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ADAPTATION FINANCING
Strategic options for Africa

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1. Challenges in adaptation funding

1.1 Adaptation needs for Africa

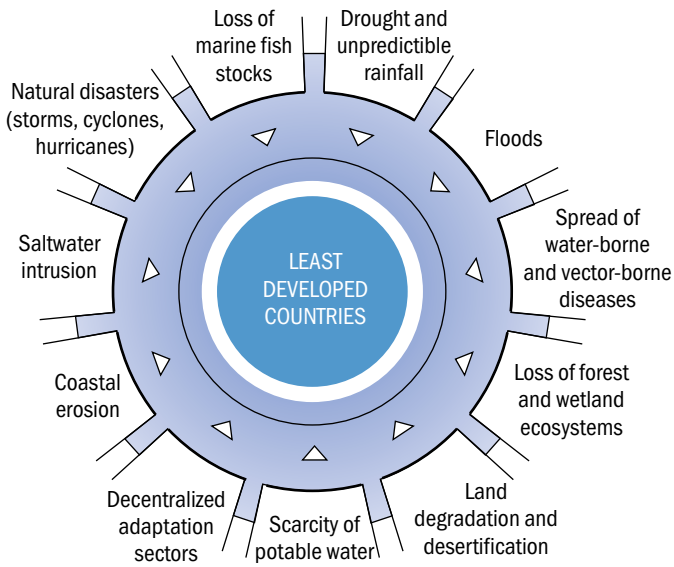
It is well recognized that climate change poses a major threat for African countries due to the climate sensitivity of their economies, high exposure to climate disasters, and limited capacity to adapt. Interactions between the complex climate system and socio-economic pressures such as poverty, ecosystem degradation, and conflicts may undermine the ability of society to adapt to climate change (Boko, Niang, Nyong et al 2007).

In Sub-Saharan Africa, climate change is expected to be an additional stress on economies that are greatly dependent on natural resources and on fragile ecosystems (two-thirds of the region is desert or dry land) that already suffer from frequent droughts and floods. These are projected to increase further with the change in climate. In North Africa, which is the world's driest region, per capita water availability is projected to halve by 2050, even without the effects of climate change. Water scarcity and variability as a result of climate change will threaten agriculture activity which accounts for 85% of the region's water use, affecting food availability and livelihood security (World Bank 2010).

Human health is a major concern as climate fluctuations are linked to many of the prevalent human diseases, which range from cardiovascular mortality and respiratory illnesses due to heat waves to altered transmission of infectious diseases and malnutrition due to crop failures. Climate change will also critically impact flora and fauna in Africa (IPCC 2007), and hence, there is a need to focus on the study and management of terrestrial and marine ecosystems with emphasis on critical habitats, eradication of invasive alien species, and restoration of vulnerable habitats and ecosystems.

As Figure 1 shows, the Least Developed Countries (LDCs) are particularly vulnerable to climate change due to the co-existence of multiple climatic, economic, and environmental stresses. But this figure also indicates that reducing these stresses can help enhance the adaptive capacity to climate change, and hence, points to the extremely close relationship between development and adaptation.

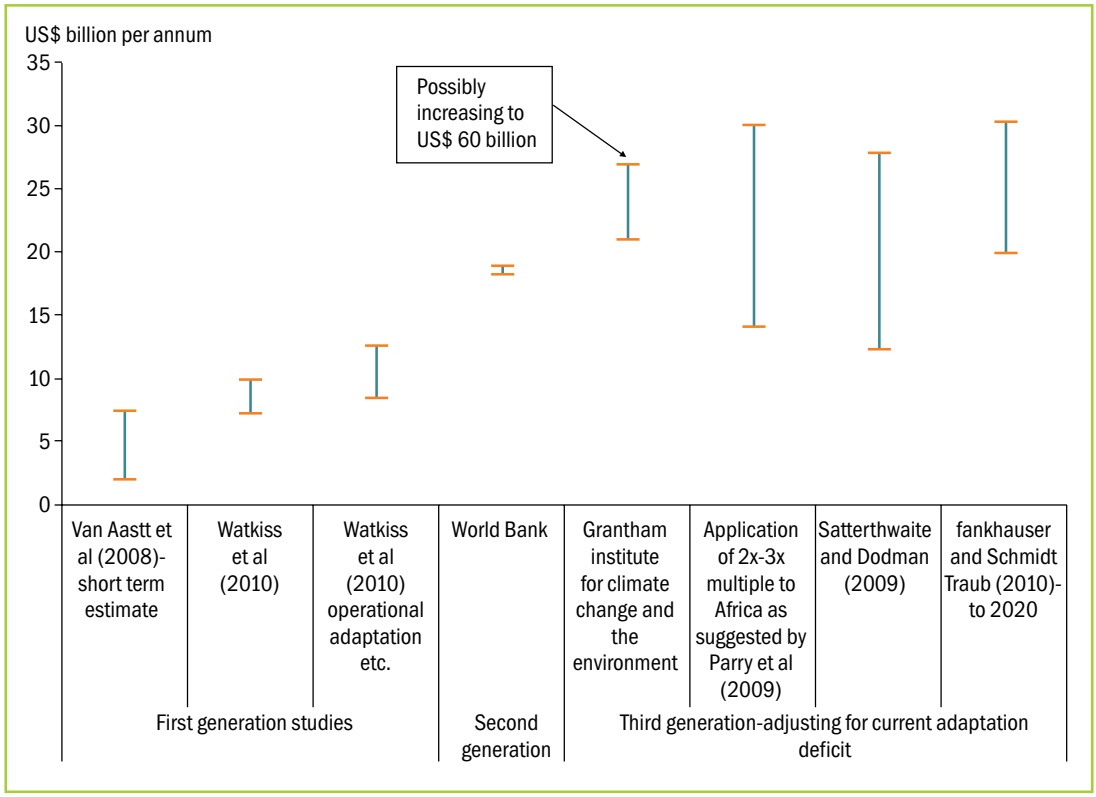
Figure 1. Multiple stresses and vulnerability to climate change in LDCs



