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Understanding and Increasing Finance for Climate Adaptation in Developing Countries

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A CPI Report

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Descriptors

Sector	Adaptation
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About CPI

With deep expertise in policy and finance, CPI works to improve the most important energy and land use practices around the world. Our mission is to help governments, businesses, and financial institutions drive growth while addressing climate risk. CPI works in places that provide the most potential for policy impact including Brazil, Europe, India, Indonesia, and the United States.

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

This report explores the current state of finance for climate adaptation and proposes practical, near term solutions to both fill in knowledge gaps and to increase investment. While many of the suggestions can also be applied in developed countries, which often face similar challenges in measuring and deploying adaptation finance, the focus of the report and selected examples highlight the role for developing country national governments and stakeholders, such as development finance institutions, local governments, and civil society organizations including academic institutions in supporting increased knowledge and investment in adaptation. The report benefits from discussions held during three adaptation finance focused workshops organized by CPI and adelphi in 2018 to present and discuss preliminary findings of this study.

There is an urgent need to spur greater investment into climate adaptation and resilience, in both the public and private sectors. The frequency and magnitude of natural hazards triggered by climate change has been increasing globally, leading to USD 1.5 trillion in economic damages from 2003 to 2013 (FAO, 2015),¹ in addition to impacts to human and ecosystem health.

However, current investments in adaptation constitute only a fraction of what is needed to avoid costly and catastrophic future impacts. The costs of adaptation in developing countries could range from USD 140 billion to USD 300 billion per year by 2030 (UNEP 2016). At the global scale, costs are likely to be between USD 280 billion and USD 500 billion per year by 2050, with even higher costs possible under higher emissions scenarios (UNEP 2016). Despite the significant climate risks at hand, combined with countries' efforts to implement policies that are conducive to scaling-up finance for climate change, investment in the sector has not taken off, with USD 22 billion of tracked global investment to address climate change going towards adaptation activities in 2016 (Oliver et al., 2018).

The measurement and disclosure of climate risk is the first step to developing strategies to address risk as part of all investment decisions. Regular assessment and disclosure also helps to measure the effectiveness of interventions over time.

In addition, tracking investment in adaptation and risk reduction is important to understand where investment is - and isn't - happening. However, there is no standard format to report on climate finance (and thus adaptation finance) for developed and developing countries so far (UNFCCC, 2016), though countries can do so in their National Communications, Biennial Update Reports (BURs), and Nationally Determined Contributions (NDCs).

In addition, there is still little agreement on what qualifies as adaptation finance and how it should be measured (UNFCCC, 2016). Adaptation activities are project and location specific, and they respond to specific climate vulnerabilities. Unlike mitigation activities, it is not possible to produce a standalone list of adaptation activities that can be used in all circumstances as adaptation investment often involves mainstreaming resilience into all investment decisions. In addition, as climate resilience and adaptation are intrinsically linked to development, it is difficult to distinguish between a standard development project and a development project that contributes to climate change adaptation. Multilateral development banks have developed agreed upon tracking methodologies, resulting in the most comprehensive datasets available (MDBs, 2018, MDB-IDFC, 2018). However, these methodologies have not been widely adopted.

Furthermore, several barriers exist - relevant to both public and private investment - that are **preventing or slowing the adoption of adaptation practices, services, and technologies at the scale that is needed, especially in developing countries** (Hallmeyer and Tonkonogy, 2018). These include:

- **Context barriers**, which are specific to the market that is implementing the adaptation projects and related to the policy and institutional environment. This is particularly relevant for private capital, which is in part driven by the incentives generated by regulatory and policy frameworks. Gaps in these frameworks are frequently cited as constraining adaptation investments.
- **Business model barriers**, which are specific to the adaptation product or service being offered, and can include challenges such as: uncertainty around investment returns; lack of consideration of climate risk in investment decisions; high upfront costs of technology; and a lack of technical capacity to implement and maintain adaptation products.

1 FAO (2015): The impact of disasters on agriculture and food security. www.fao.org/resilience 1-77

- **Internal capacity barriers**, which can lead to a lack of companies offering adaptation products and services not operating at scale. The internal capacity of a product or service provider determines whether it is investment ready (Lieberman et al. 2015) and whether it has the capacity to expand to new geographies or sectors, especially in developing countries.

Many approaches have been proposed and/or implemented to address investment barriers in adaptation. They often focus on specific areas of risk management, for example increasing the availability and adoption of risk assessment tools, or providing financing for risk reduction or transfer. Solutions can be arranged into three groups, which can address the investment barriers described above.

- 1. Increasing demand for climate adaptation services and products**, such as through policy reforms that set rules for how businesses and government evaluate, disclose, and manage risk; funding market studies that describe the potential impacts of climate change for specific local geographic areas; and supporting product demonstrations.
- 2. Sustaining suppliers of climate adaptation products and services** to help them scale-up, such as through the development of technology and data standards that allow many actors to engage with each other in the climate risk market; and provision of data, such as basic weather and exposure data that are public goods which businesses can build upon to offer value added services.
- 3. De-risking adaptation investment** to address cost and information barriers, such as early-stage funding of new technologies before they are market-ready, and soft loans to infrastructure projects that add resilience into their designs at additional cost. This can also include direct investments into adaptation projects, particularly government assets.

The role of developing country governments

While many aspects are also of relevance for developed countries, we have identified the following suggestions for developing country governments to enhance understanding of adaptation finance and drive further investment into adaptation through improved tracking, public policy, and finance.

Supporting risk assessment and tracking efforts

Domestic public actors have the largest incentive to fill the gaps in measuring adaptation progress. This includes assessing risks, and measuring actions taken to reduce risk. In particular:

- Integrating adaptation within existing national planning and evaluation systems, which would help streamline workflow and generate 'buy-in' from those responsible.
- Countries could participate in discussions around disclosure of climate risks to investors, such as the TCFD, and where possible adopt best practices in measuring and disclosing climate risks.
- Finance ministries in developing countries could analyze the threat that climate risks might pose to their sovereign debt, and incorporate considerations regarding their mitigation as part of their strategy to ensure financial sustainability.
- Further efforts are needed to improve domestic public sector tracking practices, opting for an integration with existing national planning and evaluation systems.
- Governments could find ways to systematically incorporate national development banks at the margins of climate action into tracking initiatives to build a more complete picture of their international climate efforts. Donors, on the other hand, could support the process by continuing to address the need to develop harmonized approaches.

Actions to increase investment

Developing country governments will need to support a multitude of efforts to meet the adaptation goals and priorities outlined in their NDCs and other relevant strategies and plans. These include efforts that help increase demand for climate adaptation products and services that measure, reduce, and/or transfer climate risks; increase supply of these products in local markets; and de-risk adaptation investments using different policy and financial tools.

- Near-term opportunities for **increasing demand for climate adaptation products and services** include, among others, voluntary or mandatory disclosure requirements to investors; supporting market studies and technology demonstrations to improve the business case for adaptation products; and incorporating climate risk assessment requirements in infrastructure PPP contracts.
- Near-term opportunities for **increasing the supply of climate adaptation products and services** include, among others, improving the quality of and access to public data; supporting the local development of catastrophe risk models; and providing technical assistance and concessional equity to suppliers of adaptation products and services to better serve local markets.
- Near-term opportunities for **de-risking investment in adaptation** include, among others, supporting local utilities to issue resilient infrastructure bonds; adopting pay for success instruments to reduce under-performance risk of new adaptation technologies; participating in regional catastrophe risk insurance pools; and offering technical assistance and catalytic finance to climate smart agricultural lending and index insurance initiatives.

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1. Introduction

Intense heatwaves, storms, droughts, and rising sea levels are already causing a severe, negative impact on communities around the world, resulting in lost lives, reduced quality of life, losses of ecosystem services, and financial loss. The frequency and magnitude of these natural, climate-related hazards has been increasing globally, leading to USD 1.5 trillion in economic damages from 2003 to 2013 (FAO, 2015), not to mention the impact it can have on human and ecosystem health. These effects are disproportionately concentrated in the developing world.

Without pro-active measures to adapt to climate change, extreme weather events resulting from climate change will impact government budgets, as governments will need to spend additional money on emergency services, clean-up operations, and healthcare costs, diverting resources from productive economic activities. As developing countries already have less capacity to protect and rebuild, these events can have a damaging and long-lasting effect on their growth. Beyond the public sector, private companies are faced with potential disruptions to their operations, decreased demand for their products, regulatory changes, and increasing financing costs as financial institutions consider climate impacts in their decision-making (Trabacchi and Mazza, 2015).

Different sectors of the economy are exposed to climate change in varying degrees. 25% of the total damages caused by climate change-related disasters affect the agricultural sector. As just one example of this, in 2010, flooding in Pakistan resulted in USD 5 billion in agricultural losses and slowed sector growth from 3.5% to 0.2% and GDP growth from 2.8% to 1.6% (FAO, 2015). Climate-related disasters also have a significant effect on agricultural value chains, which in turn affects the cost of agricultural commodities. In the energy sector, the economic cost of extreme weather-related power service interruptions in the U.S. alone is estimated to be between USD 25 and USD 70 billion annually. Power companies in the regions affected by Hurricane Sandy in 2012, for example, allocated USD 1.3 billion to improve the resilience of power distribution infrastructure to climate change following the disastrous storm (IEA, 2015).

These costs point to an urgent need for greater public and private investment into climate adaptation, which the IPCC (2014a) defines as “the process of adjustment to actual or expected climate and its effects.”² This report therefore explores the current state of finance for climate adaptation and proposes practical, near term solutions to both fill in knowledge gaps and to increase investment. While many of the recommendations can also be applied to developed countries, the focus of the report and selected examples highlight the role for developing country national governments and stakeholders such as development finance institutions, local governments, and civil society organizations including academic institutions, in supporting increased knowledge and investment in adaptation. This report benefits from discussions held during three adaptation finance focused workshops, organized by CPI and adelphi in 2018 to present and discuss preliminary findings of this study.

Chapters 2 and 3 of the report summarize available data and information on the current state of adaptation investment and the barriers preventing higher levels of investment. Chapter 2 takes stock of the **latest available data on adaptation finance flows**, including the types of institutions that are funding adaptation, the most prominent sectors and geographies receiving adaptation finance, and the financial instruments (e.g., grants, debt, equity) employed to deliver the finance. Chapter 2 then briefly considers how this data compares to the needs for adaptation investment, as has been described in the literature (e.g., UNEP 2016).

Noting continuing gaps in investment, Chapter 3 explores **what is preventing investment in adaptation**, employing a barriers framework first proposed by CPI in the context of the development of new investment facilities for adaptation (Hallmeyer and Tonkonogy 2018). The barriers framework focuses on barriers in the policy and institutional environment; barriers due to the lack of knowledge around climate risk and potential

2 This report defines key climate adaptation terms as follows:

Adaptation: the process of adjustment to actual or expected climate conditions and their effects on human and natural systems, to avoid or limit harmful consequences and/or realise benefits (from IPCC 2014a)

Climate risk: The potential for consequences (= climate impacts) where something of value is at stake and where the outcome is uncertain (from IPCC 2014a)

Climate resilience: The ability of social-ecological systems to absorb and recover from climatic shocks and stresses, whilst positively adapting and transforming their structures and means for living in the face of long-term change and uncertainty. (Mitchell, 2013).

risk management solutions and difficulty financing new technologies; and finally, barriers related to the capabilities of companies to scale-up their adaptation product businesses, especially in developing countries.

Chapters 4 and 5 then explore two adaptation finance topics where crucial early progress has been made, but more is needed. First, Chapter 4 looks at issues of **measurement and disclosure**: ideally financing flows to sectors and geographies that have the highest climate risks and highest needs and opportunities for investment, neither of which can be determined without adequate measurement. Therefore, the chapter examines the continued knowledge gaps for both international and domestic tracking of adaptation **finance**, as well as for the measurement of **risk**. While these two areas of measurement (adaptation finance and climate risk) are quite different, with the former focused on measuring investment, and the latter on measuring the potential risk and costs of climate change impacts, both areas are benefiting from increasing focus of international and domestic stakeholders in order to inform investment decisions.

