

# Mobilizing Adaptation Finance in Developing Countries



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23. mars 2017

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**Financed by:** Utenriksdepartementet (Ministry of Foreign Affairs, Norway)

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**Project:** UD Climate Finance

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**Keywords:** Climate finance; Adaptation; Developing Countries; Barriers; Mobilize finance; Policies; Instruments

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**Abstract:** More funding is needed for adaptation to climate change, particularly in developing countries. Mobilization of adaptation finance is difficult due to uncertainties related to frequency, severity and geographical spread of climate change impacts, and intangibility due to a mismatch between long-term payback and the short-term horizon of private investors, difficulties in sorting out climate change related adaptations from adaptations motivated by other factors, and since many adaptation projects have public good properties.

Given these barriers, most adaptation finance has been stimulated from public sources such as bilateral and multilateral climate funds, as the private sector usually is deterred by the lack of a reasonably secured revenue stream. Furthermore, there is lack of regulatory policies that could create demand for adaptation projects from the private sector. Nevertheless, some examples of private sector investment in adaptation have occurred, most notably related to crop resilience, financial services, and business climate risk services. This report examines barriers to stimulating adaptation finance within the context of different policies, instruments and approaches currently being implemented. Innovations related to adaptation finance have been produced, foremost creating a business case for adaptation in the agriculture and water sectors. Examples of innovations are disaster risk management for adaptation, climate insurance arrangements, credit mechanisms, micro-finance, green bonds, climate resilience bonds, and catastrophe swaps.

Proposed policy initiatives to stimulate increased adaptation finance flows include: Exploring crediting mechanisms; aligning disaster risk financing with climate adaptation policies; investigating micro-insurance for the lower socio-economic groups, and catastrophe bonds for institutional investors; promoting uptake of catastrophe swaps and resilience bonds to upscale financial flows; assessing aggregation and securitization for green bonds with proceeds earmarked for adaptation projects; and incentivizing adaptation in agriculture and water management.

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**Language of Report:** English

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## Foreword

The Paris Agreement was adopted at the United Nations Framework Convention on Climate Change Conference of the Parties in December 2015, and will enter into force in 2020. Climate finance will play a pivotal role in the implementation of this agreement. Developed country parties have agreed on mobilizing at least 100 billion USD annually for climate actions in developing countries from 2020. However, the need for climate finance for a climate-friendly and more climate resilient society is much larger. Part of this financing can be public, but private finance also has a key role to play.

This report is the second from a study that has been carried out on assignment from the Norwegian Ministry of Foreign Affairs (MFA) in the period December 2014 to March 2017. The first report, published in November 2016 as CICERO Report 2016:08, explored a wide portfolio of finance instruments suitable for facilitating climate finance from industrialized countries to developing countries.

This second report focuses on the specific challenges related to the intangibility of effects and financial returns from projects on climate change adaptation. The report presents a portfolio of public interventions to support finance of adaptation projects in developing countries, with specific attention to innovative ideas to engage business.

We thank Bente Herstad, Mads Lie, Vegard Hole Hirsch, and Semund Haukland from Norad; Gard Lindseth from the Norwegian Ministry of Climate and Environment; Patrick Narbel from Adapt Consulting AS; and our CICERO colleagues Christa Clapp and Knut H. Alfsen for valuable comments and assistance in preparing this report. The responsibility for any remaining errors or shortcomings rests with CICERO.

# Executive Summary

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as the “process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.”

Even if global manmade warming is limited to 2 °C by end of this century, which is the aim of the Paris Agreement, substantially more funding than presently available is needed for adaptation related investments, particularly in developing countries. The mobilization of adaptation finance has been significantly more difficult than for financing efforts to reduce emissions of greenhouse gases, given the difficulties in quantifying and comparing resilience and vulnerability projects. This is due to uncertainties related to frequency, severity and geographical spread of climate change impacts. Intangibility pervades most adaptation interventions, due to a mismatch between the long-term payback period and short-term horizons of private investors, difficulties in sorting out climate change related adaptations from adaptations motivated by other factors – such as changes in e.g. prices of energy or products, and since many adaptation projects have public good properties. In addition, there are political, institutional and legal barriers to private investments.

Given these barriers, most adaptation finance has been stimulated from public sources such as bilateral and multilateral climate funds, as the private sector usually is deterred by the lack of a reasonably secured revenue streams. Furthermore, there is lack of regulatory policies that could create demand for adaptation projects from the private sector. Nevertheless, some examples of private sector investment in adaptation have occurred, most notably related to crop resilience, financial services (such as insurance and catastrophe bonds), and business climate risk services.

This report examines barriers to stimulating adaptation finance within the context of different policies, instruments and approaches currently being implemented. Innovations related to adaptation finance have been produced, foremost creating a business case for adaptation in the agriculture and water sectors. Examples of innovations are disaster risk management for adaptation, climate insurance arrangements, credit mechanisms (e.g. Vulnerability Reduction Credits and the Adaptation Benefit Mechanism), micro-finance, green bonds, climate resilience bonds, and catastrophe swaps.

This report proposes the following policy initiatives to stimulate increased adaptation finance flows:

- Explore policy initiatives that create a demand for adaptation, e.g. crediting mechanisms;
- Align disaster risk financing with climate adaptation policies, so that impacts of post-disaster climate hazards can be managed;
- Investigate adaptation finance approaches that are suitable for the target socio-economic group, e.g. micro-insurance for the lower socio-economic group, and catastrophe bonds for institutional investors, etc.;
- Promote the uptake of financial products tailored to institutional investors, such as catastrophe swaps and resilience bonds to upscale financial flows;
- Assess approaches of aggregation and securitization for green bonds with proceeds earmarked for adaptation projects; and
- Incentivize adaptation in agriculture and water management, since tangibility within these sectors is likely higher than within other sectors.

These policy initiatives aim to facilitate greater and more private financial flows for adaptation. In addition, the regional context and institutional landscape of the adaptation case at hand must be taken into consideration.

# 1 Introduction

At the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris in 2015, the Parties reached agreement on a new, global climate agreement, to enter into force in 2020. Unlike the Kyoto Protocol, where only Annex I Parties<sup>1</sup> committed to reducing their emissions, developed and developing countries are now all expected to make contributions, according to each country's national priorities, circumstances and capabilities. In order to develop confidence in the new climate agreement and to ensure that nationally determined contributions are ambitious enough to effectively address the climate problem, it is key that developed country Parties are able to demonstrate progress in directing finance to address the needs in developing countries. This is also important from the perspective of annually mobilizing the envisioned USD 100 Billion for contributions from developed to developing countries from 2020.

One of the major barriers within the international climate negotiations has been the aspect of climate finance; more specifically, stimulating sufficient flows to address required funding in transition to a climate-friendly and climate-resilient future. The mobilization of adaptation finance has been particularly difficult. This is due to uncertainties related to frequency, severity and geographical spread of climate change impacts under future climate scenarios. It is also related to the intangibility of many adaptation interventions, a mismatch between the long-term payback period and short-time horizons of private investors, as well as non-financial barriers to private investments, including political, institutional and legal barriers. The Global Climate Fund (GCF), viewed as the primary climate finance instrument globally, is expected to be the major funder of future adaptation initiatives with the fund targeting an equal ratio of mitigation to adaptation projects.

Unless new and additional finance is secured, a significant deficit of adaptation funding is likely. The UNFCCC has also recognized the need to increase mobilization efforts for adaptation finance. Discussions during the long-term climate finance workshops of the UNFCCC held in Bonn in 2016 highlighted the need for an enhanced understanding of adaptation finance; the assessment of adaptation needs in developing country parties and the role of international cooperation; avenues to scale up adaptation finance; and, how transparency could be increased for adaptation finance (UNFCCC, 2016). Adaptation as a priority for developing countries is also highlighted within the Roadmap to USD 100 Billion, a report outlining how developed countries would mobilize USD 100 Billion of climate finance to support developing countries (Government of United Kingdom, 2016). According to projections made in the roadmap, public and private climate finance will collectively reach between USD 77 and 133 Billion by 2020.

How might the current and projected gap between adaptation funding needs and costs on one hand and adaptation finance flows on the other, be narrowed? This report focuses on how to scale up adaptation finance, with a focus on strategies, policies and instruments that can be used to create a more enabling environment for investment in adaptation. Throughout, we attempt to describe how specific barriers to mobilizing investment in adaptation finance might be addressed.

The report is organized as follows: The second section provides an overview of the history and evolution of adaptation as a concept, while the third section reviews the definition and sources of adaptation finance as well as its role under the UNFCCC and within international climate policy. The fourth section provides information on current and projected flows and costs of adaptation, and

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<sup>1</sup> Annex I Parties include the industrialized countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.



the fifth section discusses the barriers to mobilizing public and private adaptation finance. The final section provides details of the current approaches, instruments and policies that are currently being adopted in an effort to scale up adaptation finance, and policy advice to increase financial flows for adaptation.

## 2 History of Adaptation

### 2.1 Adaptation

Adaptation is not well-defined in the UNFCCC. This is perhaps not surprising, given the complex and often context-specific nature of adaptation. According to IPCC (2014), adaptation may be defined as the “process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.” The OECD/Development Assistance Committee (DAC) defines adaptation projects as those that mainstream adaptation with on-going development activities that are at risk to climate change and deliver climate-resilience through projects to address development at a sector level. This report makes no attempt to define what should count as adaptation finance, especially what should be considered as contributing to developed countries’ commitment to scale up adaptation finance flows to developing countries. Based on a review of existing definitions, the UNFCCC Standing Committee on Finance defines adaptation finance as finance that “aims at reducing vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts”. This report focuses on scaling up adaptation finance in developing countries.

### 2.2 Adaptation Needs

Adaptation needs may be defined as the “circumstances requiring information, resources, and action to ensure safety of populations and security of assets in response to climate impacts”, and may include biophysical and environmental, social, institutional, and information, capacity and resource needs, and need for engagement of the private sector (IPCC, 2014). Biophysical needs refer to ecosystem services including potable water supply, flood control and disease control, while social needs capture the vulnerability of individuals and their ability to manage climate impacts. Institutional needs refer to the need to create an enabling environment to implementing adaptation measures. This may need to be supplemented by private sector engagement and capacity building initiatives. These needs, in turn, can be addressed through a variety of options, including structural/physical (e.g. sea walls and coastal protection structures, new crop varieties), social (e.g. awareness raising and early warning and response systems), and institutional (e.g. land zoning laws and economic instruments such as taxes, subsidies and insurance) options. Implemented adaptation activities need to be in response to the specific needs of a particular country. A hazard-based approach is usually used to determine these country-specific needs. More recently, the focus has shifted towards analyzing the underlying causes of vulnerability. The IPCC has used the following equation to define climate change risk:

$$\text{Climate change risk} = \text{Hazard probability} \times \text{Vulnerability} \times \text{Exposure}$$

‘Hazard probability’ is the probability of a climate change related hazard or physical event occurring, or a climate policy being implemented. ‘Vulnerability’ refers to the vulnerability of an activity (e.g. agriculture), infrastructure object (such as a road), or an investment to climate change related risk, and depends on how well the sector or infrastructure object have adapted or can adapt to the climate change impact. ‘Exposure’ refers to exposure of the activity or infrastructure object to the risks (Clapp et al., 2017).