Source: UN (2011)

While a lot of adaptation efforts happen autonomously, for instance, farmers modifying cropping practices in response to rainfall, these autonomous adaptation efforts may not be adequate to deal with projected climate change. There is a strong need to fund targeted adaptation efforts and build adaptive capacity. Various studies have attempted to assess the costs of adaptation to climate change in Africa (Figure 2). Recent estimates tend to converge to US$ 20–30 billion per year by 2030 (AfDB 2011). This implies that adaptation costs in Africa represent roughly 30% of the estimated adaptation costs for developing countries (Table 1).

Figure 2. Recent estimates of adaptation costs for Africa (per year by 2030)



Note: World Bank estimate is an average for 2010–50
Source: AfDB (2011)

Table 1. Recent estimates of adaptation costs for developing countries

Assessment	Estimated adaptation costs in developing countries (billion US$ per year)
UNFCCC (2007)	27–66
Parry et al (2009)	(more than) 54–140
Project Catalyst (2009)	25–76
World Bank (2010)	75–100

Source: Fankhauser (2010), World Bank (2010)

1.2 Status of adaptation funding

At the fifteenth Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC), held in 2009 in Copenhagen, industrialized countries set a goal of mobilizing US$ 100 billion per year by 2020 to support mitigation and adaptation activities in developing countries. These countries also collectively pledged

to provide US$ 30 billion in fast start climate finance during 2010–2012. A dedicated Adaptation Fund was operationalized, with funds coming mainly from the sales of Certified Emission Reductions (CERs), i.e., 2% of the value of CERs issued each year for CDM projects. The Adaptation Fund can also accept other sources of funding, including donations from governments, foundations, non-governmental organizations, private corporations, and individuals.

In addition to the Adaptation Fund, adaptation projects are also funded by the Special Climate Change Fund (SCCF), the Least Developed Countries Fund (LDCF),[1] the World Bank's Pilot Program for Climate Resilience (PPCR),[2] and the Strategic Priority on Adaptation of the Global Environment Facility (GEF). As of 31 March 2012, these dedicated funds for adaptation had pledged funding of US$ 1.96 billion, of which US$ 0.58 billion had been approved for funding. By 10 May 2013, the pledged funding for these funds had grown marginally to US$ 2.17 billion, but the amount approved for funding adaptation projects had doubled to US$ 1.15 billion. The largest of these funds is the PPCR, while ***the Adaptation Fund accounts for a small fraction of pledged adaptation funding*** (Table 2).

In Africa specifically, the LDCF is the largest contributor of funding for adaptation. Japan's Fast Start Finance, though not a dedicated fund for adaptation, is a recent entrant with a large contribution: 73% of the adaptation amount approved by this fund is for Africa. The PPCR, despite its large size, is being implemented only in Mozambique, Niger, and Zambia. The PPCR is significant because of its programmatic approach, but has been criticized because it offers loans (not just grants). This is seen both as burdening low income countries and as negating the principle of historical responsibility (Nakhooda et al 2011).

Table 2. Adaptation funding for Africa (in US$ million, as on 10 May 2013)

	Pledged to the fund*	Approved for adaptation	Approved for adaptation in Africa	Disbursed for adaptation in Africa
A. Dedicated funds for adaptation				
Pilot Program for Climate Resilience	1155	374	154	0
Least Developed Countries Fund	606	376	249	86
Special Climate Change Fund	259	170	38	27
Adaptation Fund	152	179	54	16
GEF Trust Fund (GEF 4) — Strategic Priority on Adaptation		47	10	10
Sub-total (A)	2172	1146	505	139
B. Other funds for adaptation				
Japan's Fast Start Finance	15000	168	122	0
UK's International Climate Fund	4640	17	12	0
Germany's International Climate Initiative	1082	120	18	0
GEF Trust Fund (GEF 4)	754	2	0	0
Global Climate Change Alliance	385	104	60	23
MDG Achievement Fund	90	31	11	11
Indonesia Climate Change Trust Fund	21	1	0	0
Sub-total (B)		*443*	*223*	*34*
Total *(A + B)*		*1589*	*727*	*173*

* For funds in list B, the pledged amount includes funds for both mitigation and adaptation
Source: Climate Funds Update Database maintained by Heinrich Boll Stiftung and Overseas Development Institute

1 Both the SCCF and the LDCF are administered by the Global Environment Facility (GEF).
2 The PPCR is part of the Strategic Climate Fund within the Climate Investment Funds.