Chapter 5 then looks at some of the **approaches that have been supported** by public institutions to help overcome investment barriers to addressing climate risk and leverage private investment. The chapter categorizes these approaches by the types of barriers they address (from Chapter 3) and the aspect of the market on which they focus (demand for adaptation products and services vs. supply, as well as needs for de-risking). The approaches include both public policy as well as public finance mechanisms, and range from tools such as supporting market studies, capacity building, and enhanced provision of public data, to de-risking investment through mechanisms such as blended finance vehicles and early stage technology support. The chapter concludes by providing brief case studies of several of these approaches, identifying the key implementing actors, the activities, and examples of ongoing implementation.

Finally, based on this stocktake of the latest trends and current key topics in adaptation finance, Chapter 6 highlights **areas of action and concrete measures that national governments in developing countries can take to facilitate increased knowledge and investment in climate adaptation**.

2. Trends in adaptation finance

2.1 Policies that drive adaptation investment

In 2015, the global community recognized three international agendas that all have the potential to drive investment in adaptation: the Paris Agreement, the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs), and the Sendai Framework for Disaster Risk Reduction. Each of these requires the development of specific strategies to meet their objectives (Dazé et al., 2018).

The Paris Agreement, for the first time, set a global goal on adaptation for “enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development, and ensuring an adequate adaptation response in the context of the temperature goal” (Article 7.1 as quoted in UNEP 2017). Per Article 14 of the Paris Agreement, progress towards the goal will be assessed every five years, beginning in 2023 (UNEP, 2017).

To date, 75% of countries’ Nationally Determined Contributions (NDCs) have adaptation targets, including 100% of African countries and 92% of Asian countries. Water, agriculture, and health are the sectors most frequently identified as “key priority sectors” and “vulnerable” in the NDCs. However, only 18% of adaptation goals are quantitative, and more than 30% of the NDCs with adaptation components do not specify a time frame for achieving them.³

A key mechanism that many countries use to both set and implement their adaptation-related priorities as set out in their NDCs is the National Adaptation Planning (NAP) process, which is focused on preparing countries for climate change in the medium-term. Intended as an iterative process, NAPs work to mainstream climate risk in all levels of planning and budgeting, including national and sub-national/local. NAPs were first introduced in the 2010 Cancun Agreement, and were highlighted in the Paris Agreement as a mechanism to help meet the global goal (Dazé et al., 2018).

3 Data analyzed from the Tool for Assessing Adaptation in the NDCs, available from the adaptation knowledge portal AdaptationCommunity.net at: <https://www.adaptationcommunity.net/nap-ndc/tool-assessing-adaptation-ndcs-taan/taan/#>

Box 1: Methodological note

The figures presented in this chapter are based on CPI's Global Landscape of Climate Finance methodology. In a recent update (Oliver et al., 2018), CPI reviewed and revised the climate finance flows for 2015 and 2016, as previously reported in the 2017 Global Landscape of Climate Finance paper (Buchner et al., 2017). This review has ensured that the previous findings on how much, where, and to what extent finance spent on adaptation in these years incorporates the most recent and comprehensive data, in order to inform the third Biennial Assessment and Overview of Climate Finance Flows from the United Nations Framework Convention on Climate Change (UNFCCC).

As discussed more in depth in Chapter 4, institutions track and report adaptation finance differently, and data provision is usually limited to those governments and public finance institutions with the capacity to report it, while private sector investment is often missing due to lack of incentive on reporting. Finally, bilateral climate-related development finance that qualify as Official Development Assistance (ODA) and Other Official Flows (OOF) in the OECD's DAC Creditor Reporting System (OECD DAC, 2018) is reported in different ways. Finance can be marked as having 'climate change mitigation' or 'adaptation' as its 'principal' objective, or having a 'significant' climate change objective. CPI applies the mid-point between the lower and upper bound to calculate global climate finance.

Outside of the climate change agreements, SDGs depend on climate change action, both mitigation and adaptation, as without the implementation of climate change measures, they will not be attained. For example, Goal 2 (Zero Hunger) and Goal 6 (Clean Water and Sanitation) will be more difficult to attain in areas threatened by increasing severity of drought and flood (NDCP, 2018).

Finally, the Sendai Framework encourages strategies and measures that reduce disaster risk. As noted in Dazé et al. (2018), many disaster risk reduction and adaptation strategies are similar or the same, therefore this is another area where coordination is required.

While these three policy agendas contain a great deal of synergies, in practice their implementation can be challenging as they are typically managed by different ministries (development ministries for the SDGs, environment ministries for the Paris Agreement, and disaster risk management agencies for the Sendai Framework), and often must be implemented at sub-national levels which typically have lower capacity. Therefore, active alignment of strategies at the national and sub-national levels must occur in developing country governments to drive investment (Dazé et al., 2018). Beyond these strategies, many other global frameworks, such as the Aichi targets under the Convention for Biological Diversity, plans under the

United Nations Convention to Combat Desertification, and others, also have inter-linkages with action on climate change adaptation.

2.2 Current trends in adaptation finance

A comprehensive quantification, and year to year comparison, of global adaptation finance is not available due to lack of data and tracking incentives, particularly for private actors. In addition, there is a lack of harmonized methodologies in the way institutions track and report climate finance, including approaches to making a distinction between "business-as-usual" development projects and their "additional" adaptation component (see Chapter 4 for more information on current tracking methodologies).

According to CPI's analysis of available data,⁴ global adaptation finance totaled USD 22 billion in 2015 and in 2016.⁵ The entirety of the finance flows captured is provided by public sector organizations (Oliver et al., 2018; see Figure 1).

After increasing from 2011 to 2014, adaptation finance flows captured in CPI's *Global Landscape of Climate Finance* series dropped in 2015 (see Figure 1).

4 For the purposes of this paper, adaptation finance will be any finance which results in improved resilience to the effects of climate change. See the methodological note box for more information on the approach used within the Global Landscape of Climate Finance.

5 For simplicity, this report refers to annual averages across 2015 and 2016.

Multilateral development finance institutions (DFIs) are the main providers of global public finance for adaptation, accounting for USD 8 billion on average, or 36% of the total adaptation finance tracked in 2015/2016.

On average, multilateral DFIs increased their adaptation finance by 34% in 2015-16 compared to the previous two years (Figure 1). In 2017, the group of multilateral development banks (MDBs) that jointly report climate finance⁶ provided 21% of their total climate finance to adaptation activities (MDBs, 2018). On top of their direct investment in adaptation, the group also mobilized an additional USD 8.2 billion per year between 2015 and 2017 in co-financing for adaptation from public and private sources.

Bilateral donor governments and their agencies contributed an additional USD 2.4 billion, on average, in 2015-16 for adaptation finance, while multilateral and bilateral climate funds (including the Green Climate Fund and the Adaptation Fund) contributed another USD 0.4 billion. Finally, national DFIs contributed nearly USD 8 billion per year in 2015-16.

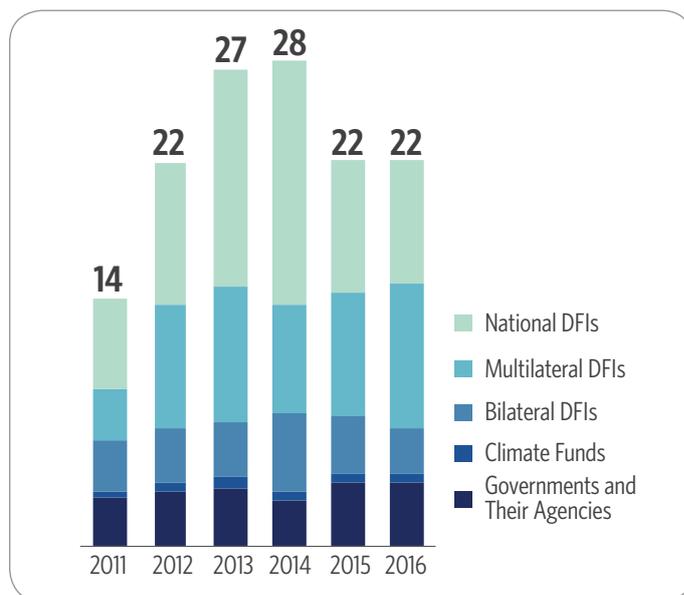
In 2015-16, market-rate loans were the main instrument used to finance adaptation activities, for an average of USD 11 billion per year (Figure 2).

Most of these loans were provided by multilateral and national DFIs, largely to increase the resilience of water utilities projects, water-intensive industries, and other capital-intensive infrastructure projects. The European Investment Bank, for example, is working to fill the funding gaps of private sector utilities to enable water and wastewater infrastructures improvements (like rehabilitation and replacement of old infrastructure or expansion of reservoirs) that would not otherwise have taken place (Trabacchi and Mazza, 2015).

Concessional instruments like grants and low-cost loans comprised USD 5 billion. These instruments are typically provided by bilateral donors and climate funds to develop pilot projects, provide technical assistance and capacity building, or give access to finance at longer and more affordable terms, thereby lowering investment costs and encouraging private investment in climate-resilient projects (Trabacchi and Mazza, 2015).

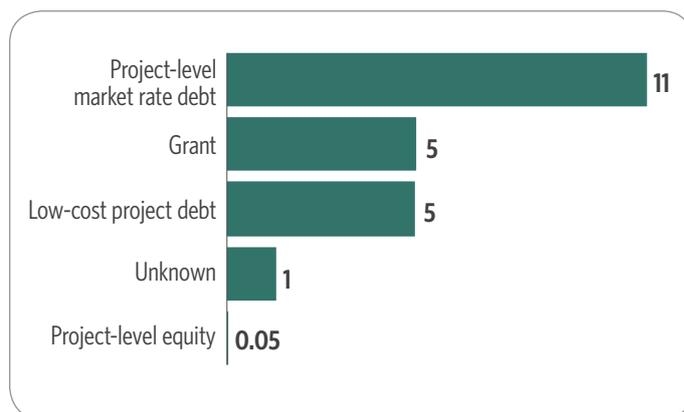
6 The MDBs that report jointly are African Development Bank (AfDB), the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB), the Inter-American Development Bank Group (IDBG), and the World Bank Group (WBG). Multilateral DFIs tracked represent a larger group of multilateral organizations, including these six MDBs as well as the Development Bank of Latin America (CAF), the Islamic Development Bank (IsDB) and the Nordic Investment Bank (NIB) among others.

Figure 1 – Finance flows for adaptation as captured by CPI landscape studies, (2011-2016 in USD billion)



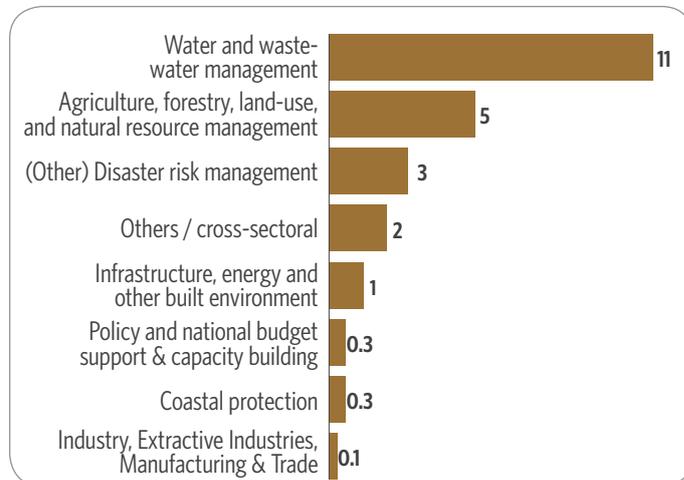
Source: Oliver et al. 2018. Mazza et al. 2016; Buchner et al. 2013; 2012.

