, this cannot happen efficiently when private actors do not have the right incentives, knowledge, resources, and skills.[7]

We categorized the main barriers hindering private investments in climate resilience as policy gaps, knowledge gaps, and funding, revenue and risk coverage gaps.[8]

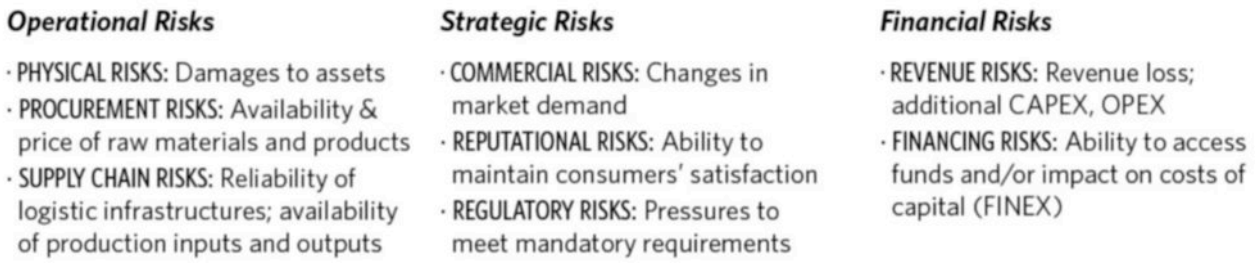
Policy gaps

Regulatory frameworks and policies can constrain adaptation investments.

Private responses to climate change risks and opportunities can be constrained by missing or deficient regulatory and policy frameworks not tailored to stimulate adaptation, including mispricing of natural resources (such as infrastructure codes and standards; environmental and social impact assessment laws, water policies, etc.), or lack of economic incentives for investment in climate resilience.

Incentives that distort the price signals of climate change risks (for example, subsidies on certain seeds, fertilizers or irrigation water) can negatively influence the business case for investing in adaptation. These incentives can also promote maladaptation practices that increase climate change vulnerability

Figure 1. Examples of main potential climate change induced risks to businesses.



Sources: authors' elaboration based on Agrawala et al. (2011); Stenek et al. (2010a); UKCIP (2010); UN Global Compact, UNEP, Oxfam, & WRI (2011); Acclimatise and COWI (2012); Frisari et al. (2013); Pauw (2014). See Agrawala et al. (2011) for detailed examples of climate change risks per sector.

[4] Agrawala et al. (2011); Baglee (2012).
[5] Oxfam (2009); GHK (2010); Baglee (2012); GIZ (2012) and EBRD & IFC (2013).
[6] See e.g. UN Global Compact, UNEP, Oxfam, & WRI (2011); Agrawala and Fankhauser (2008).
[7] Fankhauser et al. (1999).
[8] Relevant literature reviewed for this section include: Berkhout et al. (2004); Agrawala and Fankhauser (2008); IFC (2010); AGF (2010); OECD (2011); UN Global Compact, UNEP, Oxfam, & WRI (2011); Pauw (2014); Stenek et al. (2013); IFC-EBRD (2013); CIF (2013a); Chambwera et al. (2014); Vivid Economics (2014, 2015); and CIF (2015e).

(Stenek et al. 2013).[9] Political and institutional shortcomings[10] can also represent an obstacle.[11]

Knowledge gaps

Understanding climate vulnerability and risks is essential to integrating climate change risks (or opportunities) into investment or financing decision-making.

Understanding requires:

- Awareness of risks and opportunities of climate change;
- Availability of investment-relevant and usable data, information, and tools to integrate considerations of long-term climate trends into site-specific business decision-making;[12]
- Capacity and expertise to identify climate-resilient investment or financing opportunities;
- Access to and familiarity with technologies that can help to strengthen climate resilience. Lack of familiarity can alter investment risk perception.[13]

Behavioral biases such as the tendency to apply short-term investment horizons (i.e. short payback periods) can also affect business appetite to invest in climate resilience, as well as their ability to develop products or services that could help mitigate climate-related impacts. High discount rates dominate investment decision-making.

Revenue, funding and risk coverage gaps

Uncertainties about the returns of investments, inadequate access to finance and risk aversion can impede businesses' ability to invest in climate resilience.

Adaptation investments can have additional or high upfront costs, longer payback periods and uncertain returns, and higher perceived risks.

The additional analysis required to identify and evaluate climate change risks, for instance, can add 25% to the average costs of an environmental and impact assessment.[14] Businesses, therefore, may have little incentive or financial ability to perform them.

Investments in, for example, irrigation equipment, water-efficient technologies, stress-resilient plants or infrastructural improvements that could help to strengthen climate resilience, may be disproportionate to businesses' financial capacity, or have unattractive risk/return profiles.[15] Benefits associated with such climate-resilient investments may only manifest over longer time frames, and the extent dependent on uncertain climate impacts.[16] They may also be complex to evaluate when part of broader investments.

Financial institutions may also be reluctant to lend to such investments, often due to incomplete information or higher perceived risks because of the lack of track record, borrowers' inadequate collateral, or lack of capacity in appraising and financing non-traditional technologies.[17]

These barriers to investment in climate resilience can vary across countries, depending on their status of development.

The strength of the overall investment environment and the level of development of domestic capital markets, institutions, and infrastructures, can affect the opportunity and ability for businesses to engage in climate resilience. For instance, climate-resilient investments may be challenging in countries where companies already face significant operating constraints.

[9] Stenek et al. (2013) assesses the investment framework of three countries with different levels of socio-economic development (Bangladesh, Vietnam and the US), and shows which conditions are promoting or inhibiting private sector adaptation. Pauw (2014) case study in Zambia looks at how government can create incentives for the private sector to mainstream climate risks in their business operations and to capitalize on new business opportunities.

[10] E.g. layered bureaucracy.

[11] Fankhauser and Soare (2012).

[12] As noted by Chambwera et al. (2014) the provision of information not accounting for cognitive failures can also be a barrier to adaptation.

[13] IFC (2013a), for instance, highlights the technical risks associated with the adoption of improved irrigation systems when the availability of adequate skills and knowledge in the use of such systems is limited, or maintenance services are lacking. These shortcomings can lead to suboptimal results.

[14] Iqbal and Suding (2011).

[15] See e.g. IDB-GEF (2014); EBRD (2014a); EBRD (2014b);

[16] Agrawala et al. (2011).

[17] See e.g. Trabacchi and Stadelmann (2013).

In fact, CIF (2015b) notes that the underdevelopment of the formal private sector and difficult business environments were among the reasons behind limited private sector engagement in the PPCR countries (mostly least developed countries). Vivid Economics (2015) highlights that middle-income countries received most of the USD 270 million MDBs committed in 2013 and 2014 for private sector-oriented adaptation finance. This indicates that more finance opportunities are available when enabling environments and the private sector are stronger.

Barriers to private investment also vary by type of business actor and level of climate exposure.

Small and medium-sized enterprises (SMEs), especially in developing countries, typically have limited financial capacity to absorb the upfront capital costs of investing in long-term resilience or know-how to plan for climate change. Moreover, they historically have had limited access to financial products and services, as they are considered risky and costly to serve.[18] SMEs, therefore, face particular challenges in securing financing for investments in climate resilience.

The characteristics of organizations (for example, firm size, export orientation, foreign ownership, and financial performance), can also influence companies' engagement on climate change (Pulver and Benney, 2013).