Table 2 indicates that present funding earmarked for adaptation in Africa amounts to only US$ 0.7 billion. This is a long way off from the US$ 20–30 billion needed annually for adaptation in Africa. The present funding pledged for adaptation worldwide is also to the order of a few billion dollars (with US$ 2 billion pledged to dedicated adaptation funds), compared to about US$ 100 billion needed annually in developing countries.

1.3 Challenges to generating adaptation finance

Clearly, there is an urgent need to increase adaptation funding, but it seems very difficult to do so from existing sources.

While the Adaptation Fund will be operational for at least another commitment period, its main source of funding — CDM revenue — is dwindling and uncertain. As the end of the first commitment period of the Kyoto Protocol in 2012 approached, the market value of CERs (primary CERs of pre-2013 vintage) declined by 32% in relation to 2011 to just under US$ 1 billion, and prices for CERs (to be delivered in December 2012) fell by 62% compared to the previous year (World Bank 2012). ***With lingering uncertainty about post-2012 emission reduction commitments, adaptation funding cannot rely on the share of proceeds from CDM alone.***

Official development assistance (ODA) is also a limited channel for climate finance, given that total ODA[3] amounted to US$ 92.2 billion in 2012 (OECD 2013). Moreover, the economic recession has led to declining aid levels since 2009: even in 2012, net ODA was 1% lower than the previous year in real terms (OECD 2013). The OECD's aid outlook predicts a recovery in 2013 but stagnation thereafter till 2016.

Recognizing these trends, the Adaptation Fund Board set itself a target of raising US$ 100 million between March 2012 and the end of 2013. The High-level Advisory Group on Climate Change Financing, established by the United Nations Secretary-General in 2010, has also reviewed proposals for mobilizing US$ 100 billion per year by 2020 from various public and private sources. The Green Climate Fund has been launched to scale up long-term climate finance to developing countries.

1.3.1 Additionality of public funds for adaptation

One of the challenges with increasing public funds for adaptation is the lack of agreement on what constitutes new funding. It has been argued that this lack of agreement on baselines and additionality stems from a basic lack of trust between donor and recipient countries (Fankhauser and Burton 2011, Stadelmann et al 2010). While donors are concerned about their economic competitiveness and the utilization of funds, recipients are concerned about additionality, predictability, and conditionalities.

Many different definitions of additionality have been discussed. Brown et al (2010) review the following four definitions:

- **Climate finance classified as aid, but over and above the 0.7% of GNP target for ODA**: As mentioned above, given historical trends, this seems quite difficult. In fact, so far it has been quite difficult to even identify the climate finance component of aid. In order to make it possible to identify and track aid flows for climate change adaptation specifically, the OECD now requires donors to apply a new marker while reporting aid statistics (Box 1).
- **Increase over 2009 ODA levels spent on climate actions:** This will favour donor countries which made low contributions in 2009, while setting high benchmarks for donor countries who contributed larger amounts.
- **Rising ODA levels (including climate finance), but climate finance is limited to a specified percentage of ODA (as followed by the United Kingdom):** Unlike targets such as 0.7% of GNP, this baseline means that contributions are not linked to a country's relative capacity to pay, but just become a continuation of their past and current contributions. In other words, this definition does not emphasize adequacy and ambition.

3 From member countries of the OECD's Development Assistance Committee (DAC) and multilateral donors.

- **Increase in climate finance not connected to ODA:** This definition is complicated because it requires that climate funds be separated from development aid at source but then be mainstreamed in implementation.

Stadelmann et al (2010) also review eight baseline definitions. They are of the opinion that the Climate Investment Funds (including the PPCR) do not constitute new and additional resources. They argue that pre-defined projection of business-as-usual development assistance as a baseline will create trust and predictability. In the longer term, the benchmark could be funds from new sources only.

In light of the unresolved debates on the additionality of public funds for adaptation, and the poor outlook for the carbon market, we need to seek other avenues to garner new resources for adaptation.

Box 1. New marker for aid for climate change adaptation

An activity should be classified as adaptation related if it intends to reduce the vulnerability of human or natural systems to the impacts of climate change and climate-related risks by maintaining or increasing adaptive capacity and resilience. This encompasses a range of activities from information and knowledge generation, to capacity development, planning and the implementation of climate change adaptation actions.

An activity is eligible for the climate change adaptation marker if:

- the climate change adaptation objective is explicitly indicated in the activity documentation; and
- the activity contains specific measures targeting the definition above.

Examples of typical enabling activities include:

- Supporting the integration of climate change adaptation into national and international policy, plans, and programmes
- Improving regulations and legislation to provide incentives to adapt
- Education, training, and raising public awareness related to the causes and impacts of climate change and the role of adaptation
- Adaptation related climate research including meteorological and hydrological observation and forecasting, impact and vulnerability assessments, early warning systems, etc.