## 2.3 Actors

Despite adaptation interventions – and the financing of such interventions – being undertaken by both public and private actors, the public sector is more important as adaptation is primarily regarded as a public good. State actors, bilateral agencies and Development Finance Institutions (DFIs), Multilateral Development Banks (MDBs), climate funds, and private investors are involved in raising and channeling international adaptation finance flows from developed to developing countries (CICERO & CPI, 2015). State actors – donor governments – make decisions regarding the size and distribution of public international adaptation finance. Bilateral agencies (e.g. NORAD) and DFIs (e.g. KfW)<sup>2</sup> are public institutions with development mandates involved in channeling finance to donor countries. MDBs (e.g. the African Development Bank) and international climate funds (e.g. the Adaptation Fund) are public entities tasked with allocating adaptation finance. In addition to providing adaptation finance, governments can also use policy and regulation to promote private investments. Private investors include both commercial entities (e.g. commercial banks) and private actors (e.g. philanthropic foundations) that contribute private capital.

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<sup>2</sup> The KfW (formerly KfW Bankengruppe), is a German government-owned development bank, where the name originally comes from Kreditanstalt für Wiederaufbau.

## 3 Adaptation Finance Landscape

### 3.1 Adaptation Finance

There is still little agreement on what qualifies as adaptation finance and how it should be measured (see UNFCCC, 2016). In line with CICERO & CPI (2015), this report adopts an inclusive definition. Broadly speaking, adaptation finance may be defined as any finance – public or private, international or domestic – that specifically targets development that reduces climate risk and promotes climate resilience objectives. To illustrate the difference between mitigation and adaptation finance, consider the case of loans acquired for a solar energy facility: This project is considered to be a mitigation project as the initiative seeks to lower emissions by reducing the reliance on fossil fuels rather than adjusting development to the impacts as a result of enhanced global emissions. In line with OECD (2015), we define as developing country any country classified as a non-Annex I party to the UNFCCC and/or OECD DAC Official Development Assistance (ODA)-eligible.

### 3.2 Sources of Adaptation Finance

Public budgets and to a lesser extent private capital are the two key sources of adaptation finance. The former is the source of domestic, bilateral and international public adaptation finance flows, and can be increased e.g. via the introduction of taxes or via raising debt. The latter is the source of private domestic, bilateral and international adaptation finance flows, and can be increased via various investments, including e.g. equity and debt (Torvanger et al., 2016). This report considers both these sources of finance, focusing on sources of finance with a developed country origin.

### 3.3 Adaptation Finance under the UNFCCC

The distribution of climate change damage across countries is heterogeneous, and the required level of adaptation expenditures will be higher in developing countries as compared to developed countries. For example, the financial need for adaptation interventions owing to limited economic resources will be higher in Bangladesh (where impacts of sea-level rise are already evident) than Switzerland. Developing countries have fewer financial resources to adapt to the adverse effects of climate change, and have moreover contributed less to climate change than developed countries, even though the contribution to climate change of some developing countries is rapidly increasing (in particular China and India). Article 4.4 of the UNFCCC recognizes the need to provide financial resources to assist developing country parties mitigate and adapt to climate change: “developed country Parties and other developed Parties included in Annex II shall also assist the developing countries that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation to those adverse effects”. The 2007 Bali Action Plan recognized the need for enhanced action on adaptation, including the consideration of “improved access to adequate, predictable and sustainable financial resources and financial and technical support, and the provision of new and additional resources, including official and concessional funding for developing country Parties”.<sup>3</sup>

Although adaptation and adaptation finance have received increased political attention in recent years, many questions have yet to be resolved. The predictability of long-term climate finance has

<sup>3</sup> A concessional loan is a form of public grant used to provide more favorable terms than market loans, e.g. in terms of reduced interest rate, longer tenor, and/or grace periods.

been a key topic of discussion since COP 16 in 2010, and developing countries have repeatedly stressed the importance of addressing the many uncertainties surrounding long-term financial flows (e.g. UNFCCC, 2013a,b). In particular, this holds for adaptation finance. The principles for allocating adaptation finance, both between and within recipient countries, has been another central topic in UNFCCC negotiations. How should projects be prioritized, given scarce adaptation funding? The UNFCCC Article 4.4 emphasizes the needs of particularly vulnerable countries. Stadelmann et al. (2014) analyze the projects funded by the UNFCCC Adaptation Fund Board in 2011, and find that the board has “approved projects from high-income and less vulnerable countries with high absolute economic savings, while not approving projects in poor, vulnerable countries with high relative economic savings”. It should be noted that more recent reviews of the Adaptation Fund (see e.g. Tango International/ODI, 2015), and more recent project funding data (e.g. Climate Funds Update website, see section 6.1) suggest a more balanced resource allocation between high-income and low-income countries, and between less vulnerable and more vulnerable countries. In their review of the Adaptation Fund, Tango International/ODI (2015) conclude that “the Adaptation Fund has made substantial progress towards establishing processes that support its objective of reducing vulnerability and increasing adaptive capacity to respond to the impacts of climate change, including variability at local and national levels.” Reaching vulnerable communities is a strategic priority, although, in practice, “the Adaptation Fund has prioritized those countries that were most “ready” or prepared to bring viable projects to the Adaptation Fund for consideration” (Tango International/ODI, 2015, p. 27).

Pauw et al. (2015) assess official UNFCCC documents, and identify ten adaptation finance criteria in addition to general requirements such as cost-effectiveness and efficiency: 1) adequate; 2) predictable; 3) sustainable; 4) scaled up; 5) new and additional; 6) improved access; 7) balanced allocation; 8) prioritizing the most vulnerable countries; 9) mobilized by developed countries, and; and 10) transparent.

In an attempt to determine whether *private finance* would succeed in meeting these criteria, Pauw et al. (2015) assess several examples of private adaptation finance under the Private Sector Initiative (PSI) of the UNFCCC, and find that only “a minority of the case studies take place in the ‘prioritized’ most vulnerable developing countries”. This is possibly owing to a less favorable investment environment with credit and foreign exchange risks being significant. Moreover, the private investments’ adequacy and predictability are unclear, and their sustainability and potential for scaling up are often undisclosed. Importantly, there is little evidence of private investments being mobilized by developed countries (Torvanger et al., 2016). Overall, the authors conclude that “the diplomatic UNFCCC conceptualization of financing adaptation is dissonant from the private sector reality.”

### 3.3.1 Adaptation Finance in the Paris Agreement

The Paris Agreement contains a number of provisions that relate to adaptation and adaptation finance. Article 7.1 states that “Parties hereby establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring adequate adaptation response in the context of the temperature goal referred to in Article 2” (UNFCCC, 2015). Article 9 states that developed country Parties “shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention”, and “continue to take the lead in mobilizing climate finance from a wide variety of sources, instruments and channels”. Mobilization of climate finance should “represent a progression beyond previous efforts”, and “scaled-up financial resources should aim to achieve balance between adaptation and mitigation”. The Paris Agreement further recognizes the “need for public and grant-based resources for climate change adaptation, in particular with regard to least-developed countries and small-island developing states.”

Acknowledging that there is a close link between disaster risk management and climate adaptation, the Paris Agreement also contains text promoting approaches to address climate risk. Firstly, insurance-related approaches are mentioned in Paragraph 49 in the section on loss and damage of the COP Decision. It is important to note that liability is not mentioned within the COP decision on loss and damage. Paragraph 49 also requests the Executive Committee of the Warsaw International Mechanism to establish a clearinghouse<sup>4</sup> for risk transfer development. Paragraphs 48 – 52 outline the COP decisions and provide a road map for work on comprehensive climate risk management including the formation of a task force composed of existing groups and bodies under the Convention. The proposed clearinghouse for risk transfer will serve as a repository and insurance and risk transfer, and facilitate efforts to implement climate risk management. This demonstrates that there is a focus on implementation and building resilience.

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<sup>4</sup> A clearinghouse refers to an agency or organization which collects and distributes something, especially information.

## 4 Current and Projected Adaptation Finance Flows and Needs

### 4.1 Current and Projected Adaptation Finance Needs

The need for adaptation may be defined as “the difference between actually implemented adaptation and a societal set goal, determined largely by preferences related to tolerated climate change impacts, and reflecting resource limitations and competing priorities” (UNEP 2014). UNEP (2014, 2016) explores developing country adaptation gaps in three areas – finance, technology and knowledge – and finds that unless new and additional finance is mobilized, a significant developing country adaptation need is likely after 2020. Current global level estimates of developing country adaptation costs range from approximately USD 70 to 100 Billion annually in the period 2010-2050, assuming that the world is on an emission pathway that limits warming to 2°C Celsius<sup>5</sup>. The cost estimates are summarized in Table 4.1 below. National and sectoral studies suggest that costs could potentially be in the range USD 140 to 300 Billion by 2030, and between USD 280 and 500 Billion by 2050 (UNEP 2016). Adaptation needs are not equally distributed. Least Developing Countries (LDC) and Small Island Development States (SIDS) are likely to have relatively high adaptation needs.

**Table 4.1.** Global annual cost estimates (USD Billion) for developing country regions and sectors 2010-2050.

Region	Adaptation costs	Sector	Adaptation costs
East Asia & Pacific	17.9	Infrastructure	13.0
Central Asia	6.9	Coastal zones	27.6
Latin America & Caribbean	14.8	Water supply, flood protection	19.7
Middle East & North Africa	2.5	Agriculture, forestry, fisheries	3.0
South Asia	15.0	Human health	1.5
Sub-Saharan Africa	14.1	Extreme weather events	6.4
<b>Total</b>	<b>71.2</b>	<b>Total</b>	<b>71.2</b>

Source: UNEP (2014).

It must be stressed that cost estimates are indicative. Firstly, due to methodological challenges and lack of data (e.g. incomplete sectoral coverage), current estimates are still characterized by large uncertainties (e.g. UNEP, 2016; Chambwera et al., 2014). Secondly, adaptation and adaptation finance depend on (uncertain) mitigation pathways and scientific knowledge about how adaptation costs and needs vary under different greenhouse gas emissions pathways. Reducing climate change

<sup>5</sup> The cost range is taken from a 2010 study by the World Bank. The costs are estimated to increase from 60-70 Billion for the years 2010-2019, to 90-100 Billion by 2040-2049. The methodology used was to calculate existing planned investment and financial flows, and then the additional investment in the adaptations required to maintain the welfare levels to the levels prevailing before climate change. See UNEP (2014) for further details on the approach used.

reduces the scale of adaptation needed and hence reduces adaptation costs.<sup>6,7</sup> Thirdly, there are different interpretations of “adaptation needs”, and adaptation goals may vary across communities, sectors and countries; estimating the adaptation finance gap depends on a rather subjective process of defining desirable future states.

Despite the abovementioned caveats, there is general agreement that current international public adaptation finance flows (see section 4.2 below) are not sufficient to meet current needs. This gap is likely to widen significantly over the coming years unless new and additional finance from a variety of financial sources is secured (see e.g. CPI & CICERO, 2015; Westphal et al., 2015). UNEP (2016), for instance, estimates that adaptation finance would need to be 6-13 times larger than current public finance by 2030, and that closing the adaptation finance gap would require 12-22 times current public finance levels by 2050.

## 4.2 Current Flows

### 4.2.1 Global Climate Finance Flows

The most comprehensive estimates of international climate finance are provided by the Climate Policy Initiative’s (CPI) annual *Global Landscape of Climate Finance* reports (Buchner et al., 2015). It is estimated that total global climate finance reached USD 391 Billion in 2014, an increase of 60 Billion compared to 2013 levels (Buchner et al., 2015). The observed increase between 2013 and 2014 is to a large extent a result of increased private finance, which reached a total of 243 Billion in 2014.

Of the total global finance in 2014, approximately 25 Billion was dedicated to adaptation. Regarding adaptation finance, however, Buchner et al. (2015) caution that current estimates are partial and uncertain, reflecting “the different accounting approaches used for tracking finance, and tracking gaps for domestic budgets and private investment.”