Figure 2 – Adaptation finance by instrument (2015-16 average, in USD billion)



Source: Oliver et al. 2018.

Figure 3 – Adaptation finance by sector (2015-16 average, in USD billion)



Source: Oliver et al. 2018.

Equity finance represented only a negligible amount in 2015-16, but it could be used to help businesses scale-up their activities and develop products with adaptation benefits (see the IFC example in Trabacchi and Mazza, 2015).

In addition to established instruments such as loans and grants, green bonds are emerging as new important financing approaches to channel international public adaptation finance. Green bonds that are aligned with adaptation activities (mostly funding water sector projects), accounted for 3-5% of the total green bonds outstanding by May 2017 (CBI, 2017).

In line with the sectors most frequently identified as “key priority sectors” and “vulnerable” in the NDCs, water and wastewater management projects attracted 50% of the total volume of international public adaptation finance tracked over 2015-16, on average (Figure 3). This includes demand side activities aimed at reducing water consumption or increasing water use efficiency, and supply side management activities, for example, increasing water supply, reducing water losses, or improving cooperation on shared water resources (CPI, 2017).

Agriculture, forestry, and land-use adaptation activities followed with an average of USD 5 billion, 21% of the total. Between 2003 and 2013, 22% of the damage and losses caused by climate-related disasters in developing countries accrued in the agriculture sector (FAO, 2018).

Disaster-risk management activities, such as early-warning and rapid response systems, accounted for 13% of all adaptation finance in 2015-16, which is about USD 3 billion a year, on average.

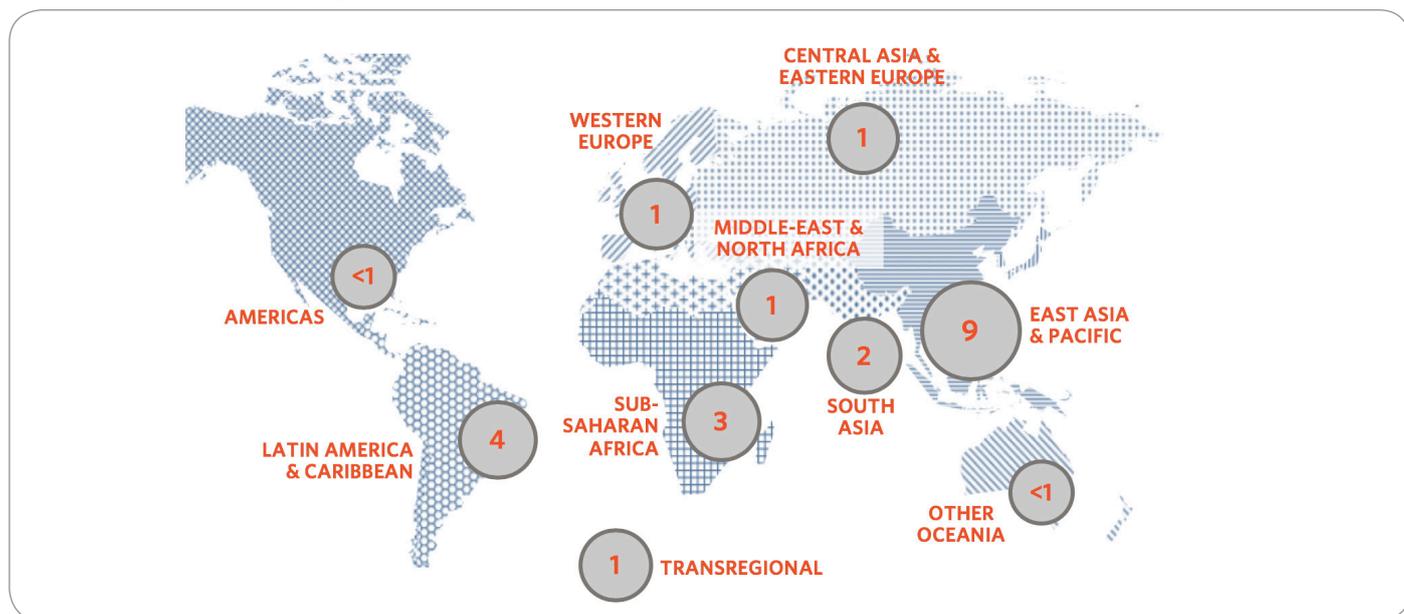
During 2015-16, most of the adaptation finance tracked flowed to the East Asia and Pacific region with USD 9 billion annually, followed by Sub-Saharan Africa and Latin America with USD 3 billion, respectively. Most of the finance tracked was spent in non-OECD countries (Figure 4), reflecting the fact that current information on adaptation finance is only available from international and domestic development finance institutions. In fact, two-thirds of adaptation finance tracked is international, predominantly from OECD to non-OECD countries, while one-third originates domestically and is spent by national development finance institutions.

Additionally, our analysis has only partially tracked adaptation finance in developed countries. Tracking this finance is difficult, as developed countries typically take an integrated approach to adaptation that makes it challenging to report adaptation-specific components, and only have a few funds for adaptation-specific activities (Mullan et al., 2013).

2.3 Gaps in current investment

Estimating the costs and the investment required to adapt to a changing climate is a complex topic and limited literature is available. Estimates may range significantly depending on the assumptions,

Figure 4 - Adaptation finance by region (2015-16 average, in USD billion)



Source: Oliver et al. 2018.

time-horizon, and baseline considered. For example, the consequences of a 4°C warmer world on ecosystems, productive sectors, and livelihoods, and the projected costs to adapt to it, are considerably higher than a 1.5°C scenario.

According to the UNEP Adaptation Gap report, developing countries would need to invest between USD 140 billion to USD 300 billion per year by 2030 in order to adapt to a 2°C future (UNEP, 2016). This means that estimated costs are nine-to-nineteen times higher than current levels of international public adaptation finance to avoid an adaptation finance gap in 2030 (based on figures from Oliver et al. 2018). Even compared with the developed countries' commitment of mobilizing USD 100 billion per year for mitigation and adaptation from 2020 (assuming an equal split between mitigation and adaptation), estimated adaptation costs remain higher.

At the global scale, costs are estimated to be between USD 280 billion and USD 500 billion per year by 2050, with higher costs possible under higher emissions scenarios. Despite the increasing rate of climate-related disasters, projected risks, and growing policy efforts to combat them, only USD 22 billion of total global climate finance in 2016 went to adaptation activities (Oliver et al., 2018). Regardless of the methodology used, it is clear that the current amount of investment constitutes only a fraction of what is needed to avoid costly and catastrophic future impacts.

3. Barriers to increased investment in climate adaptation

3.1 Investors and their limitations in investing in adaptation

The private sector, including its role in adaptation finance, is wide-ranging (Agrawala et al., 2011; Trabacchi and Stadelmann, 2013). The private sector can refer to smallholder farmers or small-and-medium-sized companies that implement adaptation activities, large multinationals with complex supply chains, or to private financiers (private equity funds, commercial banks) who finance adaptation activities directly, either independently or together with public actors. It can also refer to private insurance and reinsurance companies that cover losses related to extreme weather events, such as droughts (Brown et al., 2015). Private sector investments can take many forms, spanning soft (improvement in water efficiency in manufacturing processes) and hard (infrastructure investments) measures (Agrawala et al. 2011; Averchenkova et al. 2015). It is not always easy to delineate adaptation activities from general investments and upgrades that companies routinely undertake. In many cases, investments that do not have adaptation as a main objective (e.g. increasing efficiency of companies' operations or improving transport and storage facilities) can also contribute to adaptation (Pauw, 2014).

At the same time, some investment in adaptation is simply not suitable for the private sector, as the public sector often owns and manages many assets, such as national parks, roads, ports, buildings, and other assets that face climate risks which the public sector is responsible for managing.

All these actors have an interest in taking climate risks into account in their financing and investment decisions, yet their investments may be lower than optimal due to market failures. Especially in developing countries, a set of barriers prevents or slows down the adoption of adaptation practices, services, and technologies at the scale that is needed. Building on prior CPI work, Hallmeyer and Tonkonogy (2018) developed a barriers framework to understand what is holding back adaptation investment. They separated barriers into three categories: context barriers, business model barriers, and internal capacity barriers. These barriers apply to both public and private investment in adaptation.

3.2 Context barriers

Every market has properties that can either enable investment or make it more challenging. Context barriers are specific to the market that is implementing the adaptation projects. This is particularly relevant for private capital, which is in part driven by the incentives generated by regulatory and policy frameworks. Gaps in these frameworks are frequently cited as constraining adaptation investments.

Missing or deficient regulatory and policy frameworks (such as infrastructure codes/standards or environmental/social impact assessment laws) that are not tailored specifically to climate risks can create barriers to action and investment. In addition, responses to risks are significantly restrained by a distinct lack of economic incentives for investment in climate resilience. Moreover, maladaptation practices also arise from incentives that sustain business-as-usual practices, reducing the incentives for adaptation investment, and leading to an increase in climate change vulnerability (Stenek and Amado, 2013). These

include subsidies on crops and production methods that are not climate-resilient, subsidies that promote inefficient use of water, as well as publicly funded disaster relief cushions.

More broadly, private capital requires a stable investment environment, in which investors can trust governments to provide a degree of regulatory stability, enforceable laws, and the protection of property rights (both intellectual and physical) among other factors, with effective regulations and political stability particularly important to foreign direct investment. While significant adaptation investment will be needed in the developing world (Bathiany et al. 2018 and Kreft et al. 2017), these countries often score poorly on the metrics which are essential to stimulating investment.

3.3 Specific business model barriers

Specific business model barriers relate to the adaptation product or service being offered. While adaptation investments are often of a cost-saving nature to end-users and look at a long-term horizon, businesses prioritize revenue generating and short-term investments. The

Table 1: Barriers to investing in adaptation

BARRIER TYPE	BARRIER NAME	DEFINITION
Context Barriers	Poor policy environment	Policy environment lacks conditions supportive to sector-specific investment (e.g., no requirements for businesses to implement disaster risk management strategies).
	Poor institutional environment	Legal and regulatory institutions and infrastructure that support investment are lacking (e.g., property rights, contract enforcement, permitting, rule of law, etc.).
	Poor market environment	Market environment is unsupportive to sector-specific and general investment (e.g., weak economy, unsophisticated financial institutions, weak historical track record of sector-specific investment, etc.).
	Poor value chains and human capital	Environment lacks the organizations and people with needed capabilities for the investment to take place and be successful (e.g., no sector-specific value chain or local sectoral expertise).
Business model barriers	Uncertain or unknown value-add	Value or benefit of the technology is not known to users or is uncertain; users do not consider their climate risk in decision-making.
	High cost	Upfront and/or operational cost of technology is too high.
	Lack of technical capacity	Prospective users of the technology don't have the technical capacity that is needed to implement or use the technology.
Internal capacity barriers	Lack of internal capacity	Internal management & operational capabilities of the adaptation product or service provider are insufficient to scale.

Table based on Hallmeyer and Tonkonogy (2018)

benefits of a climate-resilient investment typically manifest over long time frames, while businesses (and governments) often face pressure to make investment decisions based on short-term factors, overriding the longer-term impacts of climate change (Crick et al. 2016). Institutions – both public and private – are not incentivized to properly evaluate risks and identify solutions, due to lack of:

- Awareness of risks and opportunities of climate change
- Availability of reliable and accurate comprehensive data on vulnerabilities and risks (CSE, 2018). There is a limited number of analytical providers that can assess physical climate risks. Sources of data are different and there is an asymmetry of information across different datasets on climate risks and risk mitigation measures (CPI and adelphi, 2018). Developing countries often do not have institutions in the country that would collect climate-resilient data (UNDP et al. 2018)
- Availability of investment-relevant and usable tools, such as risk assessment tools, to integrate considerations of long-term climate trends into site-specific decision-making, and serve as a rationale for budgeting financial resources (CSE, 2018)
- Technical capacity to properly evaluate climate risks and identify climate-resilient investment or financing opportunities
- Access to and familiarity with technologies that can help to strengthen climate resilience, as lack of familiarity can alter investment risk perception (Hallmeyer and Tonkonogy 2018)

Climate risks can also be costly to evaluate (CPI and adelphi, 2018). For example, in the experience of MDBs, the cost of an environmental and impact assessment can add about 25% to the total cost due to the more extensive analysis of additional risks, reducing the incentive and financial ability to perform assessments (Iqbal and Suding, 2011; more recent numbers were not identified).