Furthermore, business pressures for climate change risk management will vary depending on companies' level of exposure and sensitivity, which can be context,[19] technology, and asset class-specific.

Public intervention is needed to stimulate private investments in climate resilience at scale

Policymakers and public financial institutions can undertake targeted actions to overcome these obstacles to private engagement in climate resilience and help ensure needed levels of adaptation investment.

This is important considering the role played by private and publicly-owned companies in providing socially and economically relevant services, such as energy and water supply, or agricultural products, and the shared benefit nature of certain adaptation measures.[20]

In particular, DFIs, in their role as key public providers of finance and technical advice, and as an intermediate between public aid and private investment, can provide investment tools and help clients to identify, assess, and manage the climate change risks threatening their own assets and operations. This also thanks to their increasing mainstream of climate change considerations in due diligence, investment appraisal and monitoring processes.[21]

The next section explores DFIs' interventions and analyzes how they have been addressing specific barriers to private engagement in climate resilience.

[18] IFC (2010b); Grace et al. (2014).
[19] In European countries, for instance, increased water restrictions and economic losses by flooding are key risks from climate change (Kovats et al. 2014). In Latin America, decreased food production and quality is a major threat from climate impacts on yields (Magrin et al. 2014).
[20] That is, the benefits of individual actions are shared by other actors (e.g. with respect to water supply). See Mendelsohn (2000) for a discussion on the shared benefit nature of the so-called joint adaptation.
[21] Some DFIs have integrated climate change risk screening in their Environmental and Social Safeguard Standards e.g. IFC (See IEG, 2012). See also Van Aalst (2011).

3. Development Finance Institutions interventions to drive private investment in climate resilience

DFIs have proactively addressed pre-investment stage barriers that hinder private sector investment in climate resilience.

The portfolio of private sector adaptation projects of the selected DFIs is still relatively limited[22] compared to their private sector mitigation portfolios,[23] and some projects are still at an early stage. Nevertheless, it is growing and already offers interesting insights.

Our assessment of a sub-set of these projects shows the variety of approches DFIs have developed to tackle pre-investment and investment stage barriers preventing private action in climate resilience (see Figure 2 and Annex A for details on the methodology used). These approaches, often used in combination, varied across institutions, sectors, and geographies, and go beyond finance interventions. Governments' resources have often supported DFIs to perform such activities, particularly in developing countries.

To bridge knowledge gaps, EBRD and IFC, in particular, carried out market and feasibility studies, resource audits, consultations with stakeholders, or designed other advisory services to:

- Stimulate the demand for climate-resilient investment by enhancing awareness of climate risks or opportunities;
- Support project preparation by identifying the most suitable investment options, and implementation strategies;
- Enable the supply of finance for investments in climate resilience by building local banks' or businesses' capacity toward this end.[24]

To generate climate-resilient investments some DFIs have also been using or piloting climate risk screening tools within the project cycle. These allow them to identify opportunities for adaptation investments.[25]

To address revenue, finance and risk coverage gaps, some DFIs provided access to:

- Longer-term debt for capital-intensive infrastructural improvements, sometimes encompassing grace periods (e.g. EBRD, EIB, and IFC);
- Concessional/low cost finance (BNDES) to incentivize investments in water supply, treatment and sanitation with climate-resilient benefits;
- Growth capital (equity) to help businesses harness market opportunities for products with adaptation benefits (IFC);[26]
- Risk coverage instruments such as OPIC's Political Risk Insurance to protect companies' equity investment in projects with climate-resilient benefits carried out in unstable or unpredictable political contexts.

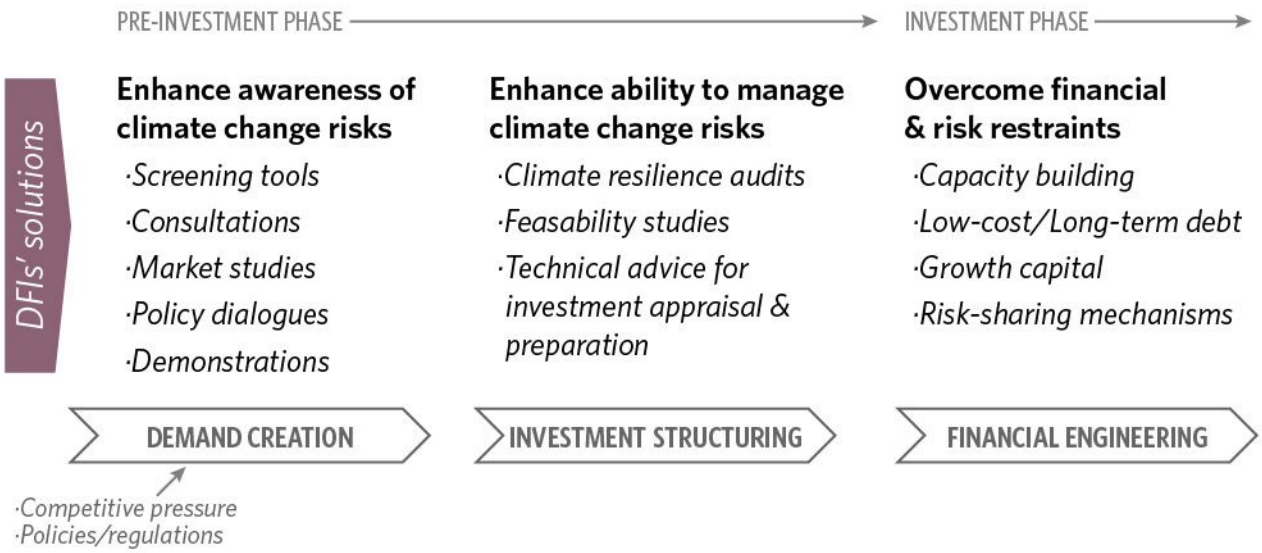
To fill policy gaps, there is evidence, in one EBRD project in Tajikistan, of the use of policy dialogue as an approach devised to support regulatory reforms.[27]

This section details the interventions we outlined above, including how these were applied in different countries and sectors.

[22] This does not imply that private actors are not investing in adaptation. As noted by e.g. Agrawala et al. (2011), in fact, companies often manage climate risks as part of standard risk management or planning processes. For a discussion on private sector investment in adaptation that have been mobilized by public climate finance see Kato et al. (2014),
[23] See also Jachnik et al. (2015) forthcoming and Vivid Economics (2015).

[24] See also IDB'ECOMICRO in section 3.2.3.
[25] Vivid Economics (2015); ADB (2014a); See also e.g. Van Aalst (2011); IEG (2012); IFC (2014); ADB (2014a); Idle (2014).
[26] See IFC (2013b) project where IFC provides equity to support the scale-up of a company's R&D and commercial activities with the aim of contributing to enhance the availability and, ultimately the use, of high-yield, water-efficient and more climate-resilient seeds in emerging and developing markets . See also IFC (2013f).
[27] See EBRD (2014a, b).

Figure 2. DFIs' approaches to private engagement in climate resilience.



Note: authors' elaboration based on the DFI projects assessed, and literature reviewed; the development and use of these approaches vary across DFIs; framework adapted from Smallridge et al. (2013) and Trabacchi et al. (2014).

3.1 DFI activities to engage the private sector in climate resilience, by geography and sector

DFIs private sector interventions targeted highly-climate sensitive sectors, which align with the main sectoral climate vulnerabilities of developed and developing countries.