Examples of eligible sectoral activities include:

- Implementing measures to control malaria in areas threatened by increased incidence of diseases due to climate change
- Promoting water conservation in areas where enhanced water stress due to climate change is anticipated
- Promoting heat and drought resistant crops and water saving irrigation methods to withstand climate change
- Promoting a diverse mix of forest management practices and species to provide a buffer against uncertainties of climate change
- Promoting changes in fishing practices to adapt to changes in stocks and target species; introducing flexibility in the gear that is used, the species that are fished, the fishing areas to be managed, and the allocations that are harvested
- Implementing measures for flood prevention and management such as watershed management, reforestation, or wetland restoration
- Developing emergency prevention and preparedness measures including insurance schemes to cope with potential climatic disasters
- Implementing measures to respond to glacial lake outburst flood risk, such as the creation or improvement of early warning systems and widening or deepening of glacial lake outlet channels

Source: OECD (2010)

2. Proposals to generate climate finance

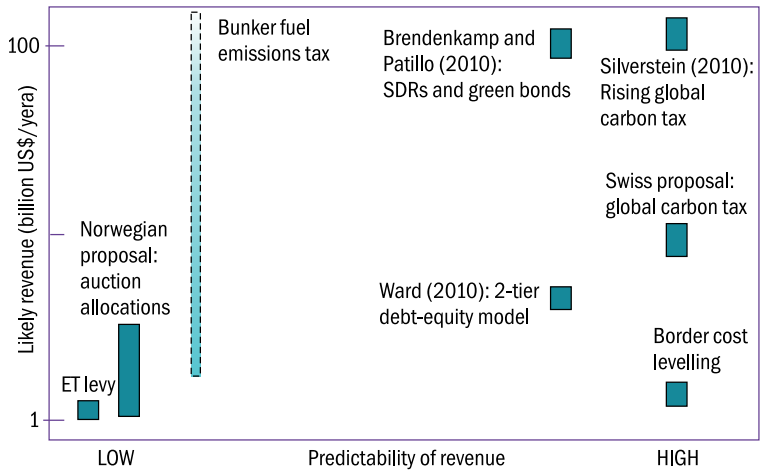
Various proposals have been made in the negotiations and in academic literature to generate new climate finance. But in many of these proposals, the potential revenue heavily depends on the stringency of the mitigation commitments adopted by countries and on the market price of carbon. Figure 3 schematically presents the relative merits of different proposals.

Among the most promising are the Swiss proposal of a global carbon tax, and the variation proposed by Silverstein (2010). The Swiss proposal suggests imposing a global carbon tax of US$ 2 per tonne of CO_2 (with an exemption of 1.5 tonnes of CO_2 per capita for all countries). Such a proposal will ensure that all countries with high *current* carbon emissions are taxed while exempting countries with very low per capita emissions. Since it is based on current and not historical emissions, however, it ***does not conform to the CBDR (common but differentiated responsibilities) approach***. For instance, Europe will be required to contribute only 14% of total revenues under the Swiss proposal, instead of 23% under the CBDR approach. Much of the burden will fall on East Asia, which will have to contribute 33% of total revenues (Hof et al 2011). The advantage of the Swiss proposal is clearly in its predictability as it does not rely on the adoption of mitigation targets by countries. Hence, it is expected to generate US$ 40–50 billion per year (Hof et al 2011).

Similar to the Swiss proposal, Silverstein (2010) also proposed a global carbon tax as an alternative to the unpredictable revenues raised by market-based approaches. It differs from the Swiss proposal in terms of the calculation of the tax rate and the disbursement of the collected revenues. Here, the tax rate is calculated as a fraction of the actual cost to remove carbon from the atmosphere, and the rate is to increase every year during the period 2011–2050. This common tax rate is to be applied to all countries. Part of the collected tax revenues are to be used by each country for internal investments in climate change mitigation and adaptation, while a part — proportional to historical responsibilities and capabilities — is to be transferred to a global climate fund. This is to be disbursed for climate aid based on a set of national climate need factors for each country. This approach is estimated to raise US$ 110 billion per year by 2020.

Another small but new and relatively predictable source of revenue that has been proposed is border cost levelling, i.e., charging for the carbon embodied in the international trade of carbon-intensive commodities, mainly steel and cement (Grubb 2011).

Figure 3. Selected proposals to generate climate finance



Source: Adapted from Hof et al (2011) and other sources specified in the figure

Another new source of finance draws on the reserve assets maintained by developed countries (Brendenkamp and Patillo 2010). These reserve assets include Special Drawing Rights (SDRs) created by the International Monetary Fund (IMF) in 1969 as an alternative to maintaining reserves in the form of gold and US dollars. SDRs are allocated to countries in proportion to their IMF quotas, and can be exchanged for freely usable currencies. Brendenkamp and Patillo (2010) propose that developed countries can contribute their SDRs to capitalize a central climate fund. In exchange, they would receive equity stakes in the fund. Further, this initial capital can be used to leverage resources from private and official investors by issuing low cost 'green bonds' in global capital markets. This idea is estimated to raise US$ 100 billion per year by 2020, and hence, scores high on both adequacy and predictability of revenue.