This is combined with possible high upfront costs of adaptation technologies. Investing in, for instance, irrigation equipment that could strengthen climate resilience may not be viable under a business's current financial capacity. Willingness to pay for climate risk insurance or resilience is low in developing countries where margins are low, and businesses

are often family- or government-owned (CPI and adelphi, 2018). These barriers are considerably more significant for small and medium-sized enterprises (SMEs) in developing countries, due to their limited financial capacity to fund upfront costs of investment. Additionally, SMEs struggle with reduced access to financial services as their size leads to higher transaction costs for lending institutions, and they are often perceived as riskier investments. This can also be an issue particularly for developing country governments which – even when benefiting from strong political will – often lack the adequate resources for project development and accessing available financial mechanisms⁷ to meet the challenges and priorities in all vulnerable sectors (CSE, 2018).

Finally, financial institutions are often reluctant to invest in adaptation and resilience solutions, due to the lack of a track record of prior investments and caution in financing early stage technologies.

3.4 Internal capacity barriers

In developing countries, a lack of operative companies offering adaptation products and services limits the potential supply at scale. The internal capacity of a product or service provider determines whether it is investment-ready and whether it has the capacity to expand to new geographies or sectors, especially in developing countries. Micro, small, and medium-sized enterprises (MSMEs) are often limited by internal capacities, especially in developing countries (Divakaran et. al, 2014). These internal capacity limitations include lacking financial records and information, lacking good governance, and lacking accounting functions, all of which add investment risk. In addition, existing companies offering adaptation products and services in developed countries often do not have the internal capacity or knowledge to expand to developing countries, as this typically requires a detailed understanding of local legal environments and development of partnerships, joint ventures, and/or local branches, with which smaller companies especially may struggle or not prioritize (Hallmeyer and Tonkonogy 2018; see summary of Case Study example from this publication in Box 1).

7 E.g. It is very difficult for many countries to put together investment data required for when preparing a project proposal, as this creates additional costs (UNDP et al. 2018). English is the main language for accessing most of available financial mechanisms for adaptation. Most of projects proponents thus need to translate their project proposal into English, a language different from their own, which may cause further delays and inaccuracies in the application process, ultimately representing a significant entry barrier (CSE, 2018).

3.5 Case study examples

Box 1 provides several case study examples of adaptation and resilience service companies interested in expanding in developing countries, and the barriers they encountered.

Box 2: Case study examples

Hallmeyer and Tonkonogy (2018) assessed barriers to the expansion of two climate risk assessment companies: Planalytics, a U.S.-based weather analytics firm with expansion potential in Latin America, including Brazil; and JBA Consulting, a UK-based risk assessment company with expansion potential in Asia. Each faced different barriers to scaling up. Planalytics offers a product – weather analytics – that most companies do not already deploy. Therefore, to enter new markets they must build demand for the product and service through, for example, product demonstrations or with first mover clients. JBA faces a similar barrier in emerging markets – namely to build demand for large scale climate risk assessment services, especially in the local and national governments that, for example, would seek to understand flood exposure across their territories. Even if local and national governments recognize the need for these services, they may not be able to pay the upfront costs for the technology development or have the capacity to evaluate suppliers.

Another barrier Planalytics encountered is a lack of their own internal capacity to increase the climate risk assessment capabilities as well as impact of their product. For example, some clients are interested in long-term understanding of their weather-related liabilities, whereas the existing product primarily focuses currently on short-term impacts. In addition, while the company recognizes they can increase their development and adaptation impact by serving clients in more underserved, vulnerable populations (such as smallholder farmers vs. large multinational agribusinesses), there is uncertainty about the business case for making investments in this direction (Hallmeyer and Tonkonogy, 2018).

Separately, UNEP Finance Initiative (2016) illustrated adaptation investment barriers through 28 case studies primarily in developing economies, including case studies on water saving measures in Bangladesh, St. Lucia, and Rwanda. While water saving measures typically reduce costs for the user, public adaptation investment was initially needed in these cases to overcome barriers related to lack of awareness of climate impacts and lack of experience and knowledge of available solutions. The publication also includes case studies on flood risk abatement, health, heat stress, insurance, and early warning systems.

4. Improving tracking of climate risks and adaptation finance

Understanding climate change risks associated with investment decisions is a critical first step to reducing them. Without measuring adaptation risks and understanding the existing investment deployed to address them, it is difficult to develop strategies to overcome barriers to investment in adaptation. The following provides an overview of the challenges and existing systems currently available for measuring adaptation finance and climate risk.

4.1 Progress in the disclosure of climate risks

The disclosure and tracking of climate risk is a critical part of adaptation information. In 2015, the G20 (Group of 20) Finance Ministers and Central Bank Governors requested that the Financial Stability Board (FSB) “convene public-and private-sector participants to review how the financial sector can take account of climate-related issues.”⁸ In response, the FSB established the industry-led TCFD to design a set of recommendations for consistent “disclosures that will help financial market participants understand their climate related risks”⁹ divided into two major categories: (1) risks related to the transition to a lower-carbon economy and (2) risks related to the physical impacts of climate change.

In developing its recommendations, the TCFD considered the challenges for preparers of disclosures, as well as the benefits of such disclosures to investors, lenders, and insurance underwriters. The TCFD issued recommendations in 2017 and has identified different levels of disclosure:

- **Governance:** Disclosing the organization’s governance around climate-related risks and opportunities
- **Strategy:** Disclosing the actual and potential impacts of climate-related risks and opportunities on the organization’s businesses, strategy, and financial planning where such information is material
- **Risk Management:** Disclosing how the organization identifies, assesses, and manages climate-related risks.

- **Metrics and Targets:** Disclosing the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material (TCFD 2017).

The introduction of mandatory climate risk disclosure in France, and the EU’s efforts for aligning its Non-Financial Reporting Directive with the recommendations released by the TCFD in 2017 illustrate growing momentum for transparency on climate risks.

Impact of climate risk and disclosure on sovereign credit ratings

While investors’ focus is usually on managing climate risks in the context of the global financing industry and globalized supply chains, unmanaged risks of climate change may also negatively affect credit ratings and capital cost of countries which are least resilient.

To date, no sovereign downgrade by a major credit rating agency has been attributed to climate risks.

The major rating agencies do not generally itemize climate risks in their published country assessments: while sovereign credit ratings may be incorporating these risks in their assessments but capturing them in other areas, climate risks are not indicated in Sovereign Ratings Methodologies, the formal criteria published by rating agencies that delineate the factors relevant to credit rating assessment. (Moody’s Investors Service, 2016 and 2017, S&P Global Ratings 2017).

However, agencies themselves have indicated that climate-related rating actions are likely to be taken in the future, almost certainly with a negative impact on ratings. Some experts advise that disclosure – particularly for developing country markets – should be done gradually and intelligently.

Agencies have recently begun to consider climate change and its potential role in credit assessment, suggesting that a range of sovereign issuers, particularly emerging market sovereign issuers, are potentially vulnerable to negative rating actions because of climate impacts. S&P Global Ratings (2017) noted in a recent report that “climate change, in particular, could have significant implications for sovereign ratings in the decades to come.” Disclosure is important, but it should be done gradually and intelligently, in tandem with efforts to improve resilience, to avoid putting issuers at risk of disinvestment or increased financing costs (CPI and adelphi, 2018).

8 <http://www.g20.utoronto.ca/2015/150417-finance.html>

9 <http://www.fsb.org/2015/12/fsb-to-establish-task-force-on-climate-related-financial-disclosures/>

Analysis from the UNEP Inquiry (2018) found that countries with higher vulnerability to climate change risk bear an incremental cost on government-issued debt: on average, 117 basis points or nearly 10% above the rates that are attributable to macroeconomic and fiscal fundamentals (the study starts from a base of 12.4%).

Recognizing climate vulnerability and mitigation measures in investment decision-making is an appropriate response to climate-related fiscal impacts and can help allocate financial resources more effectively. Further strengthening national adaptation capacity and resilience, with investment in measures of social preparedness is able to reduce the cost of debt by 67 basis points. (Buhr et al., 2018).

4.2 Progress in defining adaptation finance

Despite its importance, there is still little agreement on what qualifies as adaptation and adaptation finance and how it should be measured (UNFCCC, 2016).

Unlike climate mitigation activities, particularly renewable energy projects, for which the nature of the project or activity itself might be enough to qualify it as having mitigation benefits,¹⁰ adaptation activities are highly context-specific as they are dependent on the specific climate change signals and climate vulnerability context of the project or region. Furthermore, a standalone “list of adaptation activities” that can be measured under all circumstances cannot be developed for adaptation.

Finally, as climate resilience and adaptation are intrinsically linked to development, it is difficult to distinguish between a standard development project and a development project that contributes to climate change adaptation. These challenges have resulted in different approaches and methods for tracking and reporting adaptation finance (MDBs, 2018; UNDP et al. 2018).

The World Resources Institute (2013) summarized common traits that surround the definition of adaptation finance:

- **Context-specific:** Because climate change impacts vary significantly by location, what could count towards climate change adaptation finance depends on the types of interventions and the local needs (e.g. drought resistant seeds make sense for dry areas more so than wet areas). Furthermore, there are initiatives (e.g. the development of new seeds) that might make sense at global level, but could be inefficient to develop at the local level.
- **Dynamic:** What counts as effective adaptation in a specific context today (e.g. protecting crops by introducing new irrigation strategies to address inconsistent rain patterns) may no longer count as effective adaptation 25 years from now, given changing circumstances (e.g. identification of new substitute crops).
- **Relationship to business-as-usual:** the volume of adaptation finance depends on whether the definition considers: the total value of investment for implementation (broad definition); only the additional finance needed for implementing an adaptation-relevant solution as compared to a “business-as-usual” (incremental); or whether it considers only adaptation finance activities that address or enhance our understanding of climate impacts and only the decision-making process of activities (or adaptive steps) where adaptation is mainstreamed.

According to IISD, strict definitions and calculations of additionality in adaptation would undermine support for effective work - as development activities and adaptation activities “fold into one another” - and suggests adopting broader definitions of adaptation. Yet, it advises that the adaptation logic or justification must be clearly articulated by those seeking funding and other forms of support, and supported by appropriate vulnerability/risk assessment; stakeholder consultation planning; and clarification of assumptions used to define climate trends (Hammill, 2018). IISD is currently undertaking further analysis of existing experiences and good practices which can be used for a methodological distinction between additionality of adaptation finance and development finance.

Recognizing the challenges and the need for employing comparable tracking approaches, MDBs and the International Development Finance Club (IDFC) developed The Common Principles for Climate Change Adaptation Finance Tracking (AfDB, 2015).

¹⁰ E.g. When considering mitigation efforts, a one-ton reduction of CO₂ emissions has the same impact regardless of where the activities are located. It is therefore possible to define lists of typical activities that are deemed to support the path to low-carbon development and to quantify spending for these activities.