### 4.2.2 Flows from Developed to Developing Countries

CPI considers total global climate finance flows. Three recent studies have contributed to estimating flows from developed to developing countries; the UNFCCC (2016; 2014) has published two biennial assessments covering public climate finance flows in the years 2010-2014, as reported by Annex II Parties to the UNFCCC, while OECD (2015) focuses on the USD 100 Billion annually by 2020 goal.

Climate-specific finance funding provided by Annex II Parties to non-Annex I Parties amounted to an average of USD 17 Billion annually in the years 2011-2012, and 26 Billion annually in the years 2013-2014 (UNFCCC, 2016). Of the total 86 Billion in public climate-specific finance flows from developed to developing countries in 2011-2014, 63% targeted mitigation, around 16% targeted adaptation, while 21% targeted crosscutting or other activities, see Table 4.2 below.

<sup>6</sup> The resilience of societies and the options available to prepare for and manage climate risks also depends on other (uncertain) developments, including demographic, political, institutional and technological trends (see e.g. IPCC, 2014).

<sup>7</sup> The types of risks and potential for adaptation also vary with the magnitude and rate of future temperature increases, see IPCC (2014). For instance, over the longer term (2080-2100), a warming of 4 °C above preindustrial levels would pose very high risk to crop productivity in Africa. In such a scenario, the potential to reduce risks through additional adaptation would be limited (IPCC, 2014). If warming is limited to 2 °C within the same timeframe, very high risks to crop productivity could be reduced to medium risk in a highly adapted state.



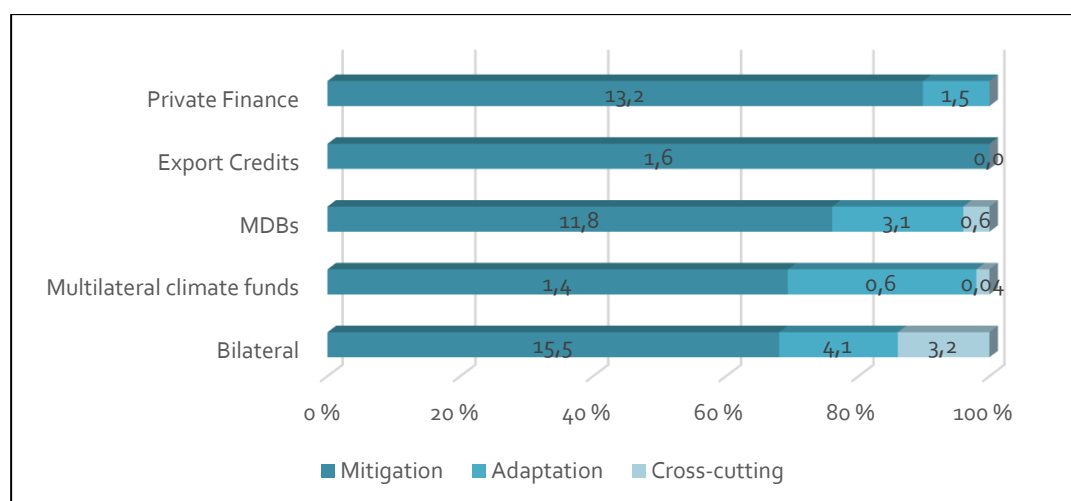
**Table 4.2.** Climate-specific finance provided by Annex II Parties to developing countries, 2011-2014 (USD Billion).

Year	Bilateral, regional and other channels			Multilateral			Total
	Mitigation	Adaptation	Other*	Mitigation	Adaptation	Other*	
2011	8.79	2.64	2.65	1.33	0.44	1.13	16.97
2012	9.91	2.00	2.47	0.99	0.44	1.27	17.08
2013	15.17	4.25	3.73	0.58	0.43	1.26	25.42
2014	17.07	3.55	3.24	0.45	0.29	2.00	26.60

\*includes cross-cutting finance.

Source: UNFCCC (2016).

OECD (2015) provides an overview of public and private climate finance flows from developed to developing countries in 2013-2014. Public and private climate finance was on average USD 57 Billion per year, of which 9 Billion was dedicated to adaptation only. A majority of the finance targeting adaptation was contributed by public actors. However, private adaptation finance may be difficult to track and thus be underestimated. In terms of shares of finance targeting adaptation, finance from climate funds ranks highest, with approximately 30% of its total climate finance in 2013-2014 dedicated to adaptation. In absolute terms, the largest contributor to adaptation finance in 2013-2014 was bilateral public finance, followed by finance from MDBs. Private finance only contributed 10% of its total finance to adaptation, despite private finance accounting for approximately 16% of total developed country adaptation finance in 2013-2014. This hints at the importance and potential of private finance in international climate finance. Figure 4.1 below provides a summary of the thematic distribution of finance in 2013-2014.



**Figure 4.1.** Developed to developing country finance, average 2013-2014, USD Billion. Data from OECD (2015).

An important contribution by the OECD (2015) report was its attempt to estimate, for the years 2013-2014, the public and private flows that could count toward the USD 100 Billion annually by 2020 goal. Public finance estimates were based on data provided by developed countries (their preliminary estimates of the financial flows to be reported officially under the UNFCCC) and relevant financial institutions (based on their definitions of what should be counted as climate finance). Data on private finance that could be counted as being mobilized by developed countries were provided by bilateral (using established joint-DFI and DAC methodologies) and multilateral (using MDB methodologies for estimating co-finance) finance institutions. As an estimate of public mobilization of private finance, the report relies on data on direct co-finance, and the point of measurement is the year of commitment/board decision to provide co-finance. A focus was kept on the avoidance of any double counting, and on estimating the origins and shares of particular flows. In the report, the distinction between public and private finance was based on the majority ownership of the entity providing the finance. The geographic origin of private flows mobilized by

public finance was mapped where possible, based on Foreign Direct Investment statistics standards. Regarding attribution among public actors involved, including any developing country public finance, the report relies on a volume-based pro-rata attribution of private co-finance at the activity level. Importantly, the report stresses the need for further improvements in the measurement and reporting of mobilization, for instance by further exploring questions of share of concessional finance, the risks covered, and the roles played by each actor.

In a follow-up study, OECD (2016) draws on and further develops the analytical and accounting frameworks used in OECD (2015), in an attempt to project climate finance flows for the year 2020. The projections are based on country pledges, and there is currently limited information on the thematic distribution of finance going forward. Projections therefore rely on a combination of quantified information where these exist (six pledges in total), an assumption that flows going to the Green Climate Fund (GCF) will be balanced 50:50 between mitigation and adaptation, and an assumption that the respective shares by theme identified in OECD (2015) remain the same in 2020 as the average in 2013-2014. Based on this approach, it is estimated that developed countries' bilateral and multilateral public adaptation finance will amount to close to USD 16 Billion in the year 2020 (24% of total finance), mitigation will amount to close to USD 45 Billion, while around USD 6 Billion will be dedicated to cross-cutting activities. Based on the average private mobilization ratios for the years 2013-2014, the level of mobilized private climate finance (mitigation, adaptation, and cross-cutting) for the year 2020 is estimated at USD 24.2 Billion. Again, it should be noted that estimates may be partial and that uncertainties remain. There are ongoing efforts to further refine and harmonize methodologies for estimating private climate finance (e.g. OECD, 2016).

Related to the difficulties associated with providing estimates of “adaptation needs” and “adaptation costs”, reports on climate finance (and adaptation finance in particular) often emphasize that estimates are partial, and that important questions relating to what should count as climate finance, have yet to be resolved (see e.g. UNFCCC 2014, 2016). The numerous methods employed to define whether climate finance could be counted as ‘new and additional’, and the different methodologies used to report climate finance that could count toward the USD 30 Billion commitment during the 2010-2012 fast-start finance period is an illustration of this point (Donner et al., 2016). The abovementioned studies conducted by OECD have also been challenged. For instance, the Government of India has argued that only 4% of the reported flows to developing countries should be counted as such (Donner et al., 2016). One reason adaptation investments are difficult to quantify, is that adaptation efforts may be difficult to separate from other development efforts. Also, with adaptation it may be difficult to define a “counterfactual” against which to measure incremental costs and additionality of adaptation investments. As Donner et al. (2016) comment, “an aid-funded project to replace a broken water reticulation system in a country that happens to be threatened by groundwater salinization from sea-level rise may not be seen as an ‘adaptation’ project by some donors or by the recipients”.

## 5 Barriers to Adaptation Finance

There are several possible explanations of why, despite consensus among the UNFCCC Parties on key principles that should guide international cooperation on adaptation, adaptation finance flows fall short of adaptation needs.

### 5.1 Public Donor and Private Investor-side Barriers

#### 5.1.1 Public Adaptation Projects

Adaptation interventions produce benefits with differing degrees of public good characteristics that vary greatly across time and space. Adaptation may produce private (e.g. installing air conditioning in a private home) or public (e.g. protection of coastal areas from sea level rise) goods, and public goods may be local, national, or regional. Although some examples of global adaptation goods do exist (e.g. medical research and innovation to cure climate change-induced diseases), most public adaptation interventions produce benefits that are much more concentrated geographically. Inadequate financial resources, information and tools to adapt effectively may nevertheless prevent the provision of public adaptation goods in many regions.

International public donors have less of an incentive than domestic public actors to bear the costs of a recipient country's public adaptation measures, and also have less of an incentive to bear the costs of domestic adaptation than mitigation measures in a recipient country (Aakre and Rübhelke, 2010; Abadie et al., 2013). Whereas mitigation will benefit both donor and recipient, the benefits from public adaptation goods are mostly felt in the recipient country. In addition, schemes such as the Clean Development Mechanism (CDM) have allowed developed countries to achieve compliance with their national mitigation commitments by investing in projects in developing countries (typically at lower cost). Investing in mitigation is also perceived as a more effective way to limit future global risks associated with climate change than investing in adaptation. These factors help explain the donor bias towards mitigation. Recipient country constraints specific to adaptation interventions (discussed in more detail in the section below), such as a lack of readiness to access and absorb adaptation finance and insufficient data availability and expertise specific to adaptation interventions, also make public donor investment in adaptation especially difficult (see e.g. IDRC, 2013).

Like international public actors, private actors lack an incentive to finance public adaptation goods, since such goods often do not involve a market rate of return on investment. With adaptation, there is currently no commonly accepted metric for comparing and valuing adaptation interventions across projects, comparable to that found for mitigation. With mitigation, investments might for instance entitle the investor to a carbon credit, which can be traded and which puts a monetary value on investing in mitigation<sup>8</sup>. To date, providing adaptation as such has not been commodified, and it is difficult to see how such commodification might be accomplished, given the context-specific nature of many adaptation interventions (Persson, 2011).

Interventions that do not produce adequate returns on investments, such as public goods provision and the adaptation of common resources without property rights (e.g. biodiversity), must rely on public finance. Examples of adaptation interventions that would likely require public finance – either in full or in part - include:

<sup>8</sup> Here, it should be noted that attempts to create a market that puts a monetary value on investing in mitigation have also experienced difficulties in recent years.

- Public infrastructure, including dam and water management;
- Production and dissemination of adaptation information and decision-support tools for climate-related risks; and,
- Crisis management and emergency response.

### 5.1.2 Private Adaptation Projects

Adaptation projects that offer *reasonable*, relatively *quicker* and more *predictable* return on investments at acceptable risk are more likely to attract private financing, especially from financial institutions (Pauw, 2015). Examples of adaptation interventions that could potentially succeed in attracting private finance include:

- Development of drought resistant crop varieties (more generally, technology development).
- Development of financial products that promote adaptation, including insurance, and financial products that help finance adaptation, including green bonds.
- Mainstreaming adaptation in business operations, to protect revenue and/or prevent costs of climate change.

The above list of possible interventions reveals that private actor engagement in the financing of adaptation may be diverse. Private finance may be directed at adaptation directly, as an investment in a particular adaptation project, or indirectly, as an investment in a particular financial product dedicated to supporting adaptation activities.