The bunker fuel emissions tax is a proposed tax on international aviation and shipping emissions. If the tax rate is equivalent to the global carbon price, the resulting revenues from this source will be tied to the performance of the carbon market and hence, to national mitigation commitments. Consequently, as Figure 3 shows, the estimated revenues from this proposal are quite uncertain, ranging from as low as US$ 17 billion per year to as high as US$ 111 billion per year (Hof et al 2011).

An aviation tax has also been implemented by the European Union. The report of the UN High-Level Advisory Group on Climate Change Financing estimated that carbon pricing of international transport can raise US$ 10 billion annually without burdening developing countries (AGF 2010). Theoretically, specific sectoral taxes are always less efficient than a comprehensive carbon tax (due to the deadweight loss generated), but they do offer a good opportunity to apply the 'polluter pays' principle and to internalize the external environmental costs of aviation. Such a tax, however, is only imposed on current emissions and cannot take into account historical responsibilities (Dasgupta et al 2011). It also needs to be applied carefully so that it does not dampen traffic to and from developing countries (e.g., tourism flows to Africa), and also within developing countries with poor road or rail infrastructure.

A global financial transaction tax has also been long discussed. Such a tax is meant to discourage speculative financial transactions, and also raise funds for a variety of economic and environmental purposes. The share of revenues for funding adaptation to climate change would need political agreement internationally. Also, just as with the aviation tax, there have been concerns that it should not negatively impact the growing economies of developing countries.

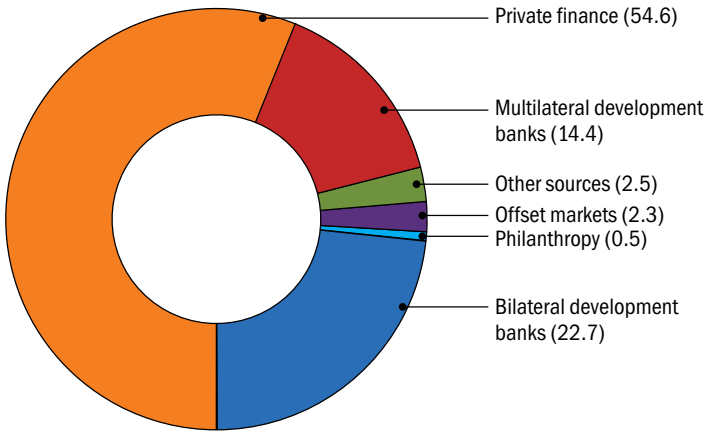
The Norwegian proposal of auctioning 2% of Annex I countries' emission allocations is estimated to generate relatively low revenues of US$ 3–26 billion per year (Hof et al 2011). The report of the UN High-Level Advisory Group on Climate Change Financing considered the auctioning of emission allowances to have a very promising potential (AGF 2010). However, these revenues also depend on the price of carbon, and last year, the price of EU allowances (to have been delivered in December 2012) fell by 50% compared with the previous year, mainly due to excess supply in the EU emissions trading system (World Bank 2012). This indicates the fragility of such revenue sources.

Given the above, possibly the best effort to generate long term, scalable climate finance for both mitigation and adaptation is given in the Green Climate Fund (GCF). The Fund will contribute to the achievement of the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC). The GCF was established at COP 16 (decision 1/CP.16) as an operating entity of the financial mechanism of the Convention under Article 11. The GCF is envisaged to support projects, programmes, policies, and other activities in developing countries. The Fund will be governed by the GCF Board. Parties at COP 18 endorsed the consensual decision of the GCF Board to select Songdo, Incheon, Republic of Korea, as the host of the GCF.

3. Approaches to raise private finance

In addition to flows that depend on public money or on carbon markets, private sources can be tapped to meet climate finance needs. Buchner et al (2011) estimated that close to US$ 100 billion was already committed for "low-carbon, climate-resilient activities" in developing countries, and that more than half of this funding came from private sources (Figure 4). Admittedly, this estimate can be questioned on the grounds of additionality. For instance, it uses a very wide definition of relevant projects (including railways) that might have happened anyway. Also, the bulk of the finance (US$ 74–87 billion of US$ 97 billion) takes the form of equity or loans that have to be repaid — not grants. And US$ 4 billion went for adaptation related projects; US$ 93 billion was spent on mitigation related projects. Despite these caveats, this figure highlights the marginal contribution of carbon markets and the very significant potential contribution of the private sector.

Figure 4. Climate finance flows to developing countries in 2009–10 (in US$ billion)



Source: *The Economist* (2011), with data from Buchner et al (2011)

The challenge of attracting private finance for adaptation is to address climate goals while meeting investors' expectations. Risk is the critical issue because of which the cost of capital becomes very high. But all types of adaptation projects are unlikely to generate sufficient returns. Private capital can be attracted to invest in adaptation, provided that the associated risks are managed. This means that ***new approaches and models are needed to attract private capital to invest in adaptation***. Moreover, ***no single approach will work for all types of adaptation projects***.