According to these Common Principles, for a project to be counted either fully or partially towards adaptation finance, it must:

- 1. Set out the project's context of vulnerability to climate change.** A project may experience vulnerabilities to climate change which results from the specific, socio-economic context and geographical location it is conducted in. This *specific vulnerability context* is set out in existing analyses, reports or the project's climate vulnerability assessment.¹¹
- 2. State the explicit intention to address this vulnerability as part of the project.** The project must convey how it will solve issues pertaining to the context and location specific climate risk factors.¹²
- 3. Articulate a clear and direct link between climate vulnerability and project activities.** The adaptation finance methodology is intended to capture only the value of those activities within the project that are aimed at addressing specific climate vulnerabilities, tracking the estimated incremental cost or investment associated with any discrete project component, sub-component or element that addresses current and expected effects of climate change within the project's vulnerability context.¹³

11 Project documents may refer to existing analysis and reports including citing authoritative, preferably peer-reviewed sources - E.g. such as academic journals, National Communications to the UNFCCC, NDCs, reports of the Intergovernmental Panel on Climate Change (IPCC), or strategic programs for climate resilience - or original, bespoke assessments of climate vulnerability carried out as part of project preparation. Projections must match the predicted lifespan of the asset financed by the project

12 Project activities may include (Saich 2014):

- Addressing current drivers of climate vulnerability especially in poorest countries or communities;
- Building resilience to current and future climate risks;
- Incorporating climate risks into investments especially for infrastructure with a long lifespan;
- Incorporating management of climate risk into plans, institutions and policies.

13 Eligible components are usually parts of a larger project, for example, water-saving equipment that is part of a larger capital expenditure (CAPEX) investment in an area vulnerable to increased risk of drought or financing for improved drainage of a newly constructed road to withstand heavy rainfall or storm surges that in turn contributes to the overall resilience of the road and the investment. When it is not possible to disaggregate adaptation-specific project components and to estimate incremental cost, the proportion of the project cost or investment corresponding to adaptation activities may be identified qualitatively.

The three-step methodology as set out in the Common Principles is recommended by the "climate marker handbook"¹⁴ as a best practice to contributor countries (OECD DAC, 2016).

During 2018, MDBs and IDFC members carried out a consultative process to set out the lessons learned from three years of applying the Common Principles. This major exercise - summarized in a forthcoming report to be presented by the MDB/IDFC Adaptation Working Group at COP24 in December 2018 - looks into the successes and challenges of applying the Common Principles in MDB and IDFC financing operations.

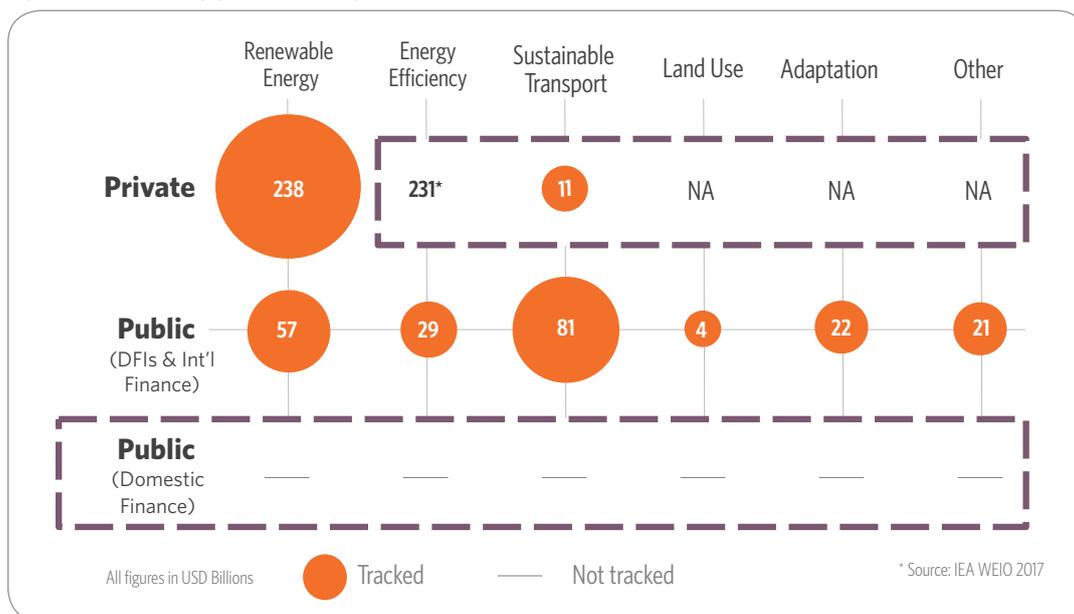
4.3 Addressing gaps in data availability and quality

In recent years, progress has been made in terms of the quality and consistency of available global climate finance data (Figure 5). However, data on adaptation finance remain scattered. While data on international public finance is generally available - particularly for North-South flows - the landscape of adaptation finance is affected by significant data gaps:

- There is a lack of systematic collection of data on climate-related private finance flows globally, due to difficulties in identifying climate-related finance, restrictions based on confidentiality, and conceptual and accounting issues (UNFCCC, 2016).
- The tracking of domestic public adaptation finance, including spending from government budgets and national development banks in both developed and developing countries, is very limited.
- Coverage of international finance *within* the Global South is limited, for example, international South-South financing.

14 Climate change markers are a vital first step to distinguish and track climate change finance committed under UNFCCC from Official Development Assistance (ODA) (Resch et al. 2017). To be counted as ODA, public money must be given outright or loaned on concessional (non-commercial) terms and be used to support the welfare or development of developing countries. Members apply markers to project level data across several sectors to help the international community track its performance relating to several international agreements to act in certain areas. This includes markers targeting environmental objectives (including the Rio conventions): biodiversity, desertification, climate change adaptation and climate change mitigation

Figure 5 – Accounting gaps in tracking climate finance



Source: Oliver et al. 2018.

4.3.1 TRACKING PRIVATE SECTOR ADAPTATION FINANCE

Businesses and private actors are investing in climate adaptation, but there is a lack of systematic data collection for climate-related private finance flows globally, due to lack of incentives for tracking, difficulties in identifying climate-related finance, restrictions based on confidentiality, and conceptual and accounting issues (UNFCCC, 2016). Private sector organizations are not required to monitor, label, and disclose their climate actions (unlike international development finance institutions). In addition, they typically consider investments in climate risk management to be part of their broader risk management processes (UNEP, 2016). Juergens et al. (2012) emphasize that climate-aligned investments are not distinguishable from expenditures in the re-investment cycle that are considered normal, for example the acquisition of new equipment. These challenges further complicate tracking of climate adaptation finance by the private sector.

Consequently, there are no global private sector adaptation finance tracking initiatives, methods, or approaches applied comprehensively across sectors or regions, and current work is sector-specific. For example, a study from Audinet et al. (2014) looked at capital expenditures for climate change adaptation for five large global power utilities, estimating them to be USD 1.5 billion since 2000 through the 2020s.

Most efforts on tracking private investment come, again, from MDBs, but their coverage remains limited to private co-financing leveraged through their own development projects. In 2015, the MDBs began reporting on climate co-financing flows to estimate the volume of financial resources invested by public and private external parties alongside MDBs for climate mitigation and adaptation activities (MDBs, 2018). Climate co-financing reporting also covers private entities and might, therefore, provide an example for an approach mapping private sector climate finance across sectors and regions. However, MDBs do not usually provide a break-down of these reported figures into sectoral uses, or in certain cases even by mitigation/adaptation.

With the introduction of policies promoting climate risk awareness across vulnerable sectors, private sector adaptation tracking and data are expected to become more widespread, especially in the developed countries. Developments in climate-related financial disclosures for public companies may also increase disclosure of steps taken to reduce risks and corresponding investment. For example, the voluntary risk assessment and management disclosure approaches recommended by the TCFD¹⁵ are likely to increase the availability of private sector adaptation data as companies begin to adopt the recommendations.

15 For more details, see <https://www.fsb-tcf.org/>

4.3.2 TRACKING PUBLIC DOMESTIC ADAPTATION FINANCE

Although the Paris Agreement calls for all financial flows to be consistent with a pathway toward reduced greenhouse gas emissions and climate-resilient development, this is not yet translated into adaptation reporting. Information on domestic climate-related finance is available through limited sources, including Biennial Update Reports (BURs) from the UNFCCC, Climate Public Expenditure and Institutional Reviews (CPEIRs), and other independent studies. Furthermore, there is no detail or standard format for developed and developing countries to report on domestic climate finance, and thus adaptation finance so far (UNFCCC, 2016). Countries can do so in their National Communications, BURs¹⁶ and NDCs.¹⁷

Furthermore, ongoing reporting activities by developing countries are short of capacity and difficult to compare (Resch et al., 2017). Developing countries have limited capacity to navigate complex financial landscape to access, manage, deliver, track, and report on different forms of finance (Buckley, 2014), in order to track the climate finance that has been received and overcome data challenges (UNFCCC, 2016). Countries further face challenges in integrating adaptation in national planning documents, as when preparing their budgets, very few ministries include resources for adaptation activities. (CSE, 2018).

However, domestic public finance likely represents a large share of overall adaptation investment, which calls for the development and advancement of methodologies and approaches for tracking and assessing domestic public budgets for their adaptation relevance. Georgeson et al. (2016)

estimated that over USD 6 billion was spent by the cities of London, Paris, New York, Mexico City, São Paulo, Beijing, Mumbai, Jakarta, Lagos, and Addis Ababa on adaptation measures in 2014-15. The study tracked specific activities of adaptation and resilience to climate change drawn from ten sectors of the economy: agriculture and forestry, built environment,

16 As of July 2018, the following non-Annex I countries have submitted their BUR(s): Andorra, Argentina, Armenia, Azerbaijan, Bosnia and Herzegovina, Brazil, Chile, China, Colombia, Costa Rica, Ecuador, Georgia, Ghana, India, Indonesia, Israel, Jamaica, Jordan, Lebanon, Malaysia, Mauritania, Mexico, Mongolia, Montenegro, Morocco, Namibia, Nigeria, Paraguay, Peru, Republic of Korea, Republic of Moldova, Saudi Arabia, Serbia, Singapore, South Africa, Thailand, The former Yugoslav Republic of Macedonia, Togo, Tunisia, Uruguay, Vietnam.

17 For example, current BUR guidelines for reporting by developing countries on financial, technical and capacity-building needs and support received do not require information on the underlying assumptions, definitions and methodologies used in generating the information. (UNFCCC, 2016).

disaster preparedness, energy, health, Internet & Communications Technology, natural environment, professional services, transport infrastructure, and water. The authors extended the same methodology globally, generating an estimated global spending on adaptation of USD 343 billion in 2014-15, roughly 0.38% of global gross domestic product (GDP).