Possible barriers that may hinder private investments include uncertainty, and the long-term timescales of climate impacts; many adaptation investments are long-term investments that do not match the short-time horizons of private investors (Berensmann and Lindenberg, 2016). For instance, the benefits associated with investment in irrigation equipment, water-efficient technologies and stress-resilient crops are often realized over longer time frames, and the size of these benefits would be dependent on climate impacts which are uncertain (Trabacchi and Mazza, 2015). When the benefits of interventions are difficult to measure, the returns on investments are also difficult to assess. The returns from many adaptation activities may be too low, too far in the future or too risky for those projects to be bankable, and the activities may therefore be unable to obtain finance from banks (PwC, 2013). Also, many adaptation interventions are motivated by cost-savings in the face of anticipated damages from climate change, rather than revenue-generating. High transaction and information costs may also be a barrier to private investments. For instance, adaptation interventions often require detailed knowledge about local context, and producing such knowledge may entail high costs. Sufficient private finance flows may also be hindered by the investment climate in the recipient country, including policy, knowledge and market barriers (see discussion below).

Access to long-term debt funding for adaptation projects is also frequently cited by private actors, notably micro- and small and medium-sized enterprises, as a barrier to adaptation investments (e.g. Druce et al., 2016; Trabacchi and Mazza, 2015). Many adaptation investments, such as those directed at the rehabilitation and replacement of water supply infrastructures and the expansion of water reservoirs, involve high upfront costs and the financial benefits only accrue over the longer term (*ibid.*). Facilitating access to longer than market-term loans with grace periods can therefore help catalyze private investments.

## 5.2 Recipient Country Constraints and Risks

In addition to donor and investor side barriers to ensuring adequate levels of international adaptation finance, recipient-side barriers might also help explain the existing and projected adaptation finance need.

A broad distinction can be made between non-financial and financial barriers to private investments in developing countries. The former include regulatory constraints (e.g. institutional and legal frameworks), while the latter include investment costs and investment risks. The two main types of

barriers to private investments could be addressed by the public using non-financial tools (provision of data and information, creating an enabling environment by improving institutional arrangements and by introducing policies) and financial tools that address the risk/return profile of adaptation investments (e.g. public lending, risk guarantees, insurance, and public private partnerships). Many non-financial and financial barriers (including legal frameworks, political stability, and investment environment) are not necessarily specific to adaptation investments, but rather conditions that influence the level of investments more generally.

Regulatory frameworks and policy environments influence the business case for investing in adaptation and resilience projects. One example is lack of tenure security over land and vital assets (IPCC, 2014). Low levels of technical capacity and readiness also represents a barrier to adaptation investments (UNFCCC, 2016). For instance, adaptation interventions in southern Africa have been hindered by political and institutional inefficiencies, lack of prioritization of adaptation and short-term disaster focused views of climate variability (IPCC, 2014).

Costs affecting the rate of return, transaction costs, and information costs are possible barriers affecting private actors' incentives to invest in adaptation (Torvanger et al., 2016).<sup>9</sup> Tippmann et al. (2013) note that, in many African countries, a common investment barrier is the high transaction costs associated with the small-scale projects often required in the poorest areas; "it is difficult to design and implement such programs in ways that are financially viable and that can be scaled up and replicated".

Possible types of risks that might hinder private investments in climate activities include market risks, political risks, technological risks, and outcome risks. Buchner et al. (2014) argue that risk "is the single most important factor keeping promising projects from finding investors", and developing countries have a higher level of (perceived) risk than for developed countries. With climate investments, policy risks (e.g. unexpected policy change) and financing risks (e.g. immaturity of financial markets) are especially prominent (ibid.) Instruments such as first-loss dedicated insurance instruments (e.g. political risk insurance and partial risk guarantees) can be used to address such risks.

Currently, international private finance to developing countries is concentrated in a small number of emerging economies and resource-rich developing countries, with least developed countries (LDCs) struggling to attract significant financial flows (Atteridge, 2011). According to the authors, private finance is also more likely to flow to some sectors (primary industry sectors) than others (water and agriculture). Atteridge (2011) notes that "few of the sectors categorized by the UNFCCC in its summary of NAPA priorities appear well matched with private patterns of investment and lending". Water sector adaptation investments are likely to be among the costliest adaptation interventions (Fankhauser and Schmidt-Traub, 2010). Massa (2011) finds that the water sector in most developing countries in Sub-Saharan Africa is unattractive to private investors, "due to the low price of water, as well as to the associated high risks (e.g. physical, community, reputational, geopolitical, and regulatory)".

The fact that private adaptation finance does not necessarily flow to the countries and sectors most in need hints at the importance of engaging public actors in order to secure adequate adaptation finance. International and domestic public entities can mobilize both international and domestic private finance by addressing the existing barriers. For many adaptation interventions, private finance will likely have to be combined with some public funding in order to be profitable. Public entities could for instance reduce investment costs by providing grants. Risk transfer mechanisms (such as guarantees and insurance) will also be important to incentivize private investments (Torvanger et al., 2016). Possible public sector approaches to promoting private adaptation investments by improving the cost-effectiveness and/or address different risks associated with

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<sup>9</sup> Torvanger et al. (2016) discuss several potential approaches that public actors might use to reduce risks and/or improve returns of investments.

adaptation projects are further addressed in section 6 in this report. For other interventions, public funding could serve to leverage private adaptation finance indirectly, for instance through capacity building, institutional strengthening, technical assistance and creating enabling environments (Brown et al., 2015). For some countries and sectors, public finance will continue be the key source of adaptation finance.

## 6 Policies, Instruments and Approaches to Mobilize Adaptation Finance

Currently, there is a lack of consensus regarding the extent to which different financial instruments should be considered as contributing to scaling up international climate finance. Stimulating adaptation finance, in particular, is difficult owing to inherent nature of many adaptation projects. Adaptation projects are often described as intangible, as it may be impossible to assess the value gained from engaging in an activity. Intangibility influences the evaluation of the associated economic costs and benefits and makes the business case difficult to determine.

It must be noted that the ability of climate resilience activities to stimulate adaptation finance may be dependent on the scale and sector within which projects are undertaken. From a scale perspective, adaptation initiatives undertaken at a small-holder farmer level, for example, may be able to demonstrate tangible benefits in the form of cost savings and increased productivity whereas the contribution of localized sea walls against future sea level rise to a country's climate resilience is almost impossible to determine currently.

With regard to stimulating adaptation finance for different sectors, agriculture and water are possibly the two sectors which are more sensitive to the effects of climate variability. This may make adaptation projects in these sectors more likely, even though water infrastructure investments may require public finance, see section 5.1.1. The following sections have been divided into specific themes that have been identified as possible policies, instruments and approaches to stimulate adaptation finance. These themes include:

- Traditional Adaptation Finance focused on Multilateral Funds;
- Climate Adaptation within a Disaster Risk Management Framework;
- Insurance as a form of Adaptation Finance;
- Incentives for Adaptation Finance;
- Microfinance Solutions to Facilitate Climate Adaptation;
- Green Bonds; and
- Adaptation Finance Innovation.

### 6.1 Traditional Adaptation Finance – Multilateral and Bilateral Funds

Adaptation finance has typically been stimulated through various multilateral and bilateral funds. Multilateral and bilateral funds can be described as public climate finance mechanisms, with flows mostly being realized from donor countries or international donor organizations. These funds primarily use grants to provide financial support to entities applying to the fund with adaptation projects. One of the main strengths of grants is its simplicity, the relative ease at which it can be implemented and managed, as there “are no ongoing administration costs, besides the monitoring of the project” (Lindenberg, 2014). Grants do not entail risk to the project developer and are also particularly appropriate in the early project development phase (Lindenberg, 2014). Conversely, a major weakness of grants is the low leverage factor for private capital (Torvanger *et al.*, 2016).

Dedicated adaptation funds can help break down barriers to private investment in projects in developing countries. In addition to creating enabling environments for private investments – such

as by strengthening local capacities and institutions - funds could help mobilize private finance by providing financial incentives, by taking on the largest risks and/or actions with the lowest returns. Considering grants as a leveraging instrument to catalyze private investment, a strength of this instrument is that it may be used to “cover costs during the highest risk development phase and by this provide confidence to private investors” (Lindenberg, 2014). Grants (and concessional loans) can be used to compensate for positive externalities of adaptation projects (i.e. they could be used to address profitability barriers to private investments). Grants are also suitable instruments when the participation of the private sector is not guaranteed. Some adaptation projects do not offer tangible goods and services, which often makes the business case difficult to demonstrate.

In the following section, we focus on multilateral climate funds.<sup>10</sup>

### 6.1.1 Multilateral Climate Funds

When considering the different sources' shares of funding dedicated to adaptation, climate funds rank highest, with 30% of its funding dedicated to adaptation in 2013-2014 (OECD, 2015). Climate Funds Update (CFU) provides a detailed overview of the funding channeled through climate funds. USD 793 Million was approved for adaptation projects in 2013 (of a total USD 2100 Million in approved funding by multilateral climate funds<sup>11</sup>), USD 479 Million in 2014 (of a total of USD 1846 Million), USD 492 Million in 2015 (of a total of USD 1255 Million), and USD 306 Million in 2016<sup>12</sup> (of a total of USD 1307 Million). The CFU overview includes funding from and to developed and developing countries, although the vast majority of funds were channeled to developing countries from developed countries.

The sectoral and geographical distribution of cumulative approved adaptation finance in 2003-2016 is summarized in Figure 6.1. The largest shares of finance were allocated to agriculture, fishing and forestry and to multi-sector activities. Included in the multi-sector category are projects that target environmental policy and administrative management, research, and projects targeting flood prevention and control. Regarding geographical distribution, Sub-Saharan Africa received 41% of total adaptation funding in 2003-2016, followed by East Asia and the Pacific (17%), South Asia (16%), Latin America and the Caribbean (14%), Middle East and North Africa (5%) and Europe and Central Asia (5%). 114 countries received project funding from multilateral climate funds dedicated to single country recipients. The mean allocation per recipient country in 2003-2016 was USD 27 Million (range USD 0.2 Million to USD 185 Million per country).