First, private players are less interested in small disaggregated projects because of the high transaction costs. Here, host country governments can play an important role by providing incentives and acting as aggregators. They can further help de-risk such investments by offering credit guarantees (or addressing currency exchange rate risks) (Ward 2010, Holm 2010). In the mitigation context, a useful success story is offered by solar energy parks, funded by the Clinton Climate Initiative in the Indian states of Gujarat and Rajasthan. The regional governments lease out the land and supporting infrastructure for clusters of solar power plants to individual developers. These developers are free to finance the project according to their own preferences, but being part of such a solar park reduces the risks and hence, the cost of accessing debt for them (Ward 2010). Another example in the context of mitigation is the fund established by the Economic Community of West African States (ECOWAS) to purchase carbon credits upfront to provide start-up capital for domestic small- and medium-sized enterprises and NGOs.

Second, recessionary pressures pose challenges but also offer some new avenues. For instance, long-term investors (such as pension funds, insurance funds, and sovereign wealth funds) are seeking new investment avenues in

infrastructure that can offer stable returns (Holm 2010). These investors could be induced to invest in infrastructure for clean water, sustainable transport, irrigation, or clean energy.

Third, private equity could be raised to leverage debt finance — as is being done for infrastructure funds for international airport construction in developing countries (Ward 2010). It should be noted that according to this proposal, the debt finance is to be raised from local financial institutions in developing countries themselves, which may be a constraining factor for African countries with less developed financial sectors. Ward (2010) estimates that a two-tier fund with a top fund that uses public and private money to seed debt funds, with "de-risking" commitments offered by public sector bodies, can raise US$ 25 billion per year in climate finance.

However, drawing lessons from the EU funding programmes for Eastern European countries that were candidates for accession, Przyluski and Hallegatte (2010) caution that leveraging private funding for adaptation is not straightforward. If climate finance is used to fund only the very small incremental costs of adaptation measures, that money may be insufficient to leverage other private sources of funding. This means that there should not be insistence on very strict distinctions between adaptation and development measures, especially in African countries, for whom the links between sustainable development and building adaptive capacity are very strong.

Fourth, climate finance can be promoted through local financial intermediaries to increase the financing for smaller adaptation projects. This is discussed in detail in the next section.

3.1 Risk management for mobilizing private capital

The concept of risk is dynamic, and the financial mechanism to address and mitigate these risks is also a dynamic concept (Box 2).The risk of implementation of adaptation projects or programmes can be analysed by categorizing the types of risk as follows:

3.1.1 Characterization of risk

From IPCC[4] to the Stern Report[5] we have found that the risk of inaction is large. However, there are risks associated with action as well, and for a simple understanding of these risks, three broad categories are drawn up which are given below:

- **Primary risk:** This is the risk taken when an action is done for the first time, or in other words, when there exists no precedents of that action. This kind of risk is best borne by grants or public finance. In the context of climate change adaptation this risk is best addressed by public finances from developed countries.
- **Implementation risk:** This can be taken up quite simply by the implementing authority, and can be well managed by the private sector or private finance, or even community finance. This can also be undertaken by local entrepreneurs.
- **Consequential risk**: This is the risk of the consequences of implementation. Even if the implementation of an adaptation project has happened in exact accordance with a plan, the consequences may still not be along the expected lines. Normally, such risks, especially on a large scale within a nation state, are borne by the sovereign, or via public resources. These public resources are normally provisions such as a disaster management fund. On a smaller scale these are addressed through insurance mechanisms, especially when risks are diversifiable or where insurance pools can be formed, such as typical life or health insurance. Insurance is normally for a high risk, low probable event as a risk mitigation method. In case of low risk but high probable events, such as crop yield fluctuations due to weather changes, these kinds of consequential risks can be borne by financial derivatives, sometimes called weather derivatives; such risks can also be mitigated by commodity options and future contracts (Bose 2011).

4 IPCC (2012).
5 Stern Review (2006).

Box 2. Risk mitigation through public finance as a dynamic strategy: The case of renewable energy in India

Time period 1

- Policy Tool: Public Finance and accelerated depreciation
- Implication => boost investment in renewable energy
- Risks borne by developers is of implementation; result: fit windmills
- Risks borne by government are consequential; result: electricity generation
- In this time period experience is gained to move into the second stage.

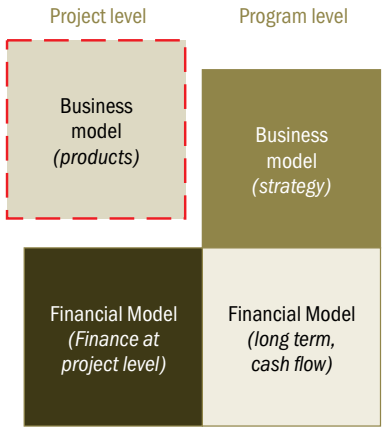
Time period 2

- Policy Tool: Public Finance becomes limited
- Wind developers who do not produce power to the grid will be moved out
- Private finance => boost power production
- Consequential risk has been eliminated

3.1.2 Financial gradients approach

Figure 5 illustrates the complex bottom-up and top-down interactions in implementing projects that can promote climate change adaptation and sustainable development.[6] The top level is called the programme level (such as an implementing or coordinating agency); the bottom level is the project level (such as a local technical centre, NGO, or entrepreneur). We also distinguish between the financial model and the business model because the end user is not necessarily the person who pays for the product, and even if the end user pays for the product, a substantial amount has to be paid by other financial sources.