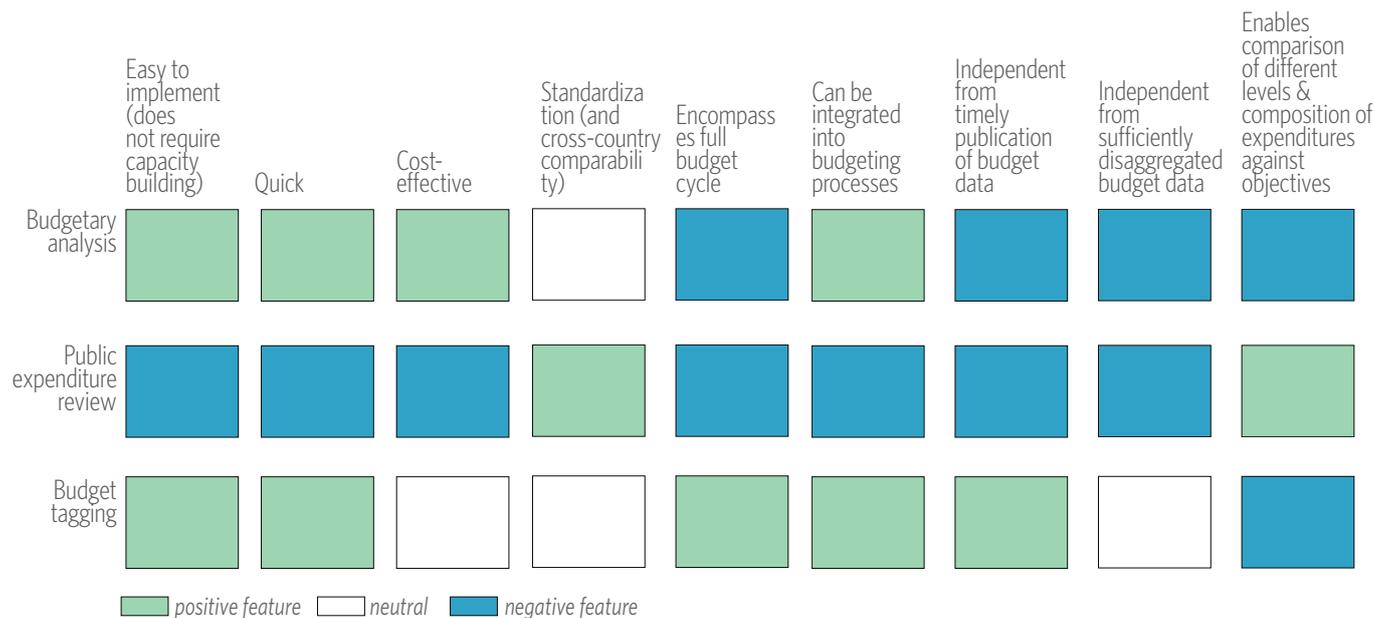
Domestic public actors have the largest incentive to fill the gap in the measurement of adaptation progress at the local, public level. Domestic public actors bear the costs of a recipient country's public adaptation measures (Pillay et al. 2017), as most public adaptation interventions produce benefits that are concentrated geographically and assessing national adaptation progress can help countries inform national planning and commitments. In addition, parts of international adaptation finance will be transferred through the government's budget.

Integrating adaptation efforts into existing national planning and evaluation systems can improve domestic public-sector tracking. As countries have multiple layers of reporting requirements, integrating adaptation within existing national planning and evaluation systems would help streamline workflow and generate 'buy-in' from the people responsible. This may require, according to IIED (2018):

- Integrating adaptation information into current planning (National Strategic Development Plan);
- Integrating adaptation information into existing databases to assess progress against different framework agreements (SDGs, climate and disaster risk reduction);
- Using common/already available development data and evidence (water, agriculture, losses from climate-related disasters, health impacts) to assess progress on adaptation;
- Expanding technical capacity to gather, manage and analyze adaptation data;
- Enabling data sharing between departments;
- Strengthening accountability between departments responsible for the process.

More in-depth approaches for tracking domestic public finance include budget analyses, public expenditure reviews, and budget tagging systems (Resch et al. 2017; see Table 2). All three approaches analyze the allocated expenditure of government budgets from domestic sources for their climate

Table 2: Comparison of different expenditure tracking methodologies (based on Resch et al. 2017)



relevance. They then identify climate change relevant budget lines/ codes for selected sectors by reviewing detailed budget reports from those sectors and/or analyzing the chart of accounts and interviewing key government officials and donor organizations. All of them apply weighting or ‘scoring’ methodologies to reflect varying degrees of climate change relevance. More specifically:

- **Budgetary analysis** is a Government-level, on-budget analysis. The approach covers allocations and the available, actual expenditures. It has been used for ACT financing frameworks¹⁸ and implemented in many countries (Resch et al., 2017);¹⁹
- **Public expenditure review** is a Government-level and external donor, on-and off-budget analysis, assessing climate expenditures within the national and sub-national budget allocation

and expenditure process. The approach covers allocations and available, actual expenditures. It has been used for CPEIRs (GCCF, 2018) and implemented in Bangladesh, Cambodia, China (Hebei Province), Fiji, Kiribati, Indonesia, Morocco, Nepal, Pakistan,²⁰ Philippines, Samoa, Thailand, Tonga, Vanuatu, and Vietnam (Resch et al. 2017; UNDP 2012 and 2016).

- **Budget tagging** is a Government-level, on-budget approach, that flags budget codes that are relevant to climate change adaptation/mitigation on the government’s electronic financial management system. This approach allows for quick, routine-based assessment, potentially capturing transactions across the planning-disbursement-auditing cycle. It has been used for governments’ and donors’

18 ACT (Action on Climate Today) is a five-year initiative that works closely with governments in South Asia to develop strategies to build resilience to the impact of climate change (ACT, 2018).

19 The Governments of Assam, Bihar, Chhattisgarh, Kerala, Maharashtra and Afghanistan have used budgetary analysis, adopting a benefits-based approach to estimate the portion of total benefits which are associated with adaptation and/or mitigation. In certain cases (e.g. Afghanistan, Bihar, Chhattisgarh, and Kerala), estimates were based on benchmark ranges with the view to replacing them with refined estimates subject to availability of robust data. (Allan et al. 2016)

20 The focus of this Pakistan public expenditure review for the budget 2011-12 to 2014 - 15 was on both federal and provincial government level. The methodology followed a three-phase process of identifying climate-related expenditure, classifying climate response and assessing the climate relevance of expenditure. The data was from key line ministries and based on expert judgment combined with consultations with various involved ministries (UNDP, 2017). To estimate CC relevance, Pakistan CPEIRs - as often within this approach - adopted an objectives-based methodology where activities are grouped into one of four categories of relevance (Allan et al. 2016).

electronic financial management systems and implemented in Nepal, Philippines,²¹ Indonesia, and Bangladesh (Resch et al. 2017).

- National and multilateral climate funds' commitments retrieved from the OECD and Climate Funds Update (Mazza et al. 2016).

Table 3 illustrates pros and cons of the three approaches.

Approaches can be complementary and depend on the financial capacity of governments as well as the purpose of the activity. Developing country governments mostly use the **budgetary analysis** approach for tracking their progress on climate change expenditures, mainly due to its low cost, while **public expenditure reviews** are mostly one-off exercises, as they are more expensive and time consuming, conducted to measure progress of an existing adaptation or mitigation policy to understand the resource levels required. Finally, **budget tagging/coding** has the advantage of tracking budget lines from disbursement, to expenditures and audited expenditures, which more precisely identifies weaknesses in the climate budgeting cycle (Resch et al. 2017).

While this approach captures most flows from these actors, its ability to capture public expenditures from domestic "South-South" cooperation has been limited. Many national development banks are likely to have provided climate relevant finance. However, it is not tracked systematically due to their lack of measurement and reporting (Mazza et al. 2016). It is therefore important to find ways to **systematically incorporate national development banks and other national actors at the margins of climate action into tracking initiatives** to build a more complete picture on their international climate efforts.

4.3.3 TRACKING PUBLIC INTERNATIONAL FINANCE FLOWS WITHIN THE GLOBAL SOUTH

As previously mentioned, international tracking efforts have recently focused on the group of MDBs that jointly report on climate finance, as well as some members of the IDFC. Publicly available international flows mainly comprise:

- DFIs' climate finance commitments, including multilateral, bilateral, and national development banks;²²
- Bilateral, climate-related development finance reported to the OECD Development Assistance Committee's Creditor Reporting System (CRS) to track Official Development Assistance (ODA) and Other Official Flows (OOF) from bilateral donors and agencies; and

21 In the Philippines, following a recommendation in CPEIR, Budget Tagging was introduced in 2015 at the national level and expanded subsequently to the local level. Relevant expenditures for every program/ activity/project aimed at climate adaptation and mitigation are tagged based on their objectives. Policy managers then subjectively estimate the proportion of climate-relevant expenditure. The tag is fully online and computerized, integrated along with other tags into the existing information system (UNDP 2015 and 2016).

22 Data is available from i) DFI's quantitative aggregate surveys or annual reports; ii) The OECD-DAC Creditor Reporting Systems, iii) project-level assessment of transactions tracked in Bloomberg New Energy Finance (BNEF).

5. Approaches to drive investment in climate adaptation

Moving beyond measurement and disclosure, this chapter describes some of the promising **approaches that have been supported to date** by public institutions, including both public policy and public finance, to help overcome investment barriers to addressing climate risk. The chapter also provides brief case studies of several of these mechanisms, identifying the key implementing actors, the activities, and examples of implementation.

5.1 The role of the public sector in increasing adaptation investment

The barriers to adaptation investment outlined in Chapter 3, including institutional/policy barriers, business model barriers related to high upfront costs and lack of information, and capacity barriers, mean that not enough investment is occurring.

As policymakers, regulators, and fiscal managers, public institutions have a key role in stimulating currently low investor appetite through public policies and de-risking mechanisms that incentivize investment, including for example, through policy reform, data provision, and blended finance initiatives.²³ Specifically, this chapter focuses on public sector actions that can leverage investment for adaptation, which can be categorized as follows:

- Actions that address barriers related to awareness of climate risks and knowledge of potential solutions, in order to **increase demand** for climate adaptation services and products. These activities include setting rules for how businesses and government evaluate, disclose, and manage risk; funding market studies that describe the potential impacts of climate change for specific local geographic areas so that businesses understand their own risks better; and supporting product demonstrations with technical assistance funding to increase understanding of how climate adaptation products can help specific businesses and sectors.
- Actions that address barriers related to the ability of companies to offer adaptation products and services, in order to **sustain suppliers** of climate adaptation products and services. These activities can include industry

or government-led development of technology and data standards that allow many actors to engage with each other in the climate risk market; public provision of data, such as weather data and exposure data, that are public goods that businesses can build upon to offer value added services; and technical assistance funding to build capacity in technology suppliers, including to enter new markets.

- Actions that address barriers related to the cost and uncertainty of deploying new technologies by **de-risking adaptation investment with financial instruments**. These activities can include early-stage funding of new technologies before they are market-ready; soft loans to infrastructure projects that add resilience into their designs at additional cost; and direct investments into adaptation projects.

While this framework is helpful to organize activities, they can address multiple barriers, as can be seen in Table 3. The table provides an overview of some of these approaches and how they address one or more of the three types of barriers described in Chapter 3.

The activities selected for this table as well as the more detailed descriptions in the following section were chosen based on information available in the literature as well as CPI's experiences in supporting innovative mechanisms as Secretariat of the Global Innovation Lab for Climate Finance. Those activities in Table 3 that are then described in more detail in the following section are indicated with an asterisk (*).

5.2 Increasing demand for climate adaptation services and products

Governments and donors could encourage the following actions that help to increase the demand for risk assessment and management tools and practices.

Mandate disclosure of climate risks

Barrier: Lack of policy requiring measurement and disclosure of climate risk in sensitive sectors means that investment decision-making does not reflect climate risk. This reduces demand for climate risk and adaptation products and services and reduces climate resilience of these sectors.

How it works: Mandating climate risk disclosure in climate sensitive sectors helps investors understand the potential impacts of climate change on their investments' returns.

23 As discussed in a 2018 CPI and adelphi adaptation roundtable (CPI and adelphi, 2018)

Table 3: Approaches to Drive Investment in Resilience

		BARRIERS							
		Poor policy environment	Poor institutional environment	Poor market environment	Poor value chains and human capital	Uncertain or unknown value-add	High cost	Lack of technical capacity	Lack of internal capacity
INCREASING DEMAND FOR CLIMATE RISK ANALYSIS SERVICES AND PRODUCTS	Mandatory disclosure requirements*								
	Development of national and sub-national action and investment plans and processes to meet NDCs*								
	Mapping of financing sources for adaptation*								
	Supporting market studies and other awareness raising activities*								
	Incorporate climate risk in public private partnership (PPPs) contracts*								
	Tax credits for purchases of adaptation technology								
	Grants for user training (e.g., for climate risk assessment)								
SUSTAINING SUPPLIERS OF CLIMATE RISK SERVICES AND PRODUCTS	Development of data and risk assessment standards								
	Improving quality of and access to public data								
	Incentives for development or deployment of catastrophe risk models*								
	Support of partnerships between local and international firms								
	Technical assistance and access to capital for suppliers*								
INCREASING INNOVATION IN CLIMATE RISK SERVICES AND PRODUCTS	Resilient infrastructure bonds*								
	Early-stage funding for adaptation technology deployment for demonstration effect								
	Pay for success instruments*								
	Innovative finance (such as leasing) to reduce upfront costs.								
	Index insurance*								
	Technical assistance for climate-smart agricultural lenders								
	Climate-smart supply chain finance*								

Source: CPI analysis

Sector: Finance, Manufacturing, Agriculture, other climate sensitive sectors.