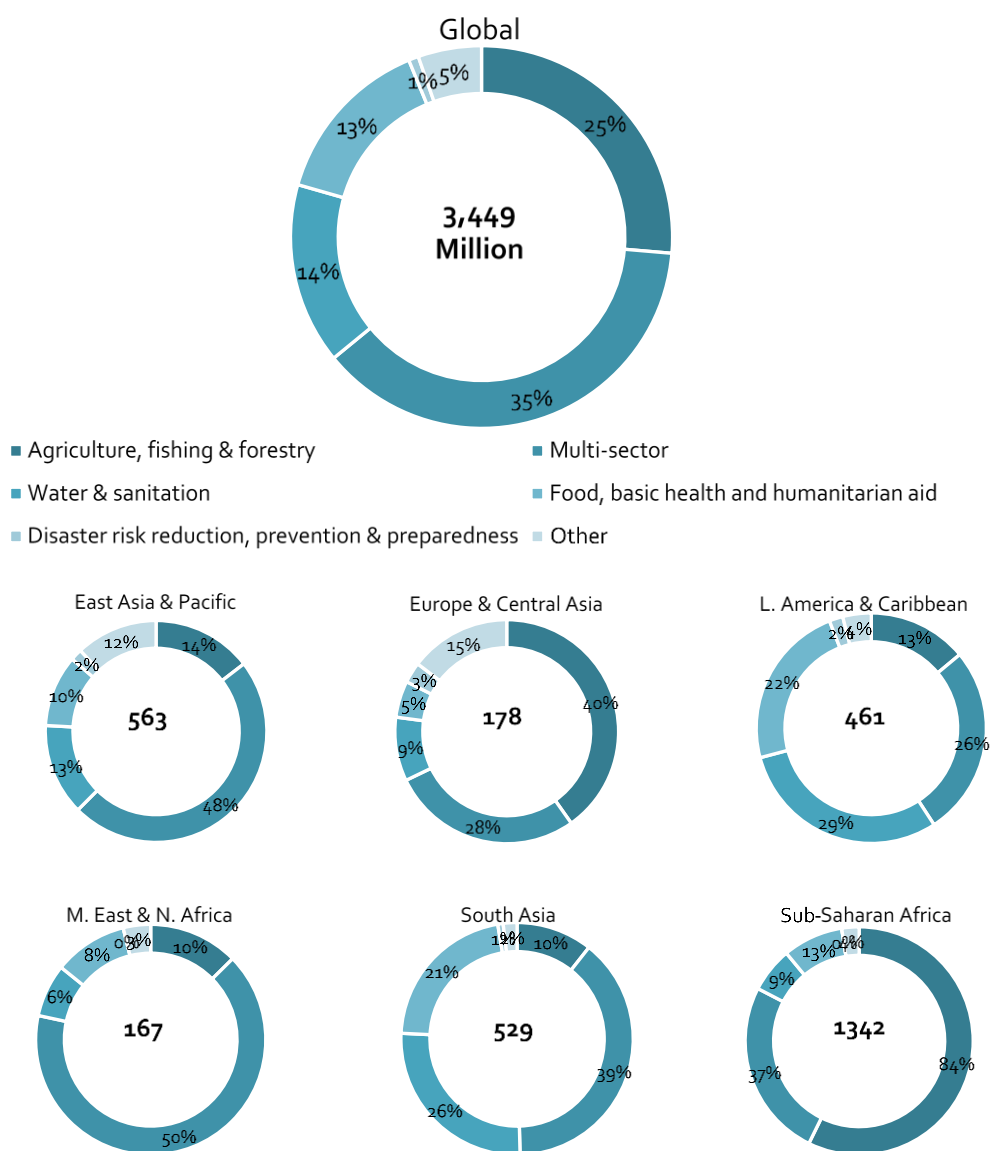
As of October 2016, funding amounting to close to USD 3.5 Billion cumulatively since 2003 had been dedicated to projects targeting adaptation in developing countries, amounting to around 26% of total approved funding by multilateral climate funds (CFU 2016). 90% of the approved allocations were given as grants, while concessional loans comprised 10% of total approved allocations to adaptation projects. The largest shares have been allocated via the Pilot Program for Climate Resilience and the Least Developed Countries Fund. Other large contributing climate funds included the Adaptation Fund, the Special Climate Change Fund, the Adaptation for Smallholder Agriculture Programme, and the Green Climate Fund. The breakdown by adaptation finance by fund is summarized in Figure 6.2.

<sup>10</sup> The recently launched Norwegian USD 400 Million fund to prevent tropical deforestation is an example of a fund that could help promote adaptation or produce adaptation co-benefits, by financing investments in deforestation-free agricultural practices. See <https://www.regjeringen.no/no/aktuelt/norge-lanserer-nytt-fond-for-a-redde-tropisk-skog/id2527639/> (in Norwegian).

<sup>11</sup> In 2013, 58% of the approved funding was dedicated to projects focusing on mitigation (general and Reducing Emissions from Deforestation and forest Degradation in developing countries - REDD), while 3% of the funding was dedicated to projects with multiple foci. Of the total amount approved, around USD 600 Million had been disbursed as of October 2016.

<sup>12</sup> As of October/November 2016.





**Figure 6.1.** Multilateral climate funds adaptation finance by region and by sector in 2003-2016 (cumulative amount approved, USD Million). Data from Climate Finance Update, current as of October 2016.

**Least Developed Countries Fund (LDCF):** Operational since 2002. Focuses on reducing the vulnerability of sectors and resources that are central to development and livelihoods, including water; agriculture and food security; health; disaster risk management and prevention; infrastructure; and ecosystems. As of October 2016, the fund had approved funding amounting to a total of USD 973 Million (and disbursed USD 539 Million) to 218 different adaptation projects, with more than USD 600 Million targeting projects in Sub-Saharan Africa. Financial instrument: Grants.

**Pilot Program for Climate Resilience (PPCR):** Operational since 2008. The PPCR focuses on integrating climate resilience into development planning, and also offers funding to pilot innovative public and private sector solutions. A total of USD 973 Million had been approved (and 152 Million disbursed) as of October 2016, distributed to a total of 65 projects. Co-financing is expected. The fund prioritizes highly vulnerable LDCs, including the Small Island Developing States (SIDS).

Projects approved include improving agricultural practices and food security, building climate-resilient water supply and sanitation infrastructure, monitoring and analyzing weather data, and conducting feasibility studies for climate-resilient housing. Financial instrument: Grants (64%), concessional loans (36%).

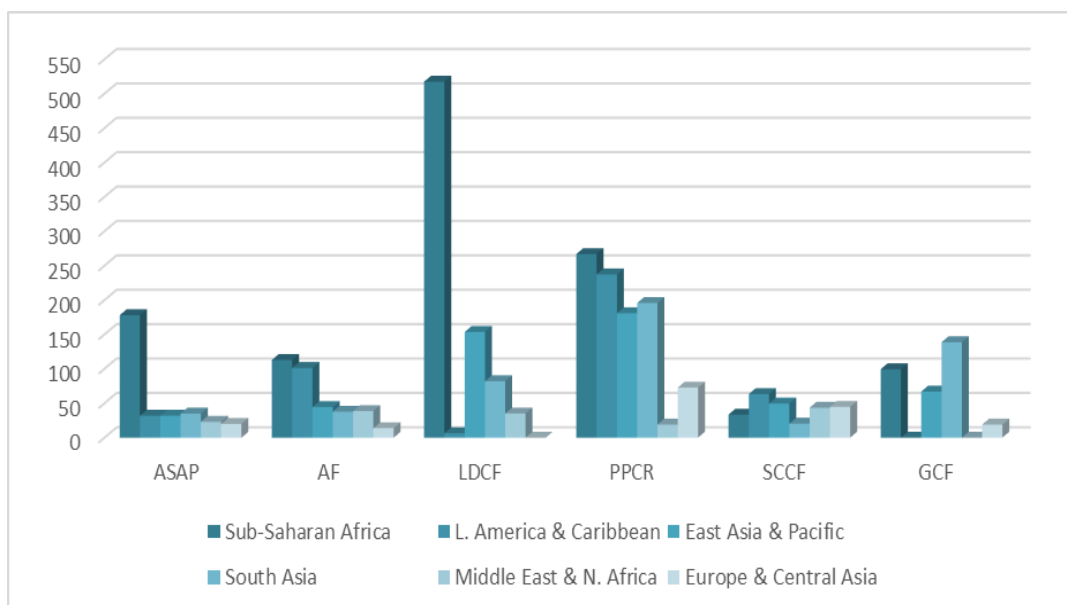
**Adaptation for Smallholder Agriculture Programme (ASAP):** ASAP has been operational since 2012. The fund provides finance to smallholder farmers, and has approved funding for 47 projects. The finance amounts to USD 345 Million in total, dedicated entirely to adaptation in the agricultural sector. Sub-Saharan Africa has received slightly more than 50% of approved finance to date. Financial instrument: Grants.

**Special Climate Change Fund (SCCF):** Has been operational since 2002. 73 projects have been approved as of December 2016, receiving a total of USD 302 Million in approved funding. The largest share of approved projects is located in Latin America and Caribbean (USD 65 Million), followed by East Asia and the Pacific (USD 57 Million) and the Middle East and North Africa (USD 48 Million). The fund covers the incremental costs of interventions. Contributions to the fund are voluntary. Financial instrument: Grants.

**Adaptation Fund (AF):** The AF has been operational since 2009, and has approved 54 projects and finance totaling USD 349 Million to date (USD 166 Million had been disbursed as of October 2016). Sub-Saharan Africa and Latin America and the Caribbean have received the largest shares (in both regions, multi-sector projects have been prioritized). The fund was established to finance adaptation activities in developing country Parties to the Kyoto Protocol, and is financed by voluntary pledges and by a share of CDM proceeds. Financial instrument: Grants.

**Green Climate Fund (GCF):** The GCF has been operational since 2015. The fund has approved adaptation finance totaling USD 324 Million to 14 projects as of October 2016. The fund has identified four impact areas that will deliver major adaptation benefits: 1) enhanced livelihoods of the most vulnerable people, communities, and regions; 2) increased health and well-being, and food and water security; 3) resilient infrastructure and built environment to climate change threats; and 4) resilient ecosystems. The largest project to date is the multisector “Climate Resilient Infrastructure Mainstreaming” project in Bangladesh (USD 40 Million in grants from the GCF, and an additional USD 40 Million in co-financing from the German Ministry for Economic Cooperation and the Bangladeshi Ministry of Local Government). Financial instrument (to date): Grants.

Table 6.1 shows examples of how some of the multilateral climate funds can soften barriers to private adaptation finance.



**Figure 6.2.** Cumulative adaptation finance from multilateral climate funds in 2003-2016 (approved funding, USD Million), by fund (Data from Climate Finance Update, current as of October 2016).

ASAP – Adaptation for Smallholder Agriculture Programme. AF – Adaptation Fund. LDCF – Least Developed Countries Fund. PPCR – Pilot Program for Climate Resilience. SCCF – Special Climate Change Fund. GCF – Green Climate Fund.

**Table 6.1.** Some examples of the possible roles of multilateral climate funds in breaking down barriers to private adaptation finance.

Climate Fund	Barrier(s) addressed
PPCR	<i>Financial tools:</i> PPCR funding has helped facilitate private investments in the integration of climate resilience in infrastructure projects by providing <b>access to long-term finance</b> (concessional loans with a 40-year tenor) and by <b>lowering investment costs</b> (grants).
AF	<i>Non-financial tools:</i> The portfolio focuses on strengthening <b>adaptive capacity</b> , including strengthening <b>legal and policy</b> frameworks relevant to the intervention in recipient countries.
LDCF	<i>Non-financial tools:</i> Funding has contributed to <b>capacity building, awareness raising and knowledge management</b> at the national level.
GCF	GCF helps overcome <b>donor governments' dis-incentive</b> to invest in public adaptation goods in developing countries through its commitment to a 50:50 balance between adaptation and mitigation finance over time.

## 6.2 Disaster Risk Management and Adaptation Finance

### 6.2.1 Introduction

According to Warner *et al.* (2015), climate adaptation and disaster risk management are inter-related issues; therefore, disaster risk reduction measures may be appropriate to alleviate climate risks posed by the physical hazards. The UNFCCC categorizes hazards as either climate or climate change hazards: Weather hazards that can be exacerbated by climate change are referred to as climate hazards while hazards that are a direct result of climate change such as sea level rise and ocean acidification are defined as climate change hazards.

Within disaster risk management either ex-post or ex-ante approaches can be adopted to manage hazards (Ghesquiere and Mahul, 2010). Ex-post approaches do not require the same planning as ex-ante approaches, with regard to budget reallocation, domestic credit, external credit, and tax increases. Conversely, ex-ante approaches require foresight and a degree of proactive planning. These approaches include risk retaining and risk transfer instruments. Risk retaining instruments such as catastrophe reserves, budget contingencies and contingent credit act as a form of self-insurance where entities assume all or part of the risk, instead of buying partial or full insurance.

Risk transfer instruments are instruments through which risk is ceded to a third party, such as traditional insurance, risk pooling, micro-insurance, catastrophe bonds and weather derivatives.