The dataset of projects we captured[28] shows that in the EU and in upper- middle-income countries in which our sample DFIs operated, most projects have targeted the climate vulnerabilities of businesses operating in the water supply and management sector, or water-intensive industries such as pulp and paper manufacturing (see Figure 3). These are particularly vulnerable to climate change impacts. Increasing water restrictions and economic losses from flooding, in fact, are key climate change risks faced in these countries.[29]

In developing countries, the projects identified have mostly targeted the climate vulnerabilities of businesses operating in the agricultural sector (see Figure 3), which plays an important socio-economic role in these countries and is particularly threatened by changes in climate.[30] Seven of the projects identified in these countries received grants and/or concessional resources from the PPCR, three of which from its private sector set asides.

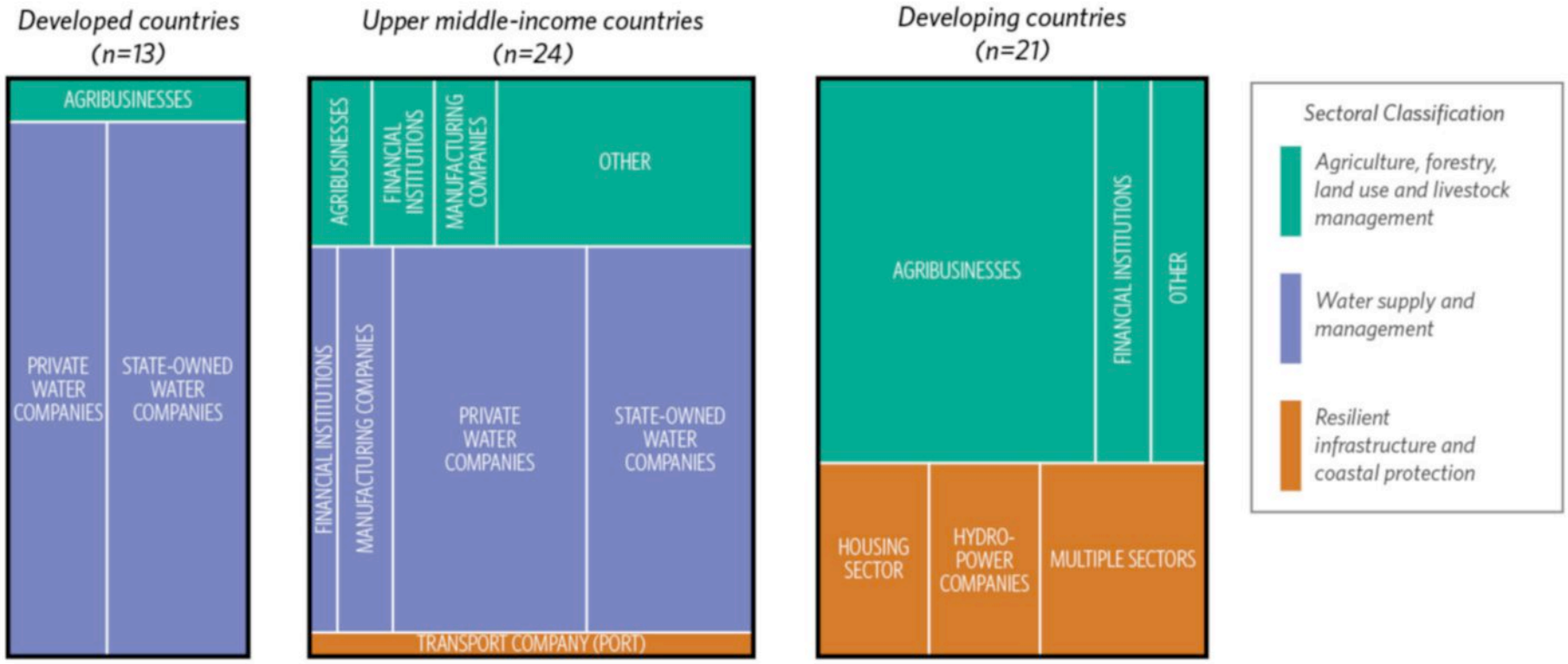
DFIs have supported projects both directly and indirectly, that is through local banks or non-bank entities engaged to on-lend to micro, or small-to-medium-sized businesses. Intermediated financing structures have been mostly used for projects in upper-middle-income and developing countries.

[28] See Annex A for details on methodology.

[29] Kovats et al. (2014); Magrin et al. (2014).

[30] See IPCC reports: Magrin et al. (2014); Porter et al. (2014) and Hijoka et al. (2014).

Figure 3. Composition of our database: DFIs' private sector projects in 2011-2014 by countries' level of income, sector and beneficiary business type.



Note: we identified 13 projects in developed countries (12 in EU countries and one in Israel), 24 in upper-middle-income countries and 22 in developing countries. In upper-middle-income countries the picture does not show a high number of projects indirectly financed by BNDES through a network of local financial institutions (see Section 3.1.2.).

DFIs' activities mostly targeted private actors operating in upper-middle-income countries.

3.1.1 DEVELOPED COUNTRIES

In the EU, EIB targeted viability gaps preventing water utilities from investing in more efficient water management and from protecting assets from climate events. Regulations and the renewal of ageing assets represented drivers of private investments.

In Western European countries, most of the European Investment Bank's (EIB) activity was to fill funding gaps to enable costly water and wastewater infrastructures improvements that would not otherwise have taken place. Adaptation measures were not stand alone, but integrated into broader projects.

The projects assessed supported regulated private water companies (UK) and state-owned utilities (Austria, Belgium and Germany) in implementing capital-intensive investments, ranging from USD 132 million to USD 2.46 billion,[31] with long lifespans, around 30-200 years.[32]

Interviews with business representatives highlighted that access to longer-than-market-term finance, which rarely exceeds five years in tenor in some countries, tipped the balance in attracting their investment. This is because long-term finance has been in short supply in EU countries, particularly since the financial crisis and the introduction of stricter banking regulations.[33]

Access to long-term finance is important given the high upfront costs associated with these kinds of investments, and that financial benefits accrue over the long life-span of the investment. These investments included:

- Rehabilitation and replacement of water supply infrastructures or old installations;[34]
- Reconstruction and upgrading of sewer systems and modernization of wastewater treatment plants;
- Expansion of water reservoirs; and
- Construction or storm overflows, collector sewers and pumping stations.

Benefits from these types of investments are difficult to evaluate, particularly those stemming from the specific 'adaptation component'. They are rarely estimated as associated with the avoidance of future capital and operational expenditures due to, for example, distribution network disruptions or loss of revenues from demand-supply imbalances. For water utilities the return on the investment can also be influenced by water policy frameworks and prevalent water prices.[35]