Role of public sector: Drive regulations for disclosure.

Examples: The UK Adaptation Reporting Power under the Climate Change Act 2008 requires companies providing essential services and infrastructures (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. In France, Article 173 of the French Energy Transition Law requires insurance companies and pension funds with a balance sheet above EUR 500 million to report on their exposure to both physical climate impacts and to the changes caused by the transition to a low-carbon economy and ways to address them (Mason et al., 2016). In 2017, the European Union passed a legislation that requires pension funds to incorporate climate risk in their investment strategies.²⁴

Development of national and sub-national action & investment plans for climate adaptation to meet NDCs

Barrier: Poor institutional environment for climate adaptation. In particular, some countries may have difficulties in aligning and implementing climate and development targets.

How it works: This approach supports governments in translating adaptation and development into concrete policies, budgets and investment plans, which increases the demand for adaptation investment by both the public and private sectors and provides long term certainty for suppliers of services and products.

Sector: Government.

Role of public sector: Commission of studies, undertaking and implementing policy and budget reforms, interagency coordination.

Example: The NDC Partnership, a coalition of countries and institutions,²⁵ is improving access to technical support and financing for the implementation of the NDCs. It also provides

analytical and advisory tools to expand, manage, and share knowledge. The Partnership has shown promise in Mali, which is developing an NDC implementation and investment plan, and Fiji, which is expanding its NDC plan to include the forestry sector (BMZ, 2017).

The NAP Global Network²⁶ aims to improve adaptation planning and implementation by enhancing coordination between all actors engaged in the NAP process at the country level, including bilateral donors. To date, the Network has enabled interactive-and- needs-based knowledge exchanges on NAP planning and implementation between 18 developing countries within five regional fora (BMZ, 2017).

Mapping of adaptation financing sources to inform dedicated financing strategies

Barrier: Lack of understanding of current adaptation finance flows and government expenditures makes it difficult to assess gaps and develop solutions that improve the market environment.

How it works: Identifying adaptation finance flows through a coordinated national approach can help create the financing strategy for implementation of action plans, including financing needs and sources (NAP Global Network, 2017).

Sector: Government.

Role of public sector: Commission of studies, coordination across government agencies.

Examples: A variety of initiatives exist to help countries identify adaptation finance gaps. The UNDP's Climate Public Expenditures and Institutional Review makes a one-off systematic qualitative and quantitative analysis of a country's public spending and how it relates to climate change. The tool has been instrumental in helping decision-makers better understand the amount of resources they need to finance their national response to climate change, as described in UNDP (2015)'s case studies of Bangladesh, Indonesia, Nepal, and the Philippines. Similarly, the Adaptation Finance Accountability

24 See <https://www.reuters.com/article/us-eu-finance-climatechange/eu-requires-pension-funds-to-assess-climate-change-risks-idUSKBN13J1SV> for more information.

25 For more information, see <https://ndcpartnership.org/>.

26 The National Adaptation Plan (NAP) Global Network aims to enhance national adaptation planning and action in developing countries through coordination of bilateral support and in-country actors. The Network also facilitates international peer learning and exchange. For more information, see <http://napglobalnetwork.org/>.

Initiative aims to analyze how countries are using adaptation funding and how it is supporting local communities. (NAP Global Network, 2017). Finally, The EU REDD Facility and Climate Policy Initiative are developing a toolkit for land-use finance mapping to support countries in better understanding the nature and volume of investments impacting forests at the national and sub-national level, covering adaptation activities relevant to land use.

Market studies and other awareness raising to understand climate risks and business opportunities at the sector level

Barrier: There is very little data and information on climate risks at the sector level available in most countries, in ways that appropriately inform investment decisions.

How it works: Market studies can assist businesses in understanding climate-resilient investments, mobilizing companies to implement adaptation strategies and exposing opportunities for potential investors in a given country.

Sector: Climate-sensitive sectors (agriculture, manufacturing, etc.).

Role of public sector: Commission of studies, public private partnerships to tailor and disseminate information.

Examples: EBRD and IFC commissioned pilot studies to raise awareness and improve understanding of climate risk management. The studies were comprised of a series of workshops, interviews, and surveys. A 2013 study of EBRD & IFC in Turkey, a country with little adaptation progress and no private sector involvement, highlighted how weak policy frameworks can be. Water pricing, in particular, was identified as an area where poor policy led to a reduction in investment in water-efficiency programs (Trabacchi and Mazza, 2015). With the project, Private Sector Adaptation to Climate Change, the German Federal Ministry for Economic Cooperation and Development (BMZ) helped SMEs to assess relevant climate risks with the guidance of the 'Climate Expert' approach. Implemented by GIZ, the initiative facilitates exchanges between financial institutions and SMEs on the financing products required (BMZ, 2017).

Incorporate climate risk in public private partnership (PPP) contracts

Barrier: Most public infrastructure projects currently being funded do not yet incorporate climate risk mitigation measures due to lack of requirements and uncertainty around value of these measures.

How it works: PPPs can be designed to reflect climate mitigation risks and incorporate risk mitigation responses.

Sector: Energy, infrastructure.

Role of public sector: Require the incorporation of climate risk elements in Public Private Partnership (PPP) policy frameworks and contracts.

Examples: In Africa, hydroelectric dams financed by IFC are designed according to expected streamflow in a changing climate, in line with IFC new policy to require considerations of climate risk. Such assessments have been occasionally done at the level of specific contracts by different agencies, but not all multi-lateral development banks (MDBs) mandate climate risks (IBRD, 2016). However, despite efforts by governments and MDBs to promote climate resilience, a review of 16 national PPP policy frameworks revealed that not one mentioned climate change or adaptation (IBRD, 2016).

5.3 Sustaining suppliers of Climate Risk services and products

Governments and donors can help to increase the availability and diffusion of climate risk services and products. Some examples of promising interventions include:

Improving availability of catastrophe risk data and modeling

Barrier: Risk must be understood to manage extreme events and natural disasters. However, risk models that estimate the probability of severe loss from climate-related risk are not widely developed in low and middle-income countries. Barriers include: model development and maintenance cost, a gap in the standardization of hazard, exposure and vulnerability data, and the difficulty of accessing local experts and data. Finally, the under-development of insurance markets in countries suffering from these barriers

reduces demand for risk models.

How it works: Actions to improve availability of catastrophe risk data and modeling include, improvements to availability and standardization of underlying hazard, exposure, and vulnerability data, open access databases and open source catastrophe risk modeling software, and supporting collaborations of local researchers and insurance companies with international initiatives.

Sector: Insurance, agriculture, infrastructure.

Role of public sector: Data availability and quality, insurance regulation, resilience assessment standards in public infrastructure.

Examples: The Oasis Platform for Catastrophe and Climate Change Risk Assessment and Adaptation²⁷ is a set of tools that, together, aim to offer a more transparent, robust and comprehensive approach for analyzing and pricing risk from extreme events. Ultimately, it aims to increase the penetration of insurance and the use of catastrophe models beyond the re/insurance industry to support risk-informed planning and decision-making. The Platform will be piloted in Bangladesh and Philippines beginning in 2018, with partners to include local and international (re)insurers, universities, and non-profit organizations (Trabacchi and Tonkonogy 2016). The crop monitoring and insurance initiative RIICE (Remote Sensing-Based Information and Insurance for Crops in Emerging Economies) is pioneering the satellite-based data collection of land used for rice cultivation in Cambodia, India, Thailand, and Vietnam. By using real-time monitoring and forecasting, governments can better understand the timing, location and quantity of rice that is grown. This improves their ability to respond to emergencies threatening crops. The data has also been adopted by insurers, who use it to increase the efficiency and transparency of crop insurance (BMZ, 2017).

Access to capital and technical assistance

Barrier: Companies that offer products and services that support climate resilience often do not have the internal capacity and resources to expand their business and provide their products and services to new markets, particularly in

developing countries (Tonkonogy et al 2017).

How it works: Actions to accelerate the deployment of climate resilience services and technologies include enhancing access to growth equity capital and technical assistance.

Sector: All.

Role of public sector: Public investment in equity funds can act as anchor capital or provide demonstrate effect in first-time funds; government and donor capital can support or facilitate capacity building activities.

Examples: The Global Social Benefit Institute Accelerator, managed by the Miller Center at Santa Clara University in California, specifically supports the scaling up of climate resilience companies.²⁸ The Climate Resilience and Adaptation Finance and Technology Transfer Facility ("CRAFT") will focus on helping companies in its investment portfolio expand their climate resilience products and services into new sectors and geographies (Tonkonogy et al., 2017). The InsuResilience Solutions Fund establishes climate risk instruments in developing countries and emerging economies that lack financially stable products. Financial sustainability is achieved through partial grant funding and up-scaling of direct and indirect climate risk insurance products (BMZ, 2017).

5.4 Increasing innovation in Climate Risk services and products

Infrastructure owners and farmers alike need capital to invest in assets and techniques which build resilience to climate change. However, high upfront finance costs and a lack of access to financing exacerbated by climate risks, are a barrier to the adoption of climate-resilient measures. Governments and donors can encourage the following types of actions that enhance access to finance for such measures.

Resilient infrastructure bonds

Barrier: Green bonds issuances represent a means to engage private sector sources of capital for climate-resilient infrastructure, but there is currently a lack of investible opportunities (Pillay et al., 2017). The water sector, in particular, is not traditionally favored by private investors due to uncertainties in revenues and the potential for

27 For more information, see <https://www.climatefinancelab.org/project/climate-risk-assessment/> and <https://oasislmf.org/>.

28 See <https://www.scu-social-entrepreneurship.org/climate-resilience>

political interference, particularly in developing countries.

How it works: Resilient infrastructure bonds for local public utilities can be a solution to implement climate resilience projects. Leveraging local institutional investors is a promising source of investment.

Sector: Water, infrastructure.

Role of public sector: Government can support the development of green bonds definitions and guidelines, and the issuance of demonstration bonds, working to enhance the credit-worthiness of potential domestic markets and issuing entities (e.g., cities and municipalities). Government could also promote international collaboration and cross-border investments, by aligning developing country adaptation projects with green bonds frameworks of international issuers and by linking developing country markets with international capital markets. (Pillay et al. 2017).

Examples: The Water Financing Facility aims to mobilize large-scale private finance from the local bond market for the water sector in specific countries in support of their NDCs towards climate adaptation and mitigation, as well as contributing to the availability and sustainable management of water and sanitation for all (Oliver et al., 2016). The first pilot will take place in Kenya and is supported by the government of Netherlands (CPI personal communications).

A promising number of other innovative bond instruments are also emerging, including catastrophe bonds, environmental impact bonds, and resilience bonds (Marsh & McLennan Companies, 2018).

Pay for success instruments

Barrier: Resilient infrastructure, while likely saving money in the long run due to the expected effects of climate change, often includes increased performance risk of new technologies or practices.

How it works: Pay for success instruments are implemented so that payment is contingent on the performance of the green infrastructure, for example in managing flooding. This allows investors and beneficiary to share risk of underperformance.

Sector: Water, energy, and transportation

infrastructure.

Role of public sector: Public utilities are often key actors in financing vehicles; development of resilience requirements for publicly-funded infrastructure; third-party validation to bring confidence in the pay for success system.