### 6.2.2 The Effectiveness of Disaster Risk Management Approaches

Disaster risk management approaches may not be suitable to address some climate change hazards. This is owing to the uncertainty of the nature of the hazards, related to their geographical spread, intensity and scale of economic losses. In particular, a lack of understanding of the economic losses makes it difficult for decision makers to implement any suitable financial instrument. For example, ascertaining the correct amount of coverage to purchase from a risk pooling facility or assessing the appropriate level of funds to maintain in a catastrophe reserve fund is problematic. However, there are some climate change hazards that have already demonstrated their impacts such as sea level rise in Florida, United States. In this case, certain financial actors in the insurance industry have already deemed certain areas uninsurable.

The most notable form of disaster risk financing is through donor support, budget contingencies, and contingent credit. Donor support can allow affected countries to avoid domestic budget use. However, the amount of financial support may be insufficient to address the losses incurred, and funds may be slow to reach the most affected individuals, post disaster. Budget contingencies can be described as reserved funds from domestic budgets. These funds may reduce the reliance on international aid and be easily accessed. However, they may also not be sufficient to meet the post-disaster needs. Contingent credit refers to loans offered from International Financial Institutions (IFI) at favorable terms to address the impacts of disasters. Despite payouts of these funds being rapid, they could exacerbate the debt burden of countries. Self-insurance by the use of commercial insurance policies taken by individual countries may result in significant premium costs, exacerbating the sovereign credit ratings (Pillay, 2016).

Insurance has often been touted as an important instrument in the adaptation finance dialogue. Within a disaster risk framework, insurance could incentivize adaptation activities by promoting reduced premium costs. In reality, it may be difficult to determine the contribution of localized adaptation activities to a country's overall climate resilience. A significant disadvantage of insurance is the general lack of understanding of how the instrument works (particularly in developing countries), and the possibility of basis risk if payouts are based on environmental indices.<sup>13</sup> Insurance coupled with parametric insurance policies may have exhaustive data requirements despite allowing for faster payouts.

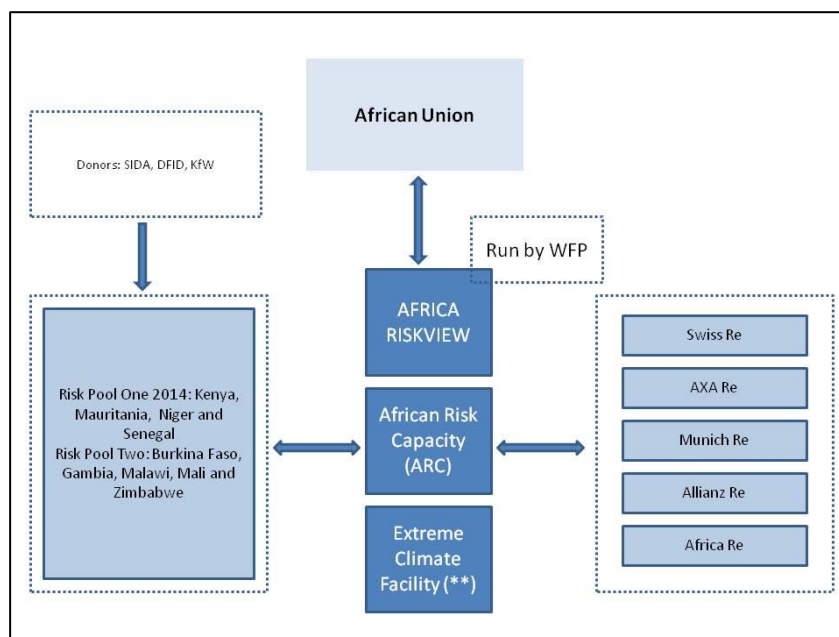
Catastrophe bonds and swaps could be a possible avenue for raising capital from institutional investors via the financial market where contracts are based on whether losses occur because of a pre-defined catastrophe. Catastrophe bonds and swaps may serve the same purpose as reinsurance (Suarez and Linnerooth-Bayer, 2011). The use of catastrophe bonds and swaps could potentially access increased financial flows as the financial markets are estimated to have 10 times more capacity than the reinsurance markets. However, the use of catastrophe bonds and swaps require large issuances and the presence of a well-developed financial market.

### 6.2.3 Case Study: African Risk Capacity (ARC) and Extreme Climate Facility (XCF)

The African Risk Capacity is a sovereign risk pooling facility that was established as a specialized agency of the African Union (AU) to help member states to respond to natural disasters in a timely manner (thereby protecting vulnerable populations). Risk pooling is a form of insurance where risks are aggregated to offer individual insurance holders with premium reductions. Payments within the ARC use parametric insurance triggers, which are based upon satellite weather monitoring data and

<sup>13</sup> Basis risk refers to the possibility that some events can occur which produce significant losses but no payout ensues because the parametric trigger is not appropriately set.

further information, gathered in the Africa Riskview software run by the World Food Programme (WFP).



**Figure 6.3.** The partnership landscape of the African Risk Capacity (Please note that some reinsurance companies do not appear in the Figure) (Own representation).

#### 6.2.4 Policy Advice

CICERO proposes to consider the following options, should the Ministry of Foreign Affairs (MFA) support disaster risk financing and climate adaptation approaches:

- Donor Support: Continue to provide financial support and assistance to relief aid organizations;
- Risk Pooling Initiatives: The MFA could support risk pools by the subsidization of premiums for LDCs within risk pools, initial capitalization of risk pools in the form of repayable loans and technical assistance grants to support satellite and monitoring technologies; and,
- Catastrophe Bond and Swaps: The MFA could engage with Norwegian bond issuers and institutional investors of the possible financial benefits of catastrophe bonds and the benefits to adaptation finance.

### 6.3 Insurance as a form of Adaptation Finance

#### 6.3.1 Introduction

As mentioned in Section 6.2., insurance is perhaps the most noted adaptation finance instrument and is an essential risk transfer tool within disaster risk management. Insurance can also be used to address potential losses as a result of climate variability<sup>14</sup>. The insurance industry is increasingly aware of the implications of climate-related events and risks on their existing portfolios of products and clients. Considering that climate change will directly affect the business costs, a number of initiatives have been implemented by the insurance sector.

The use of micro-insurance directed at poorer communities in developing countries has been touted as a viable method to increase the resilience of an economy to climate change. In 2015, the G7

<sup>14</sup> Climate variability may not necessarily lead to a natural hazard occurring. For example, fluctuations in rainfall may not be categorized as a drought.

committed to increase insurance in developing countries to cover at least 400 Million people by 2020. Furthermore, the UN Secretary-General and the International Cooperative & Mutual Insurance Federation launched the 5-5-5 initiative which seeks to roll-out micro-insurance to cover 25 Million in the five poorest countries by 2020. The following case study (section 6.3.3) will elaborate on the use of micro-insurance as a strategy to reduce the effects of climate variability for small-holder farmers.

### 6.3.2 The Effectiveness of Insurance in an Adaptation Context

There are several pros and cons to the expansion of insurance to address climate risk. Firstly, there is a risk of moral hazard which can be described as the reduction of incentives to undertake climate adaptation initiatives because of purchased insurance. Secondly, insurance penetration is generally low in developing countries, with less than 5% of the global population being covered by insurance. This is also owing to a lack of understanding of how the instrument operates.

Perhaps the most significant barrier to the widespread implementation of climate insurance is the difficulty in creating a balance between moral hazard and incentivizing climate adaptation. Furthermore, there is generally a lack of transparency in understanding of how climate resilience activities influence the terms and conditions of insurance policies such as reduced premium costs. This is often more difficult in the context of sovereign risk pools (which operate at a macro-scale) than micro-insurance which often targets coverage at a local scale (for example, small-holder farmers seeking to reduce their losses from rainfall variability).

Micro-insurance is targeted at lower income individuals who cannot afford the premiums of traditional insurance. Furthermore, micro-insurance is characterized by low premiums. Micro-insurance can cover various risks. However, in an environmental context, it has been directed towards crop and livestock protection. Typically, micro-insurance are index-based products according to some threshold such as the level of rainfall in a given period.

### 6.3.3 Case Study: Malawian Micro-insurance for Drought Resilience

In 2005, the Malawian government in partnership with the World Bank's Commodity Risk Management Group embarked on developing the concept and application of a loan and index-based weather insurance program as a means of mitigating the risks of drought faced by smallholder farmers (Hess and Sykora, 2005). This drought insurance product sought to build on the current micro-credit schemes used by smallholder farmers while investigating the requirements and barriers to implementing insurance products related to weather.

Traditional insurance products directed at the crop failures of smallholder farmers have found it difficult to avoid higher payouts and higher premiums as farmers may allow their crops to fail in order to obtain a payout. Furthermore, it is difficult to attribute the cause of the crop failure if crop yield is assessed, as this could be a result of bad farming practices and not the prevailing environmental conditions. To avoid insurance malpractice, establishing payouts based on relationships between environmental variables and crop failure ensures that farmers have an incentive to promote productive farming management while being covered against climate risks.

The targeted farmers were able to afford the insurance owing to the higher yield of crop (groundnut). For this particular type of insurance product, the trigger for payouts or the selected index was the requirement for water (a weighted sum of cumulative rainfall during the 130-day growing period, with individual weights assigned to (10-day) rainfall totals) (Hess and Sykora, 2005). The envisioned benefits of the Malawi scheme were as follows:

- Farmers were able to focus their farming exploits on higher value-added products as additional capital was provided by the loan scheme with the insurance scheme reducing the risk;
- Farmers could invest in better seeds and irrigation technology which could increase their productivity; and,

- Higher productivity would allow for greater profits, which would allow greater financial security in drier or less favorable seasons.

Several gaps were identified during the pilot phase including concerns over the robustness of rainfall data used (from one rainfall station) to decide payout triggers; poor seed quality decreasing crop yield; and, side-selling to those offering a higher price than the National Smallholder Farmers' Association of Malawi (NASFAM). From 2006 to 2009, the loan and insurance scheme has been expanded to other crop types. By the end of the 2009 season, the program covered 2500 farmers and possessed a transaction value of USD 2 Million.

#### **6.3.4 Policy Advice**

CICERO proposes that the following options could be considered by the Ministry of Foreign Affairs should micro-insurance approaches be supported:

- Supporting of pilots that aim to demonstrate the benefits of micro-insurance in addressing climate variability in developing countries;
- Technical assistance grants that promote the development of risk reducing initiatives such as improved farming practices, better input provisions, irrigation technologies, and commodity sale; and,
- Capacity building programs to deepen the understanding of micro-insurance products at the community level and the enhanced weather monitoring technologies to develop parametric insurance.

### **6.4 Credit Mechanisms for Adaptation**

#### **6.4.1 Introduction**

As stated in Section 6.1., grants and the use of public finance mechanisms such as climate funds have traditionally been the most productive avenue to gaining support for adaptation projects. The inherent nature of adaptation projects being intangible may cause difficulty in attracting the private sector. Therefore, it may be necessary that government create incentives for increased uptake of adaptation projects. The use of financial instruments such as micro-insurance and mutual contingency funds, if appropriately designed, can promote incentives as elaborated upon in Section 6.3. However, these instruments may only create incentives in certain sectors such as in agriculture and water. Stronger public policy may allow for a greater transformational shift<sup>15</sup>, where adaptation is integrated into societal concerns. The demand for adaptation projects could also be created through a crediting mechanism similar to the Clean Development Mechanism (CDM) under the Kyoto Protocol and UNFCCC that will be discussed in this section.

#### **6.4.2 The Effectiveness of Incentives for Adaptation**

Crediting mechanisms require the implementation of policies which drive the demand for credits. Within the CDM, the carbon credit price was suppressed as the Kyoto Protocol was not ratified by all the major polluters. An adaptation crediting mechanism would allow for the private sector to be engaged if entities are legally bound to meet a given quantitative adaptation credit target.