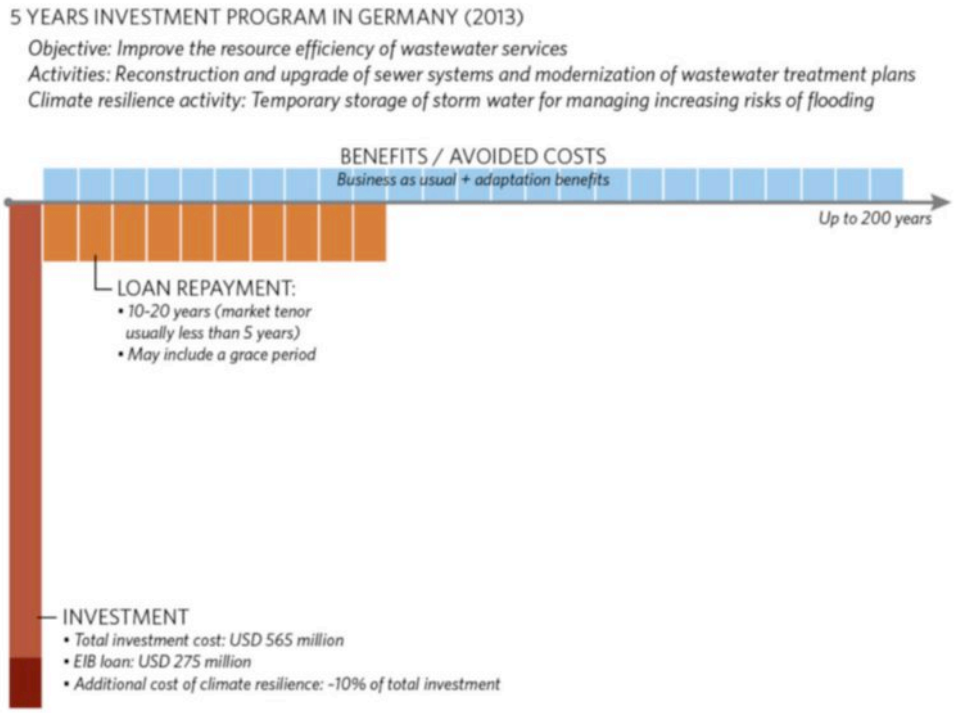
The adaptation component is generally integrated in the overall investment, and rarely stand-alone.[36] The share of adaptation costs is case-specific, but it can be critical to make the overall investment climate-resilient and to obtain longer-term benefits (NWL, 2015).[37]

The renewal of ageing assets represented an opportunity for integrating climate change considerations into projects' design. Regulations were important triggers of investment.

[31] EIB (2015b).
[32] This is the typical lifespan of water infrastructures according to Corfee-Morlot et al. (2012).
[33] See e.g. Inderst (2013).
[34] Measures comprise, for instance, water mains, connections between pipe systems, well fields, tanks/reservoirs or waterworks.
[35] See EEA (2013) for current water pricing frameworks in the EU and Vivid Economics (2015) for gaps in water policy frameworks.
[36] See also Buchner et al. (2014).
[37] Vivid Economics (2015) suggest that in MDBs projects approved in 2013-2014 it is often below 50% of the project value, and is influenced by the project size.

Interviews with business representatives[38] revealed that the renewal of ageing assets was a critical motivation for the investment in order to ensure business continuity and meet changing market demand. Compliance with policies relevant to climate resilience at the regional level, such as the EU Water Framework Directive and Urban Wastewater Treatment Directive, or at national level, such as the UK Climate Change Act 2008, has also played an important role.[39]

Figure 4. Illustrative - wastewater company investment in sewer system and wastewater treatment plants upgrade based on EIB (2013a) and information from interviews.



In particular, the climate change risk disclosure introduced with the UK Adaptation Reporting Power under the Climate Change Act 2008 has contributed to raise the awareness of organizations that deliver essential services such as water, energy and transport about the current and future predicted impacts of climate change on their operations.[40] It helped to bring discussions on climate change risk to the boardroom, and incorporate it within organizations' corporate risk management procedures.[41]

In the UK, there is also evidence that the availability of climate vulnerability assessment tools,[42] up-to-date local climate data (UK Climate Projections - UKCIP02 and UKCP09), and support on how to use projections, has helped companies to understand and assess the potential impacts of climate change on their operations and incorporate these assessments in investment decisions.[43] Also

[38] NWL (2015); EGLV (2015); WLV (2015); Thames Water (2015) and CAT (2015).

[39] Sources: interviews; EIB (2012); EIB (2013b); EIB (2013c); Anglian Water (2011). Studies on water supply companies in England and Wales have also found that the regulatory requirement to incorporate climate change in their planning played a critical role in encouraging adaptation actions (Arnell and Delaney, 2006; Wilby and Vaughan, 2011). In the UK, other water resource management policies also play a role as companies have to produce water management plans based on demand-supply forecasts over a 25-years horizon, and plan their investment accordingly. See Ofwat.go.uk.

[40] Crown (2013); DEFRA (2015). With the Adaptation Reporting Power (initially mandatory now voluntary) the UK Government can require organizations responsible for essential services and infrastructures such as energy, transport and water to report the current and future predicted impacts of climate change on their operations and their action plans for dealing with these. DEFRA provides technical support to help companies report (Crown, 2015).

[41] Crown (2013); DEFRA (2013).

[42] The UK Climate Impacts Programme (UKCIP)'s Business Areas Climate Assessment Tool (BACLIAT) is one example of tool that helps to assess the potential impacts of climate change at an organization level. (Stenek, 2013; see UKCIP.org.uk).

[43] See e.g. Anglian Water (2011); Stenek et al. (2013); interviews.

interviewees from German water companies cited the role played by freely-available studies and tools to evaluate climate vulnerabilities and helping the management of related future demand risks.[44]

Beyond the UK and Germany, in other OECD countries, codes and standards on climate resilience in climate sensitive sectors are emerging, and are expected to have significant implications on the way businesses in these sectors operate.[45] While the impact of these measures remains to be assessed, the challenge for DFIs and other public agencies will be to help businesses and policy makers in middle-income and developing countries to move towards these emerging international practices. EBRD, for instance, is working toward this end (see EBRD, 2015).

3.1.2 UPPER-MIDDLE–INCOME COUNTRIES

In upper-middle-income countries, addressing key knowledge gaps with studies or audits helped water-dependent businesses to identify opportunities for climate-resilient investments. It also helped DFIs to identify policy gaps influencing the commercial viability of investments.

Some DFIs used technical support in the form of market or feasibility studies, audits or other advisory services to identify and structure investments. In some instances, they provided access to long-term, low cost finance to enable climate-resilient investments in water-intensive industries and infrastructure.

The DFI projects we identified targeted SMEs, large corporations and state-owned companies, mostly to promote and support investments in resource efficiency and infrastructure improvements in industrial (manufacturing, port) and water sectors across different continents (e.g., Brazil, Turkey, Mexico and Bosnia and Herzegovina).

To raise businesses' awareness and improve their understanding of climate risks and how to manage them, EBRD and IFC commissioned tailored pilot studies involving a series of workshops, interviews and adaptation-focused surveys.[46]

In particular, the EBRD & IFC (2013) market study in Turkey, a country where the government had achieved little progress on adaptation and the private sector is not yet actively engaged in this context, helped to:

- Understand climate-resilient investment needs and barriers to those investments, particularly for SMEs which represent the vast majority of the enterprises in the country;
- Identify investment opportunities for those businesses operating in the country's priority sectors and potential rates of return.[47]

The study highlighted how weak policy frameworks in general, and water pricing in particular, can affect the rate of return of possible water-efficient investment opportunities,[48] thereby on business' hurdle rates in a country where businesses are increasingly at water risk.[49]

[44] See starkgegenstarkregen.de/ and "Adaptation Compass" on Future-cities.eu.
[45] The EU, for instance, revised the Environmental and Impact Assessment Directive to covers climate change impacts (EU, 2014). The International Hydropower Association introduced climate resilience standards in hydropower and the Association for Waterborne Transport Infrastructure is working on measures to ensure the climate resilience in ports and maritime transport (see Hydropower.org and Pianc.org). The UK CIBSE aimed at enhancing the resilience of buildings or the recently introduce mandatory water restrictions in California are other examples (see Cisbe.org and Waterboards.ca.gov).
[46] See IFC (2011a,b) and EBRD & IFC (2013).
[47] In the analysis, priority sectors refer to those sectors most economically important for the country and climatically vulnerable (see EBRD & IFC, 2013).
[48] Examples include: rainwater harvesting/recycling, water efficient drip irrigation and process systems and reuse of process water (EBRD & IFC, 2013).
[49] Ozkul (2009), for instance, estimated that changes in runoff between 52-61% and reductions in surface waters

The market study, along with proactive outreach by EBRD staff, proved effective in stimulating concrete financing for climate resilience as it led to the engagement of a number of Turkish commercial banks and the structuring of two EBRD credit lines that included the provision of finance for water-efficient technologies; one focused on industrial resource efficiency and the other on upgrades of buildings.[50] Impending EU water and wastewater regulations also played a role in enhancing banks' interest in on-lending to adaptation-related investments (Vivid Economics, 2015).