Figure 5. Interaction of business and financial models in implementing adaptation or sustainable development projects



Financial gradients can be thought of in three different ways, as depicted in the three boxes which are attached to each other in Figure 5.

- **Financial model (Programme level):** This is the stage where analysis of financial flows in programmes in the sustainable development or adaptation space is undertaken. It can come up with key financial indicators which can point towards the overall health of the programme.

6 The diagram is a pictorial depiction of the financial gradients method. This structure has been developed from stakeholder consultations of the management team of Lighting a Billion Lives initiative coordinated by TERI in India.

- **Financial model (Project level):** This can be thought of as the stage where the financial gradients method acts as a tool by which individually volatile sources of finance can be combined together to generate a single long term and stable inflow of finance to fund the project in sustainable development or adaptation.
- **Business model (Programme level):** This is the strategic stage of the concept which is a financial mechanism helping to create long-term strategies with the help of both business and financial models to sustain the programme or project.

The one box left outside the ambit of financial gradients is the project level business model. This is because at that level the decision has to be taken at the local level and generic solutions are probably not advisable.

This framework can help in mitigating implementation risk, and to some extent, primary and consequential risks. This also paves the way for formally articulating process maps which are important in service or product delivery. This will help in increasing efficiency and streamline financial resources effectively.

However, the financial gradients approach cannot fully address the context of uncertainty, which is intrinsic to climate change impacts and adaptation.[7] The next section discusses the real options approach, which aims to enable decision making under uncertainty. It has been applied to mitigation projects, but can also be a useful new approach for adaptation finance.

3.1.3 Real options for adaptation

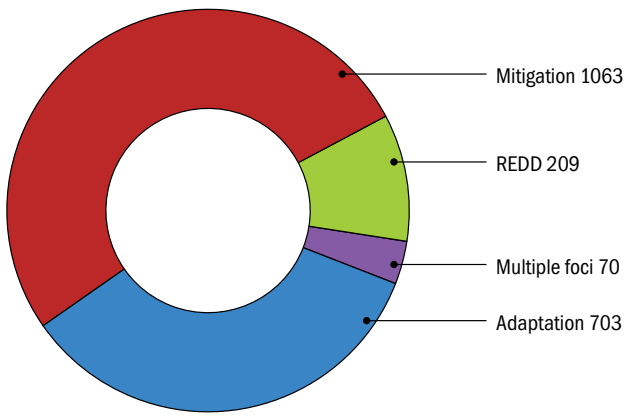
Real options analysis can be applied by investors to choose between alternative projects or programmes (Dixit and Pindyck 1994). The process of decision making involves the creation of a choice set of climate actions, and then choosing specific climate actions for evaluation and cost calculations. Whether it is mitigation or adaptation or a climate action with co-benefits in both, they all have to be first evaluated in terms of costs. These costs can be analysed to determine whether a project should be undertaken immediately or if waiting is preferable, what the scale of a project should be, or when it becomes worthwhile to abandon it. The advantage of this method is that it takes uncertainties into account while evaluating options. Unlike traditional approaches of economic and financial theory, an ex ante valuation can be done to determine the value of waiting, of changing paths, or of changing the technological parameters of a project. Though the real options approach needs to be applied with care (Maybee et al 2012), it is a promising approach for a financial mechanism for adaptation that needs to harness funds from multiple levels and sources.

4. Accessing adaptation funding in Africa

Despite tremendous attention on adaptation funding, the progress of actually funding adaptation projects is still lagging behind mitigation. Adaptation projects account for only 18% of the amounts approved by climate funds worldwide (US$ 1.59 billion out of US$ 8.96 billion), 34% in Sub-Saharan Africa (Figure 6), and less than 8% in North Africa and the Middle East.

Figure 7 shows that the bulk of adaptation funding is going to the countries of Western and Eastern

Figure 6. Focus of climate funding in Sub-Saharan Africa (in US$ million, as of 10 May 2013)