The use of a credit mechanism for adaptation can be advantageous as the demand for adaptation projects in different sectors can be prioritized by the use of different discounting schemes. Therefore, the scope of adaptation project types could be expanded beyond those that are implemented in the water and agriculture sector. Furthermore, the use of a crediting mechanism can reduce 'donor fatigue' (Schulz, 2012). Torvanger and Pillay (2016) discuss another version of credits, whereby green projects in developing countries earn green growth credits. Carbon credits, in

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<sup>15</sup> Transformational adaptation refers to adaptation at greater scale or magnitude, the introduction of new technologies or practices, the formation of new structures or systems of governance, or shifts in the location of activities.

a mitigation framework, refer to a unit of emission reduction (tCO<sub>2</sub>e). Credits may be problematic in an adaptation context where what constitutes a unit of vulnerability reduction is subjective.

### 6.4.3 Case Study: Creating Demand through Vulnerability Reduction Credits (VRCs)

Currently, there is no consensus on appropriate indicators for adaptation. The Higher Ground Foundation's Vulnerability Reduction Credit (VRC) instrument offers policy makers an approach for considering adaptation costs within a crediting framework. Figure 6.4 illustrates the conceptual framework envisioned by the Higher Ground Foundation (HGF) for the integration of VRCs into current climate mitigation landscape. VRCs are different to traditional carbon credits such as the Certified Emission Reductions (CERs) from the Clean Development Mechanism (CDM), or Emission Reduction Credits (ERUs) from Joint Implementation, as the primary focus is adaptation rather than mitigation. Despite the need to integrate adaptation concerns into climate policy instruments, VRCs need to avoid the flaws that have plagued other crediting frameworks if they are to become a mainstream flexibility mechanism. Critical elements that need to be addressed include: the implementation of policy that creates the demand for VRCs; appropriate procedures for the approval of methodologies that avoid the bottlenecking of projects; robust governance and transparency frameworks; and, lastly, the avoidance of high transaction costs, amongst others.

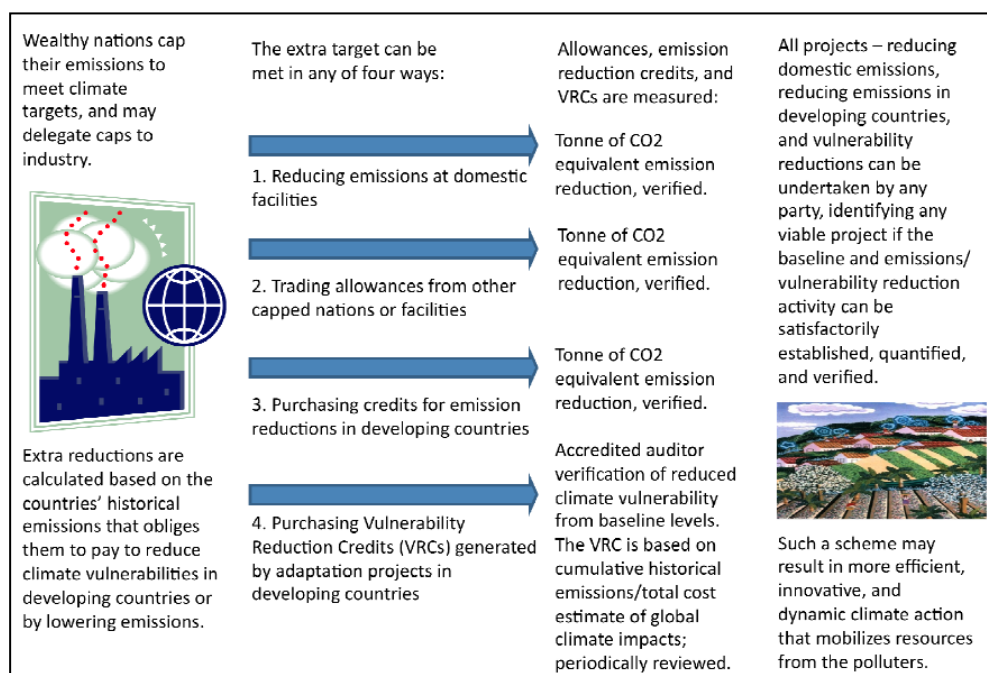


Figure 6.4. Higher Ground Foundation's Proposed Landscape for VRC Implementation

The Vulnerability Reduction Credit (VRC) concept was created by the Higher Ground Foundation and enables the adaptation potential of a project to be quantified that is the avoided losses and damages in terms of the cost. The quantity of VRCs yielded from a particular project can be described by the following equation:

$$\text{No of VRCs} = \frac{\text{AIC} \times \text{IEF}}{\text{€ 50}}$$

The number of VRCs issued to a particular project is a function of the VRC's nominal value, the project's Avoided Impact Cost (AIC) and an Income Equalization Factor (IEF). Historical climate change can be integrated into the avoided impact cost (AIC) parameter. The Income Equalization Factor (IEF) parameter is used to correct for distortions in the cost of adaptation measures in



different regions. VRCs are designed to be issued ex post, after vulnerability reduction measures have been implemented and their cost reduction effects validated.

The generation of VRCs has not been piloted yet. However, there is interest from international organizations such as the International Finance Corporation (IFC) and the United Nations Development Programme (UNDP). The African Development Bank is currently investigating a similar initiative to the VRCs (AfDB, 2017). CPMA International, a Swedish firm, has been awarded with funds from the Climate Investment Funds (CIFs) to develop a global Adaptation Benefit Mechanism (ABM). The ABM is envisioned to incentivize private sector investment in adaptation by creating a price signal for resilience benefits. The ABM will be based on the experiences of the CDM, which is focused on mitigation.

#### **6.4.4 Policy Advice**

CICERO proposes that the Ministry of Foreign Affairs could take note of the following options when considering support to adaptation incentivize approaches:

- Crediting mechanisms: The MFA could support the piloting of the VRC or ABM to better understand how crediting mechanisms would operate in an adaptation context;
- Quantified Adaptation Credits: The MFA could assist in the development of sector specific methodologies to quantify adaptation benefits for different project types and sectors; and,
- Domestic offsets: The implementation of a domestic offset credit mechanism which promotes the implementation of adaptation projects could incentivize Norwegian private sector participation in adaptation thereby increasing resilience to climate impacts.

## **6.5 Micro-finance Solutions to Facilitate Climate Adaptation**

### **6.5.1 Introduction**

Adaptation can take place in either a top-down or bottom-up manner. The top down approach refers to planned initiatives undertaken by the public sector while the bottom-up approach captures initiatives taken at the household or company level. Despite the increasing financial flows available for adaptation from a top-down approach, most notably the grants from the GCF, funds seldom reach the household level in sufficient quantities to promote resilience. Microfinance is a key solution to providing support household adaptation. Microfinance refers to formalized financial services tailored and offered to low-income and disadvantaged communities.

### **6.5.2 The Effectiveness of Microfinancing Approaches**

Appropriate levels of top-down adaptation finance initiatives are critically important to ensure that low-income groups, which lack the financial resources, are able to cope with climate variability and extreme weather events. Microfinancing, working together with top-down adaptation finance measures, can help to fill financial gaps that occur. Well-functioning public safety nets should theoretically offer protection against catastrophic risks by the offering of loan facilities, savings and informal mutual support systems. The major difference between public safety nets and private microfinancing schemes is the presence of enforceable contract that elaborates on payout terms and conditions (Clarke and Dercon, 2009). Inefficient safety nets may therefore be guaranteed, but slow in providing support on the ground. This may make private microfinancing more attractive.

Microfinance aims to include lower income groups into the formal finance sector providing greater access to lending mechanisms, saving schemes and insurance. Traditionally, lower income groups operate on an informal finance mandate, which is financial exchanges and transfers between individuals. The use of formal financial services may exacerbate the debt burden of individual households. Thus, it is important that terms and conditions of financial products be carefully evaluated as the financial needs will differ from community to community. Microfinance can also lead to maladaptation outcomes owing to enhanced debt.

A disadvantage of microfinancing is that the mechanism may not be able to incentivize pro-active adaptation. This is dependent on whether adaptation initiatives are available/feasible or whether communities are exposed to sudden or slow onset hazards. For example, agricultural adaptation measures may not be feasible to manage a severe sudden onset hazard such as a flood.

### 6.5.3 Case Study: The Use of Micro-finance in Bangladesh

The Noapara Village has 267 households with livelihoods primarily dependent on agriculture and small-scale livestock farming. All livelihoods initiatives are based on credit with debts being repaid post-harvest. Riverine flooding is the key hazard to those living in the Noapara village. Flooding has the following implications on the village:

- Households abandon cash-crops as productivity is not sufficient for the household's livelihood and the sale of crops, affecting the household's ability to repay debts;
- Decline in demand for local labor and people are forced to migrate; and,
- Income earned from other labor external to agriculture does not cover the projected income from cash crops.

Local communities favored micro-finance lending by Microfinancing Financial Institutions (MFI) owing to their trusted status, as opposed to semi-formal finance institutions. Approximately 55% of loans were from MFIs. MFIs that provided non-financial benefits such as aid were preferred by consumers. The local community did highlight that informal credit was beneficial owing to greater flexibility with regards to repayments. Based on the study conducted by Fenton et al. (2017), 95% of all consumption loans were used during times of livelihood shocks. It is important to note that when disaggregated to determine the driver behind the livelihood shock, it was found that the uptake of consumption loans becomes three times higher during flooding months, which suggests a response to flooding hazards.

### 6.5.4 Policy Advice

CICERO proposes that the following options could be considered by the Ministry of Foreign Affairs, should micro-finance approaches be supported:

- Capacity building initiatives and technical assistance grants for local NGOs which act as MFIs;
- Further research into methods to integrate adaptation initiatives into incentive structures of financial products; and,
- Evaluating financial structures to ensure that micro-finance do not exacerbate the debt burden of local communities.

## 6.6 Green Bonds

### 6.6.1 Introduction

Green bonds are a debt instrument that offer the same returns as regular bonds, but where proceeds are earmarked for projects that support the transition to low-carbon and climate resilient growth. Water bonds are a subset of green bonds, where proceeds are earmarked for financing water infrastructure or water management projects. Green bonds can help raise finance for public or private expenditure, depending on who issues the bonds.

Green bonds can help overcome both public and private barriers to adaptation finance: As a financial investment product, green bonds can help attract private finance that, in turn, can make resources (loans) available to otherwise cash-strapped local or international public entities. Although the adaptation projects themselves may not necessarily attract private finance, green bonds issued by well-rated institutions can help attract investors by offering a desirable risk/return on investments in a familiar fixed-income financial instrument.

### 6.6.2 The Effectiveness of Green Bonds as a Source of Adaptation Finance

Regarding private barriers to adaptation finance, green bonds provide an opportunity to mobilize investors, especially institutional investors. One of the strengths of green bonds is that they can bundle various projects together in a single security (Lindenberg, 2014). The leverage ratio of green bonds is also potentially high (*ibid.*). Green bonds can help make available more long-term financing for adaptation projects, especially in developing countries where demand for investments in long-term infrastructure projects is high, but supply of long-term bank loans is limited (G20, 2016). A potential shortcoming is that green bonds require sophisticated financial markets and high credit ratings for potential issuers, which could entail limited possibilities for scaling up (Lindenberg, 2014; Torvanger and Pillay, 2016). Another current challenge is the limited availability of bankable projects suitable for financing through bonds issuance.