Targeted technical support is envisaged in order to strengthen these banks' abilities to identify, assess and finance resource efficiency projects as well as enhance businesses' awareness about the implications of the emerging regulatory context, and ability to prepare projects for financing.[51]

The role of pre-investment phase measures in tackling knowledge gaps, that is by helping businesses to identify climate change risks, evaluate their materiality and possible climate change risk strategies, emerged also from two projects with pulp and paper manufacturing companies in Bosnia and Herzegovina (EBRD, 2012) and Turkey (IFC, 2013c),[52] as well as from the outcome of a pilot study in Colombia (IFC, 2011b).[53] In Bosnia and Herzegovina, for instance, EBRD performed a "climate resilience audit", in the form of an energy and water use audit, to identify viable strategies for strengthening an existing client's climate resilience (see EBRD, 2012). This included stress testing water availability under different climate scenarios up to 2050, in a region where surface run-off is expected to decrease by about 12% by that time (EBRD, 2012).

Financing tailored to investment needs can support climate change risk management opportunities driven by regulations and corporations' strategies.

In addition to technical advice, IFC (2013c and 2013g) suggest that a combination of government regulation and market rate loans at term longer than commercially available both played a role in driving and enabling a Turkish pulp and paper manufacturer's decision to invest in a water efficiency system.

The investment will enable the company to expand production capacity without increasing water use in a country where the government introduced limitations on water consumption for industrial customers, and where local banks lacked interest in these types of projects. Access to long-term finance is important given that the commercial benefits of the project will only materialize over the medium- to long-term (IFC, 2013g).

Also the 2011-2013 portfolio of BNDES' adaptation commitments,[54] and interviews with BNDES' staff, suggest that the combination of regulation and low cost/concessional loans also played a role in incentivizing private and state companies' investments in water supply, treatment and sanitation with climate-resilient benefits that ultimately contribute towards broader national developmental goals.[55]

by 20% by 2030, up to 50% by 2100. See also MEU (2011) for details on impacts of climate change in Turkey.

[50] EBRD & IFC (2013); EBRD (2014c); EBRD.com; and Vivid Economics (2015).

[51] EBRD (2014c); Vivid Economics (2015).

[52] This also applies to a port infrastructure in Mexico IDB (2013b).

[53] The simple provision of information proved sufficient to motivate a port to take action to include climate risks in its operations (IFC, 2011b).

[54] Around 90% of the USD 1.4 billion committed over 2011-2013 went to six state-owned companies, while 10% benefited seven private water companies. On average, the dataset of projects we captured show that BNDES covered from 80% to more than 90% of the investment cost of water projects financed directly. Another USD 744 million was provided between 2011-2012-2013 through local financial intermediaries (likely of both public and private nature), to support the investment of 82 public and private water companies.

[55] More specifically, the second Brazil's Growth Acceleration Program (PAC-2) was introduced to solve long-overdue infrastructure issues, foster economic growth and boost private investments. It contained an investment package of R$31 billion for the period 2010-2014 for

3.1.3 DEVELOPING COUNTRIES

In developing countries, DFIs devised intermediated financing structures by building partnerships with local financial institutions or non-bank entities to tackle debt funding gaps that impede micro- and SMEs' from investing in climate-resilience.

Almost 70% of the DFIs' projects we identified in developing countries target the agricultural sector, which is typically a key sector of these countries' economies, and is particularly vulnerable to climate change.[56]

Beneficiaries range from micro, small- to-medium businesses and non-profit business organizations[57] through to multinational companies involved in the production, processing and trading of high-value crops (e.g. sugar and coffee). These companies operate in and are linked to local or international supply chains. Safeguarding an adequate and stable quantity and quality of products to meet market demand is an important driver for these companies' investment in climate resilience.[58]

Business outreach and feasibility studies are helping DFIs to engage businesses and financiers in climate resilience.

To generate awareness and stimulate the demand for investments in measures strengthening climate-resilience, as well as support the structuring of such investments, some MDBs have conducted:

- Business outreach, engaging in consultations with local private companies and other stakeholders;[59]
- Feasibility studies to identify the climate vulnerabilities of specific supply chains, how to address them, and prospective agribusiness partners (IFC).[60]

To incentivize investments at the farm level, which is critical to ensure the resilience of businesses operating in local or global supply chains, some MDBs projects aim to:

- Demonstrate the financial and technical viability of projects by supporting, for instance, the set-up of demonstration facilities to showcase the benefits of on-the-ground climate adaptive farming practices or technologies promoted in training activities (ADB and IFC);[61]
- Harness the alignment of interest between buyers and suppliers of agricultural products in supply chains to incentivize investments that would lead to mutual climate-resilient benefits.[62]

In Nepal, these knowledge building activities backed by the PPCR helped to gain the commitment of three local agribusiness firms.[63] But, more broadly, MDBs experience in least developed countries – where they have been developing PPCR projects – has highlighted substantial challenges to private sector involvement and the identification of viable investment.[64]

In these countries, in fact, where awareness of climate risks is particularly low, substantial technical assistance and time are needed to create the

measures in the water, sanitation and electrification (BNDES.gov.br; Brazilcouncil.org, 2010).

[56] See Porter et al. (2014) and Magrin et al. (2014) for details on climate change impacts on food production systems.

[57] Examples of non-profit organization is the Bolivian Chamber of Royal Quinoa and Organic Product Exporters (CABOLQUI) (see IDB, 2014a), which is a group of 11 leading quinoa companies (Cabolqui.org).

[58] See e.g. Trabacchi et al., (2015); Trabacchi and Stadelmann (2013).

[59] For IFC see e.g. ADB (2013) and CIF (2013) and IFC (2015); This is also a strategy pursued by AfDB, whose PPCR-backed private sector projects was scheduled for approval around April-June 2015 AfDB (2014).

[60] See e.g. CIF (2013a); PwC (2012); CIF (2015a,c).

[61] See e.g. CIF (2013a); IDB (2014a); ADB (2014).

[62] ADB (2014); IFC (2013; 2014) and IDB (2013c; 2013d; 2014a, b).

[63] See Trabacchi and Stadelmann (2013).

[64] See CIF (2015), CIF (2015a) and CIF (2015b).

preconditions for private investment. It is in fact taking time to convert some of the concepts developed under the PPCR private sector set-asides into approved projects.[65]

To address micro and small businesses' lack of access to finance, MDBs are engaging with local financial institutions and members of supply chains for on-lending.