Examples: In the U.S., the DC Water Environmental Impact Bond raised investment from Goldman Sachs and the Calvert Foundation to finance green infrastructure using a pay for success model, to reduce storm water runoff worsened by climate change.²⁹ In Latin America, the Cloud Forest Blue Energy Mechanism (Narvaez et al., 2017) aims to mobilize domestic commercial finance to reforest and conserve cloud forests that provide crucial benefits to the hydropower industry. It uses an innovative “pay for success” financing technique in which a hydropower plant pays for measurable ecosystem benefits provided by cloud forests within the plant’s catchment – principally reduced sedimentation, increased water flow and improved water regulation.

Index Insurance

Barrier: Increased weather volatility means farmers, in turn, face more volatile crop yields. It is typically not profitable for banks in the developing world to offer bespoke insurance to smallholder farmers; the transaction and damage assessment costs are too high compared to the expected returns.

How it works: Rather than providing traditionally-structured insurance, insurers provide cover through index insurance. Index insurance pays out benefits based on the pre-determined level of variation of a given measure (rainfall for example) against an index.³⁰ If the actual levels of rainfall exceed a pre-agreed deviation from the index, the insurance will pay out. Through this mechanism farmers can use insurance to smooth their income during adverse weather conditions.

29 See <https://www.goldmansachs.com/media-relations/press-releases/current/dc-water-environmental-impact-bond-fact-sheet.pdf>

30 See, e.g., IFC Frequently Asked Questions on index insurance: https://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/financial+institutions/priorities/access_essential+financial+services/giif+frequently-asked-questions

Sector: Agriculture.

Role of public sector: Increased data availability for insurance products; some governments act as re-insurers; support launch of insurance products.

Examples: The World Bank's Global Index Insurance Facility is an example of a program which facilitates access to finance for smallholder farmers, typically partnering with local implementing partners.³¹ African Risk Capacity also carries out both coordination and commercial index insurance.³²

to smallholders that allows them to access information, tools and technologies that will increase their resilience to climate change (BMZ, 2017).

Climate-smart supply chain financing

Barrier: Climate change threatens agricultural production, posing challenges to the stability of global supply chains. Farmers will need to adapt their practices to become less vulnerable, but often lack skills, incentives, and access to medium-to-long-term finance at affordable interest rates, to invest in climate resilience (Trabacchi et al., 2014).

How it works: Working directly with agribusiness corporations and local lenders to reach small to medium sized farmers in developing countries is a promising approach to drive investment in climate resilience. Climate-smart supply chain financing can be extended to agribusiness corporations or local banks for on-lending to farmers, with requirements for climate-resilient scoring and farmer training. Reduced yield volatility increases the farmers' ability to service the loans, reducing the default risk for the lender.

Sector: Agriculture.

Role of public sector: Concessional finance; banking regulation; climate-resilient extension services.

Examples: The Climate Smart Lending Platform is a partnership between CPI, F3 Life, IUCN and Financial Access, designed to drive climate-smart lending deals. Their programs help agricultural lenders structure loans which incentivize the farmer to make investments and adopt practices that increase their resilience to extreme weather conditions. Trial lending programs are expected to begin shortly in Rwanda and Ghana (Falconer and Rakhmadi, 2016). The Adaptation for Smallholder Agriculture Programme (ASAP) channels finance

31 For more information, see <https://www.indexinsuranceforum.org/>.

32 For more information, see <http://www.africanriskcapacity.org/>.

6. Key takeaways for developing countries

While many of the findings are also of relevance for developed countries, this section provides suggestions for developing country governments to fill knowledge gaps and undertake concrete actions to drive further investment into adaptation, based on the findings in the previous chapters of the report.

6.1 Aligning the policy environment for climate change adaptation investment

As noted in Chapter 2, a number of international policy frameworks and processes have relevance to adaptation – this includes the most directly focused on adaptation: the UNFCCC’s National Adaptation Planning processes as well as NDCs which often set qualitative or quantitative targets for adaptation. However, adaptation needs to be considered in other policy frameworks, including the Sustainable Development Goals, the achievement of which are threatened by climate change impacts; the Sendai Framework for Disaster Risk Reduction, as risk reduction efforts need to take into account increasing climate vulnerabilities in many geographies; and others such as the Aichi Targets for biodiversity as climate change impacts can affect the ability to sustain life on land and in water.

Suggestions:

- Countries can improve their responses to adaptation by aligning policies and processes across ministries and actively seeking synergies across policy frameworks.
- Integrating, or “mainstreaming,” adaptation within existing national planning and evaluation systems would help streamline workflow and generate ‘buy-in’ from those responsible for implementation.
- Aligning goals and enhancing data sharing across different policy framework agreements will take advantage of synergies and ensure that decisions taken in support of meeting one framework support rather than conflict with other policy frameworks.

For further information:

- Alignment to Advance Climate-Resilient Development: Overview Brief 1: Introduction to Alignment (NAP Global Network): <http://napglobalnetwork.org/wp-content/uploads/2018/08/napgn-en-2018-alignment-to-advance-climate-resilient-development-overview-brief.pdf>.
- How integrated monitoring and evaluation systems can help countries address climate impacts (International Institute for Environment and Development): <http://pubs.iied.org/pdfs/17470IIED.pdf>

6.2 Measuring and disclosing climate risks

Understanding climate change risks associated with investment decisions is a critical first step to reducing them. Regular assessment and disclosure also helps to measure the effectiveness of interventions over time.

To prioritize investments in climate change adaptation, governments, businesses, and communities need to understand their climate risks, at national and sub-national levels. On the other side, governments and businesses that do not assess and act on their climate risks could find increasing difficulty in accessing capital.

An indicator of the growing importance in the investor community of assessing and disclosing risk is the Task Force for Climate-Related Financial Disclosure (TCFD), which was established in 2015 by the Financial Stability Board, at the behest of G20 Ministers. The TCFD recently released a set of recommendations for voluntary disclosure, to provide companies with investors’ view of the most important elements for disclosure. The TCFD has encouraged all organizations with public debt or equity to implement its recommendations.

Similarly, while, to date, countries’ sovereign credit ratings have not been affected by climate risks, S&P and Moody’s, both major credit rating agencies, have indicated that this status quo could change.³³ As disclosure of climate risk increases, and evidence of the relationship between climate change and sovereign risk is becoming clearer, climate-related rating actions

33 See, e.g., <https://www.bloomberg.com/news/articles/2017-11-29/moody-s-warns-cities-to-address-climate-risks-or-face-downgrades>; <https://www.brookings.edu/wp-content/uploads/2018/01/kurt-forsgren.pdf>

are likely to be considered in the future. Such a change might disproportionately affect emerging market sovereign credit issuers.

Suggestions:

- Follow and engage in climate risk measurement disclosure discussions within TCFD and other investor forums, and where possible, adopt best practices in measurement and disclosure.
- Governments wishing to borrow internationally need to monitor the fiscal factors that could affect a country's sovereign credit profile. This includes climate-vulnerable countries which are not currently in a position to issue international sovereign debt because they lack an investment grade credit rating or are limited by current debt levels (Buhr et al., 2018).
- Governments and companies could accompany disclosure with concrete actions to reduce climate risk and therefore their vulnerability to investor concerns and negative actions.

For further information:

- Task Force on Climate-Related Disclosure recommendations: <https://www.fsb-tcf.org/publications/final-recommendations-report/>
- "Environmental Risks – Sovereigns: How Moody's assesses the physical risks of climate change on sovereign issuers": https://www.moody.com/research/Moodys-sets-out-approach-to-assessing-the-credit-impact-of-PR_357629

6.3 Increasing tracking of investment in adaptation

Tracking investment in adaptation is important to assess whether adaptation finance is flowing to those sectors and geographies that have high climate risks and most value for money. It can therefore help form the basis for prioritizing future investment, identify common sources of financing, and track against global and national goals to identify gaps.

Yet, to date, tracking adaptation finance has suffered from both a lack of common definitions and of data. The MDBs and IDFC have made most progress on both issues, yet more work is needed to disseminate

these and other approaches to national governments, additional development banks, as well as into the private sector (see Figure 5 from Chapter 4).

For tracking domestic public finance for adaptation, commonly employed approaches include budget analyses, public expenditure reviews, and budget tagging systems (Resch et al. 2017) which are complementary depending on the financial capacity of governments and the purpose of tagging activities (see Table 2 from Chapter 4). However, further efforts are needed to improve domestic public-sector tracking practices, including integration with existing national planning and evaluation systems.

Suggestions:

- National governments could adopt approaches to track and report domestic finance for adaptation, to improve targeting of adaptation finance and contribute to global tracking efforts.
- A first step could be to commission a scoping study to determine which approach(es) would be most relevant for the government.
- In addition to ministries, governments can incorporate national development banks at the margins of climate action into tracking initiatives to build a more complete picture of their climate efforts and encourage additional action.
- Governments can also engage in international dialogues to improve and harmonize adaptation finance tracking.

For further information:

- Global Landscape of Climate Finance: <http://www.climatefinancelandscape.org/>
- 2017 Joint Report on Multilateral Development Banks' Climate Finance: <https://www.worldbank.org/en/news/press-release/2018/06/13/mdb-climate-finance-hit-record-high-of-us352-billion-in-2017>
- Mainstreaming, Accessing and Institutionalising Finance for Climate Change Adaptation: <https://www.opml.co.uk/files/Publications/8617-action-on-climate-today-act/mainstreaming-accessing-and-institutionalising-finance-for-climate-change-adaptation.pdf?noredirect=1>

6.4 Actions the public sector can take to increase investment in climate adaptation

Driving investment in climate resilience will require efforts across national and local governments, and across many different economic sectors. Activities can enhance demand for adaptation investment; enable suppliers to scale-up; and de-risk investment, especially for early stage or unproven technologies and practices. Actions should be based on an assessment of climate risks, current financing levels, and barriers to further investment.

Suggestions:

Some examples of promising actions that developing country governments and other public institutions including development finance institutions, can take to support additional investment in adaptation include, among others, the following (see Chapter 5 for more detailed information and examples):

To increase demand for climate adaptation products and services, public institutions can:

- Institute voluntary or mandatory climate risk disclosure requirements for public companies, and others including national development banks and state-owned enterprises;
- Support market studies and technology demonstrations to improve the business case for adaptation products;
- Incorporate climate risk assessment and management requirements into public and PPP infrastructure development; and
- Direct government service providers to provide climate risk information, technology, and training to vulnerable citizens. For example, agricultural extension units can provide these services to farmers.

To enable suppliers of climate adaptation technologies, products, and services, public institutions can:

- Collect and publish underlying public good data used by many private sector companies, such as weather and climate data, vulnerability data, and exposure data;

- Support development of national catastrophe risk models in line with international standards and with the participation of local scientific institutions to build capacity;
- Improve availability of and access to risk assessments; and
- Improve collaboration between corporations, governments, and adaptation experts to fill knowledge gaps.

To de-risk investment in adaptation, public institutions can:

- Support local utilities to issue resilient infrastructure bonds with concessional financing or guarantees, as well as technical assistance;
- Adopt pay for success instruments to share risk of new adaptation technologies;
- Participate in regional catastrophe risk insurance pools; and
- Offer technical assistance and catalytic finance to climate smart agricultural lending.

For further information:

These are not the only opportunities, but many have been tested and show promise. For further information, please see the links in the case studies in Sections 5.2-5.4.

7. Conclusion

Adaptation finance is a nascent field and suffers from gaps in knowledge and investment. This report has intended to provide a practical guidance to the state of the art in adaptation finance measurement, disclosure, and investment approaches, and identify opportunities for stakeholders, especially developing country national governments, to fill gaps and drive investment in this important area. Further research is also needed at sub-national and local levels to identify more promising approaches and experiences to enhance understanding and increase investment in climate adaptation.

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