As a debt instrument, green bonds could help mobilize private finance as a source of funding for adaptation projects in developing countries. However, public entities would in many cases need to play a key role in creating an enabling environment for such transactions (including macroeconomic and political conditions, laws and regulations). Public entities could also help facilitate market development by supporting the development and uptake of green bonds standards and guidelines, and by extending equivalent transparency, disclosure and reporting requirements to conventional bonds in order to create a level playing field. Limited availability of bankable adaptation projects could be addressed by developing a list of strategic projects, and by working to structure these projects and bring them to market. Market growth could also be stimulated through the strategic issuance of bonds earmarked for adaptation activities by public entities with high credit ratings. This would help to introduce investors to green bonds without investors having to take any additional financial risk.

To incentivize green bonds investments, public funds could be used to absorb risk in order to improve the risk-return profile of a bond and thereby improve its creditworthiness and investor appeal. The need for credit enhancement mechanisms is larger in developing countries, where risks are generally higher (CBI, 2015). De-risking support would be especially needed for bonds issued by less-well-known companies or sectors with greater perceived risks, such as infrastructure (*ibid.*). De-risking support could be provided by public entities using credit enhancement instruments such as guarantees, subordinated debt, and insurance to cover policy and political risks.

CBI (2015) estimates that around 4.3% of the total of USD 65.9 Billion globally in outstanding labelled green bonds (i.e. where use of proceeds are explicitly labelled as green) have been dedicated to adaptation projects, although spending in sectors relevant to adaptation might also support adaptation-related projects (including the water and agriculture sectors<sup>16</sup>). The low share compared to the funding approved for mitigation projects is possibly owing to issues of intangibility and the subsequent difficulty in creating revenue streams from resilience. One possible avenue to increase green bond issuances in adaptation would be backing the bond issue using the cash flow generated from climate resilient initiatives (asset-backed securities). For example, water infrastructure improvements and climate-smart agriculture initiatives may allow for greater revenue streams to be generated from water sales and increased agricultural productivity, respectively. Asset backed securities may therefore work well if initiatives are applied to entities of an adequate size (public water utilities and commercial agriculture). However, small-holder farming initiatives and community water projects may be too small in size to be considered within a green bond issuance. Lastly, projects that seek to address vulnerabilities and risk related to climate change hazards such as sea level rise may not be able to be financed through green bonds.

### 6.6.3 Case Study: World Bank Green Bonds Financed Projects

The World Bank green bonds issuances have helped finance adaptation projects that provide public adaptation goods with insufficient returns on investments (e.g. improving adaptive capacity,

<sup>16</sup> A large share of the observed increase in spending in sectors relevant to adaptation in recent years, is due to financing adaptation-related projects in municipalities in the US and elsewhere (including water infrastructure assets) (CBI, 2016).

infrastructure) and projects undertaken in high/medium risk markets (developing countries characterized by macroeconomic and political risks to different degrees). Such projects would be unlikely to attract private finance directly. World Bank green bonds have helped attract private finance because they meet a demand among investors for highly rated, fixed income investments product whose proceeds supports mitigation- and/or adaptation-related projects. The leveraged finance, in turn, has functioned as a source of funding for bank lending to recipient governments. The finance mobilized by green bonds issuances is provided to recipient governments as traditional International Bank for Reconstruction and Development (IBRD) loans. At the recipient end, what sets green bonds finance apart from ordinary World Bank project finance, is that projects must meet green bonds eligibility criteria, supporting the transition to low-carbon and climate resilient growth in the recipient country.

Around USD 3.1 Billion have been committed to adaptation projects through World Bank green bonds (22% of total World Bank green bonds commitments) to date. Projects have helped support adaptation in the agriculture, land use and forestry sectors (USD 1.2 Billion committed), helped finance resilient infrastructure, built environment and other (USD 0.6 Billion), and funded projects aimed at adaptation in waste, wastewater and solid waste management (USD 1.2 Billion). Below, we provide brief illustrations of the types of adaptation projects that have been supported to date.

#### **World Bank Green Bonds Financed Adaptation Projects - (1.) Water, Wastewater and Waste Management and (2.) Resilient Infrastructure, Built Environment and Other**

The Bengbu Integrated Environment Improvement project in China aimed to improve the effectiveness and resilience of urban water supply, treatment services and flood prevention and control systems through improved infrastructure and watershed management. A total of USD 100 Million (45% of project costs) have been committed by IBRD as a sector investment and maintenance loan. The borrower, the government of China, contributed the remaining 55% of project costs. The project, which was completed in June 2015, consisted of four separate components; 1) comprehensive water resources management; 2) urban environmental infrastructure improvement; 3) suburban environmental infrastructure improvement, and 4) institutional development and capacity building. Anticipated results include enhanced flood protection and improved water supply reserves.

The Huai River Basin Flood Management and Drainage Improvement in China aims to increase resilience of communities to the impacts of climate change, particularly flooding. Total project costs are estimated to be USD 597.4 Million, of which IBRD has committed USD 200 Million as a specific investment loan. The remaining amount is provided by the government of China. The project has five components: 1) flood protection and drainage improvement; 2) disaster assessment and support system; 3) institutional strengthening; 4) resettlement action plan implementation; and 5) project management.

#### **6.6.4 Policy Advice**

Green bonds issuances represent a means to engage private sector sources of capital. CBI (2016) notes that there is a large demand for investment products that deliver benefits to climate, but that there is currently a lack of investible opportunities. Green bonds could help address these demands. Especially in developing countries, public support will in many cases be needed to further develop green bonds markets and to incentivize green bonds private investments. Should green bonds approaches be considered as an option to mobilize private adaptation finance, Ministry of Foreign Affairs could consider supporting initiatives that promote the establishment and development of bonds markets, including:

- Supporting the development of green bonds definitions and guidelines in new markets, and the issuance of demonstration bonds;
- Working to enhance the credit-worthiness of potential domestic markets and issuing entities (e.g., cities and municipalities) for instance through capacity building and technical assistance, and structuring investment and guarantee instruments, to reach new investors;
- Facilitating larger-scale adaptation project pipelines; and,

- Promoting 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.

## 6.7 Adaptation Finance Innovation

The following sections provide brief descriptions of new adaptation finance initiatives or the use of existing financial products within an adaptation finance context. Several of these initiatives are still being researched or are within the pilot phase of implementation; therefore a more detailed analysis is not possible.

### 6.7.1 Climate Derivatives for Funding Climate Adaptation

Derivatives refer to financial products that gain their value from an index. Essentially, derivatives are contracts between two parties where one party makes a commitment to the other (investor) if the pre-conditions of the contract occur in relation to the index. In return, the investor agrees to pay an up-front amount. According to Little (2015), derivatives allow for investors with different risk exposures and opinions on future climate impacts to transact.

In Tasmania, Australia, the salmon aquaculture industry is at severe risk owing to rising sea surface temperatures. The industry, which is worth approximately 500 Million AUD, requires large amounts of capital to finance adaptation measures including selective breeding programs for thermally resistant fish species, relocation of production facilities to cooler oceanic waters and offshore operations. Considering that salmon have a thermal limit of 18°C, an option contract can be created around this index to entice investors. Little (2015) found that each derivative contract (for the protection of aquaculture) could be sold for AUD 45.85 dollars each and the sale of 21 810 contracts would raise 1 Million AUD.

### 6.7.2 Water Financing Facility (WFF) (Oliver et al., 2016)

The WFF seeks to leverage private sector investment from large domestic institutional investors such as pension funds and insurance companies. The WFF aims to coordinate these financial flows with public finance initiatives to help address the financial gap faced by vulnerable countries. The WFF plans to select projects linked to actions disclosed with country Intended Nationally Determined Contributions (INDCs; under the Paris Agreement). Currently the WFF possesses funds equivalent to 112 Million USD contributed by donors and impact investors and is estimated to provide an initial public-private leverage ratio of 1:1.4, which could increase over time. The WFF is envisioned to not only improve water infrastructure but also provide co-benefits including improved access to safe and affordable water, health, socio-economic development and resilience to climate risks.

The WFF is made up of two levels, namely a World WFF which is a limited liability company which will facilitate the formation of eight national level WFFs. The World WFF is envisioned to provide financial engineering, transaction advice and financial management support to the national facilities. The national facilities will provide low cost loans to public and private water utilities that do not have access to commercial financing from private financial institutions. The loans would be backed by the utility and linked to the investment (possibly the revenue stream created by water sales). The selected investments would be screened to ascertain whether the project would enhance the adaptive capacity of a region.

The National WFF is able to leverage private capital through the issuance of local currency bonds to the domestic financial market. Incomes generated by water utilities will be ring-fenced (i.e. financially separated from other income). This will strengthen the creditworthiness of water utilities. National governments may be required to provide pledges to the facilities debt reserve funds to reduce possible credit risk.

### **6.7.3 Climate-Smart Lending Platform (Falconer and Rakhmadi, 2016)**

One of the major issues which may accentuate the climate risk facing small-holder farmers is the access to finance on good terms. The climate-smart lending platform aims to incorporate climate risk in loan portfolios, which may help incentivize climate smart farming methods. The long-term vision of the project is to use the metrics from the platform to inform the credit scoring systems of financial institutions to improve the agriculture lending portfolio. Within the first phase of the platform will see a pilot being rolled out in three different regions and crop contexts. Under each pilot, grants and concessional loans will be used to fund climate-smart loans and monitoring tools to develop credit risk scoring tools. In the 2<sup>nd</sup> and 3<sup>rd</sup> phase of the project, concessional loans will not be used; rather first loss guarantees will be used to securitize debt for commercial finance providers.

### **6.7.4 Agriculture Supply Chain Adaptation Facility (Global Innovation Lab for Climate Finance, 2016)**

The Agriculture Supply Chain Adaptation Facility forms partnerships between MDBs and agribusiness corporations. The facility helps enhance the lending ability of MDBs to farmers while providing technical assistance. The facility seeks to provide small farmers with access the finance in the form of market-based loans to build initiatives for climate resilience. The facility is looking to be piloted in Latin America and the Caribbean region; thereafter, if successful, the facility will possibly be scaled up and replicated. The facility will be backed by a donor trust fund, which is envisioned to cover a portion of first losses and reduce MDB and third party credit default risks. According to the Global Innovation Lab for Climate Finance, “agribusinesses would be responsible for loan origination and servicing, but the majority of the loan portfolio would reside on the Multilateral Development Bank’s and co-lender’s balance sheets.”

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CICERO has garnered attention for its research on the effects of manmade emissions on the climate, society's response to climate change, and the formulation of international agreements. We have played an active role in the IPCC since 1995 and eleven of our scientists contributed the IPCC's Fifth Assessment Report.

- We deliver important contributions to the design of international agreements, most notably under the UNFCCC, on topics such as burden sharing, and on how different climate gases affect the climate and emissions trading.
- We help design effective climate policies and study how different measures should be designed to reach climate goals.
- We house some of the world's foremost researchers in atmospheric chemistry and we are at the forefront in understanding how greenhouse gas emissions alter Earth's temperature.
- We help local communities and municipalities in Norway and abroad adapt to climate change and in making the green transition to a low carbon society.
- We help key stakeholders understand how they can reduce the climate footprint of food production and food waste, and the socioeconomic benefits of reducing deforestation and forest degradation.
- We have long experience in studying effective measures and strategies for sustainable energy production, feasible renewable policies and the power sector in Europe, and how a changing climate affects global energy production.
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CICERO was founded by Prime Minister Syse in 1990 after initiative from his predecessor, Gro Harlem Brundtland. CICERO's Director is Kristin Halvorsen, former Finance Minister (2005-2009) and Education Minister (2009-2013). Jens Ulltveit-Moe, CEO of the industrial investment company UMOE is the chair of CICERO's Board of Directors. We are located in the Oslo Science Park, adjacent to the campus of the University of Oslo.