To enable micro- SMEs and farming households' investments in measures that would strengthen their resilience, IFC, IDB and EBRD devised projects aimed at engaging local banks[66], or non-bank entities such as agribusinesses (IDB, IFC, ADB) in on-lending.[67] Some of these models, still at early stages, lever supply chain relationships not only to channel finance, but also to address financiers' credit default risks by, for instance, partnering with agribusinesses who would act as vehicles to disperse and collect back the loans and/or enhance farmers' creditworthiness via purchase guarantees on crops supplies.[68]

Capacity building measures can help to encourage local banks and other financiers to on-lend to climate-resilient investments.

Some DFIs are also devising models to address the capacity of financiers to recognize market opportunities and needs, adopt adequate credit risk management approaches and design financial products that cater to the needs of private investors in agricultural supply chains. A lack of knowledge in fact, can increase credit default risk perceptions and the associated risk premium. IDB and IFC projects in the Latin American and Caribbean region and Nepal, respectively, use this approach.[69]

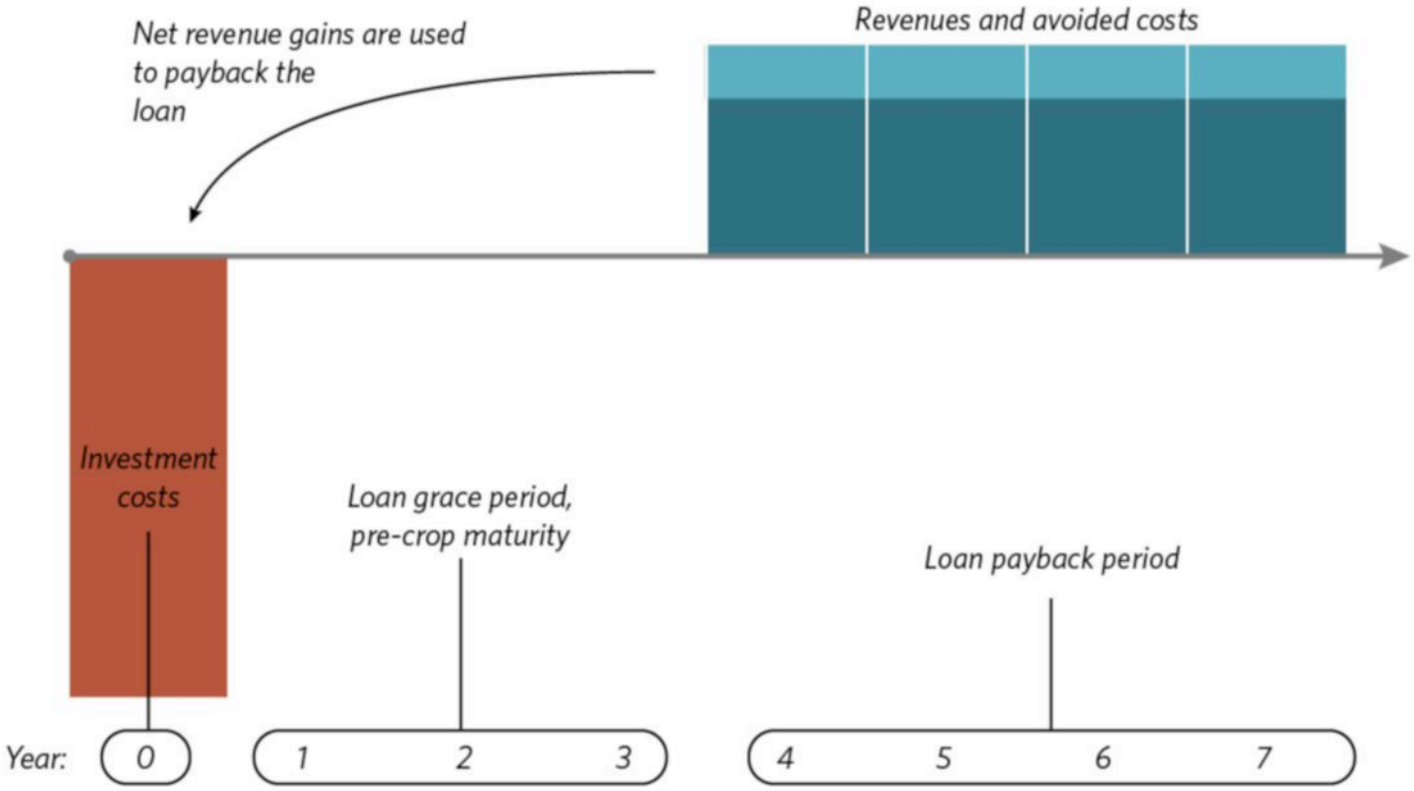
IDB also developed a technical cooperation program, ECOMICRO, aimed at enhancing microfinance institutions' ability to lend to micro- and SMEs for, among other things, adaptation measures.[70] In 2013, IDB also established a targeted USD 11 million regional facility, PROADAPT, to overcome the knowledge gaps of micro and SMEs.[71] The facility is supporting the development of business models and practices to increase the climate resilience of these businesses, including through the provision of training, analytical tools and awareness raising to promote entrepreneurship.

To overcome viability gaps, loan terms need to align with the payback profile of investments.

Investments promoted in some MDBs' agricultural projects such as drip irrigation, improved rainwater harvesting technologies, post-harvest measures or plants renovation can have payback times that are longer than locally available loan tenures, typically short-term working capital of one year or less.[72]

[65] CIF (2015).
[66] IDB (2013e); IFC (2013i); EBRD (2014c).
[67] ADB (2014); IDB (2013d and 2014b); IFC (2013i). Agribusiness companies can also be involved in tripartite relationships with local banks.
[68] Source: IFC (2013e); IDB (2014b).
[69] Sources: IDB (2014a; b) and IFC (2013i).
[70] ECOMICRO is a three year regional program funded by the IDB's Multilateral Investment Fund and the Nordic Development Fund. It offers support to both microfinance institutions and their clients for adaptation, but also clean energy and energy efficiency measures. ECOMICRO focuses on the development of dedicated finance products, and it also helps microfinance institutions to incorporate climate change into their risk management models. See Ecomicro.org and Fomin.org.
[71] See IDB.org and NDF.fi. PROADAPT is a 5 years program funded by the IDB's Multilateral Investment Fund and the Nordic Development Fund.
[72] See e.g. IDB (2013d); ADB (2014); EIB (2014a); EIB (2014b); IDB (2014b); Grace et al. (2014).

Figure 5. Illustrative – profile of an investment in the renovation of coffee plantations.



Note: *Coffee plants can take about 3-5 years to reach full production and has a life of life of 20 to 30 years. Adapted from Trabacchi et al. (2014.)*

The payback time of irrigation systems, for instance, can range from 1 to 5 years (e.g. in Nepal, PwC, 2012). In the case of renovation of perennial crops such as coffee or cocoa, it can be even longer considering the long lead-time between input investment and harvest-related revenues (see Figure 5). Access to longer-than-market-term loans with grace periods can, therefore, be critical to enable investments. In seven of the projects we reviewed, DFIs provided or are devising mechanisms to facilitate access to finance at longer than market tenors and with grace periods.[73]

MDBs' ability to extend such loans to micro- and SMEs, however, would depend on the underlying risks of the specific class of borrowers, type of investment and geography. Donors' resources can also help to mitigate DFIs and other financiers' lending risks.[74]

Finally, among the other projects we reviewed, it is worth noting the use, in one project in Rwanda, of OPIC's Political Risk Insurance, instrument used to safeguard the economic viability of climate-resilient relevant investment from possible regulatory changes or business interruptions due to political issues.[75]

Beyond projects targeting agribusiness companies and their supply chains, we also identified salient interventions to enhance the climate resilience of infrastructures. See Box 1 and e.g. CIF

[73] EIB (2014a; 2014b; 2014c); OPIC (2012; 2013c); ADB (2014); IDB (2015a).

[74] See IFC (2013e); Trabacchi and Stadelmann, (2013).

[75] OPIC (2013a); OPIC.gov; Political Risk Insurance was also used in a project in Iraq (see OPIC, 2013b).

(2013a, b).[76] Box 1 focuses on a project aimed at strengthening the resilience of a critical energy plant.

Box 1 – Project example – Bridging knowledge, viability and policy gaps to upgrade critical infrastructure projects for climate resilience in Tajikistan

In Tajikistan, a country where hydropower represents 98% of electricity's generation, an EBRD project with a major hydropower generating company showcases how climate resilience can be integrated in an infrastructure investment.

Key elements of the project are:

- The modeling of future hydrology flow under a range of climate change scenarios, and the use of the results to identify the optimal plant upgrade ensuring resilience to climate change, while improving the quality and quantity of electricity supply;
- The collaboration with many partners. In particular, donors supporting the needed feasibility studies and consultations, but also in enhancing the affordability of the investment.
- The provision of long-term financing; EBRD's 15 years loan, is complemented by USD 10 million concessional loan with a 40-year tenor from the PPCR. The PPCR also provided access to USD 11 million in grants to lower investments costs.[1]

The project has also a technical assistance component for training, upgrading operating rules as well as facilitating data management and information sharing (see EBRD, 2015). It also has a policy dialogue component aimed at building the government's capacity to reform the energy sector.

Finally, the EBRD also devised an approach to support the management of energy demand from the same plant. It developed a proposal for a Climate Resilience Financing Facility intended to support the adoption of climate-resilient technologies in the agricultural, commercial and residential sectors. This proposed Facility, which is expected to be launched in summer 2015, aims to support the uptake of energy-efficient, water-efficient and sustainable land management technologies by small businesses, farmers and households (CIF, 2014c).

[76] IFC has been carrying out feasibility studies to enhance access to climate-resilient housing in Nepal and Bangladesh. CIF (2013a) also encompassed a project aimed at strengthening the resilience of Nepalese hydropower plant. IFC has so far invested in one hydro project, and is currently seeking to expand its investments and meet the demand for financing climate resilience in Nepal's hydropower sector (CIF, 2015a).

4. Opportunities to deepen private engagement in climate resilience

Progress to date

DFIs have made progress in designing approaches and business models to engage private entities in climate resilience.

Since the EBRD and IFC 2008/2009[77] pilot studies carried out in key climate-sensitive sectors to help clients understand and respond to the risk of climate change, these and the other DFIs have refined their approaches.[78] The number of private sector-oriented adaptation projects in DFIs portfolios is still small, but it has been growing over the period analyzed, 2011-2014. Most projects in upper-middle-income and developing countries encompass measures aimed at filling knowledge gaps as a first step to stimulate demand for and/or prepare private investment in climate-resilient measures.

DFIs also continue to develop new approaches, as they have with the project concepts submitted to the PPCR private sector set-asides or with proposals for instruments submitted to the *Global Innovation Lab for Climate Finance in 2014*. These proposed instruments include, for instance, the EBRD's *Resource Efficiency and Climate Resilience Audits*[79] and the IDB's *Agricultural Supply Chain Adaptation Facility.*[80] The former mainly aims to directly incentivize and structure investment with upfront free advisory support, the latter aims to do so indirectly by leveraging supply chain relationships.

Despite this progress, more remains to be done to integrate climate resilience in the financial system and unlock finance from a broader range of banks and investors. DFIs, in fact, represent a relatively limited share of overall investment flows.

Grants or concessional loans from donors, which in many of the project assessed are supporting the ability of DFIs to develop pilot projects, provide technical assistance or give access to finance at longer and more affordable terms, can help to make further progress towards this end.

Opportunities to Increase Private Investment in Climate Resilience

The lessons learned from DFIs' experiences and discussions with investors, policymakers and practitioners[81] suggest that the following strategies, some of which must go beyond DFI involvement, could be pursued to scale up private action in climate resilience.

Identifying viable investment opportunities and developing project pipelines is the top priority for promoting private investment in climate resilience. There are four main opportunities to achieve this end:

- Governments should adjust regulatory frameworks to create stronger incentives for investments. Our assessment reveals that both existing and impending regulations can trigger private interest in climate resilience. Inadequate policy and incentive frameworks can, instead, alter the price signals for climate change risks

[77] Some DFIs, MDBs in particular, have also developed climate risk screening assessment tools to systematically mainstream adaptation into operations, and integrated climate change risk considerations into their own Environmental and Social Safeguards policies and standards. See e.g. IFC (2012); Van Aalst (2011).

[78] Key examples are the EBRD's resource efficiency audits that take into account projected climate conditions over the lifespan of a climate-sensitive project's assets (see Vivid Economics (2015), and ADB's "Aware for project" (see e.g. Idle, 2014). See also Iqbal and Suding (2008); IFC (2012).

[79] It is a mechanism addressing critical knowledge gaps, supporting operators of water-intensive industries to understand and quantify the costs associated to poor water use in areas that are vulnerable to current or projected future water stress. The upfront free process audit for assessing the material impact of climate change risks represents an incentive for companies to engage in the assessment (EBRD, 2014d).

[80] See Trabacchi et al. (2015) and Climatefinancelab.org. The Facility is at an advanced concept stage, but not yet operational.

[81] This also in the context of a dialogue on "Innovative Finance for Climate Resilience" organized on May 20th 2015 in Paris.

and affect the rate of return of possible investment opportunities in climate-resilient activities.[82]

DFIs, industry or business associations could play a role in disseminating best policy and industry practices within and across countries. To this end, DFIs could engage more often in policy consultations with governments – an approach we identified only in one EBRD project in Tajikistan – and could facilitate dialogue between governments and business. They could also increase coordination between DFIs (e.g. between the private-sector oriented IFC with its public sector-oriented counterpart, the World Bank).

- Governments, their agencies and DFIs, also in partnership with private actors, can equip businesses with the information and tools they need to see the business case for investment.

  In the UK and Germany, interviews with business representatives highlighted that information and data on local climate change projections, freely available tools to evaluate climate risks, and support for climate risk disclosure, encouraged companies' engagement in investments and improved their ability to respond to climate change. To enhance awareness, clarify the business case for action and help businesses integrate climate information into investment decision-making processes, governments, their agencies and DFIs could:

  - Promote or support investment in the development and dissemination of business-relevant data or make them usable through business-friendly impact assessment tools;
  - Support cost-sharing approaches to facilitate and incentivize climate change risk assessment and support projects preparation;[83] this is particularly relevant for micro and SMEs, which typically have limited financial and technical capacity to carry out such assessments and develop bankable projects.

  DFIs and other public agencies could also enhance the use of market studies, such as the one carried out in Turkey, to enhance awareness on climate change risks and opportunities.[84]

- DFIs and other public agencies can enhance the integration of climate change risk management and foster collaboration with the financial system and between actors of supply chains as a means to foster and support more private finance in climate resilience, particularly SMEs. Local banks, insurance companies, as well as actors of agricultural supply chains can all play a role in promoting investment in climate resilience and the uptake of climate-resilient technologies.

  Local banks, in particular, are in a privileged position to understand local barriers to investment and engage businesses in climate resilience to scale up investment. They can play a greater role in engaging with SMEs, which represent the majority of private sector enterprises in many countries and have financial needs typically too small to benefit from direct DFI support. Local banks' access to climate risk screening tools and know-how could help them to shape finance for resilience building.

  In some countries, DFIs demonstration of borrowers' creditworthiness through the creation of a track record of successful investments can help to

[82] See e.g. Stenek et al. (2013) and EBRD & IFC (2013).

[83] In UK, the cost of compliance to the Adaptation Reporting Power averaged around USD 69,000 and considered reasonable by mid- to large organizations (Crown, 2013a; Stenek 2013). SMEs may need financial support for undertaking climate assessment.

[84] See also Vivid Economics (2015).

build their trust and engage them at scale. Regulators and stakeholders can also play a role in enhancing banks' awareness on the need to determine, assess and manage climate change-related risks in projects.[85]

Agricultural value chains are emerging as a vehicle to deliver climate resilience to a large number of micro- and small-to-medium sized enterprises, lower financiers' risks and transaction costs. Such collaborative models could be further explored.

- DFIs can help create the evidence base needed to encourage private sector interest in climate resilience by piloting approaches in middle-income countries for use in lower-income countries. Most of the DFI activities we identified targeted private actors operating in upper-middle-income countries. In these countries, which have a stronger private sector than lower-income countries and, therefore, more bankable opportunities, technical and advisory services are translating into investment.

  The decision of the PPCR governing body in May of this year to open up the use of the private sector set-aside to all the countries of the Climate Investment Funds presents a noteworthy opportunity to test business models and demonstrate the benefits stemming from climate-resilient enhancing investment.[86] This decision, in fact, aims to overcome the geographic restriction limiting the use of the set-aside funds in PPCR low-income countries, where the formal private sector is generally small in size, technical capacity is limited and investment environments are challenging. In these countries, in fact, the conversion of project concepts into approved projects and investment has been limited or low so far. Given the relative novelty of the topic for the private sector, the PPCR decision can help to support the piloting and testing of private sector adaptation approaches in middle-income countries to generate the experience and track record needed to identify business models scalable and replicable in lower-income countries.

Finally, a sustainable scale up of investment in climate resilience will require efficient use of concessional resources from donors to reduce costs and risks. Our understanding about how to use public money effectively for climate action is increasing. However, open questions remain on how to best use limited public resources to drive private adaptation investments while avoiding the creation of unhelpful market distortions.

The evidence-base on the optimal use of limited concessional public finance in private adaptation projects is limited and needs to be built.

[85] For example, with principles for responsible investments.

[86] Before, the PPCR set-asides made available only concessional loans for projects in PPCR countries, mostly low-income. In May of this year, taking into account learning from rom the previous rounds of the set-aside, the governing body of the PPCR eased several procedural constraints (e.g. permits private sector projects submission on a rolling-basis rather than through call for proposals), and opened up to all the countries of the Climate Investment Funds the use of:

- Grants for technical assistance measures (audits, feasibility studies, etc.) to make the business case for investment in climate resilience.
- Concessional reimbursable finance for reducing investment costs or risks.

For investments in low-income PPCR countries both grants and concessional finance will instead be available.

5. Annex A: Methodology

To carry out the study we developed a database of 59 private sector-oriented projects approved by seven DFIs between 2011 and 2014, which qualified as either an "adaptation" or "adaptation and mitigation" project.[87]

The database builds on previous CPI work, particularly on the *Global Landscape of Climate Finance*.[88] It includes projects we identified i) through interactions with representatives of DFIs ii) from the EBRD project database and reports,[89] and iii) in the portfolio of the Pilot Program for Climate Resilience (PPCR).

For background, we reviewed existing literature on the topic, including case studies commissioned by some of the selected DFIs to understand and respond to the risks posed by climate change to private sector investments.[90] We also considered the instruments submitted to the *Global Innovation Lab for Climate Finance* between May and July 2014, to further understand barriers to investment and frame possible future actions.

We also conducted 14 interviews with representatives from DFIs and businesses, and hosted a dialogue with a diverse group of investors, policymakers, and practitioners around instruments and strategies for scaling up private investment in climate resilience.

The DFIs covered in the analysis are:

- Five Multilateral Development Banks (MDBs): the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB), the International Finance Corporation (IFC), and the Inter-American Development Bank (IDB);
- A Bilateral Finance Institution, Overseas Private Investment Corporation (OPIC);
- A National Development Bank, Brazilian Development Bank (BNDES).

We selected this group of DFIs for our analysis because of the relative importance of private sector-oriented adaptation activities in their portfolios, and because these portfolios include projects in a range of sectors and geographies. This allowed us to understand the different challenges DFIs face and the different approaches they use to drive private investment in climate resilience, in both developed and developing countries.[91] We focused on the water, infrastructure, and agriculture sectors.[92] These are priority sectors for the climate adaptation agenda, and those where DFIs have focused their private sector-oriented interventions.[93]

We considered activities where private sector entities[94] are the first recipient/borrower of DFIs' finance or advisory services. We also included state-owned organizations that operate on a commercial basis to provide essential services and infrastructure, such as water or energy utilities.[95]

We acknowledge that the pool of DFIs selected and the subset of activities are not comprehensive, due to the lack of granular project-level data.[96] We also lacked details on some projects (e.g. characteristics of the finance provided) due to the early stages of some

[87] This does not include transactions indirectly financed by BNDES through a network of local financial institutions, which we identified, but for which we did not have sufficient details (see Section 3.1.2.).
[88] See Buchner et al. (2013, 2014).
[89] EBRD (2011; 2012 a, b and 2013).
[90] See IFC (2011) and EBRD & IFC (2013).
[91] We categorized countries as developed (high-income), upper-middle-income and developing (lower-middle and low-income) based on World Bank classifications.
[92] DFIs' interventions have been categorized in these sectors according to Buchner et al. (2014)'s methodology.
[93] These sectors were major recipients of DFIs' adaptation finance in 2012 and 2013 (See Buchner et al. 2013 and 2014); Vivid Economics (2015) notes that while these sectors correspond to identified adaptation priorities, they also reflect the convenience of adding adaptation components to these projects.
[94] Entities with at least 51% of private ownership.
[95] These organizations play a substantial role in equipping countries to respond to the climate challenge, and can face barriers to adaptation similar to the ones faced by private actors (see e.g. Audinet et al. 2014).
[96] See Vivid Economics (2015) for further insights on MDBs 2013-2014 private sector-oriented adaptation projects.

interventions[97] or confidentiality. We also acknowledge that differences exist in how MDBs, BFIs, and NDBs track and report adaptation finance.[98] This can imply differences in the approaches used to integrate climate resilience into private sector operations.

[97] This refers to projects approved by the PPCR's Sub-committee, but not yet by MDBs (see CIF, 2014a and CIF, 2015a), or projects whose negotiations with clients are yet to be finalized.

[98] See Buchner et al. (2014), AfDB et al. (2014) and IDFC (2014). Worth noting that MDBs and Bilateral and National DFIs members of the International Development Finance Club (IDFC) are developing guidelines in order to bring adaptation finance tracking methodologies closer together (see WorldBank.org).

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