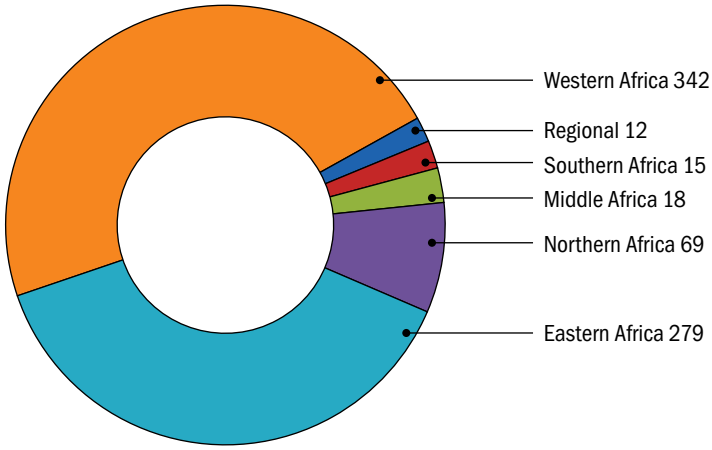


Source: Climate Funds Update database maintained by Heinrich Boll Stiftung and Overseas Development Institute

7 Box SPM.2, Treatment of Uncertainty in IPCC (2012).

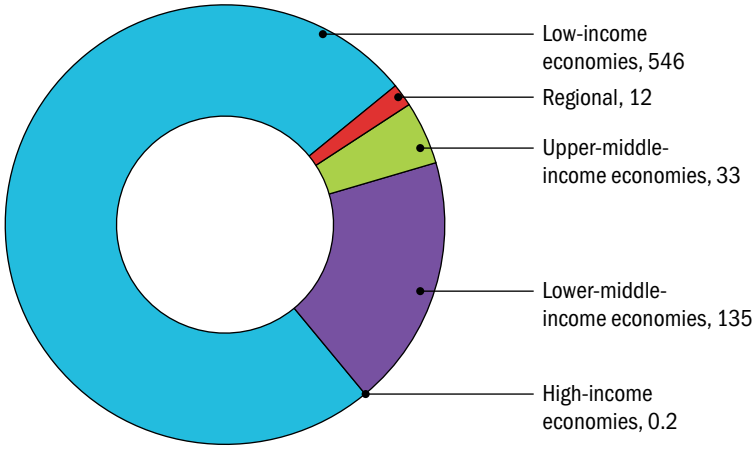
Africa, while Figure 8 shows that in terms of the income levels of countries, 75% of adaptation funding in Africa is being directed at low income economies.

Figure 7. Regional distribution of adaptation funding in Africa (in US$ million, as of 10 May 2013)



Note: Regional category refers to regional projects for Sub-Saharan Africa.
Source: Climate Funds Update database maintained by Heinrich Boll Stiftung and Overseas Development Institute

Figure 8. Distribution of adaptation funding in Africa by income level of countries (in US$ million, as of 10 May 2013)



Note: Regional category refers to regional projects for Sub-Saharan Africa.
Source: Climate Funds Update database maintained by Heinrich Boll Stiftung and Overseas Development Institute

As of May 2013, the Adaptation Fund had approved funding for 27 projects, with a value of US$ 178 million, of which US$ 52 million had been disbursed. Africa is the region with the highest number of submitted proposals, but compared with Asia and Latin America and the Caribbean, it had a relatively ***low percentage of proposals converted to full approved projects***. This indicates the need for ***capacity building of implementing entities***, e.g., gaining experience on the criteria applied by the Adaptation Fund.[8]

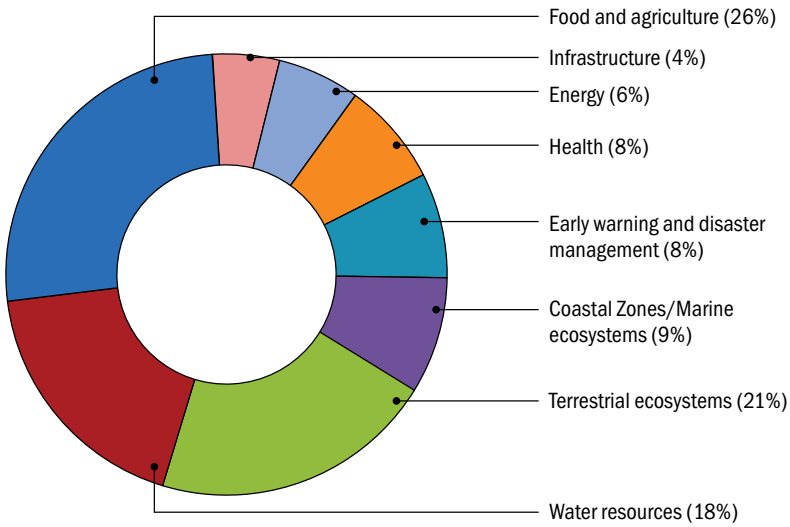
Second, African countries should aim to get ***more national or regional implementing agencies*** accredited by the Adaptation Fund to carry out adaptation projects and programmes. So far, Africa has one multilateral entity (African

8 But a confounding factor may be the difficulty of establishing the distinction between proposed adaptation projects and ODA-supported development efforts.

Development Bank), one regional entity (Western African Development Bank), and national entities from five countries (Senegal, Benin, South Africa, Rwanda, and Kenya). The experience with Clean Development Mechanism (CDM) projects indicates that increasing the number of such entities is important for gaining experience, attempting new types of projects, increasing competition, and reducing transaction costs.

Third, there is a need to develop a ***pipeline of priority projects in vulnerable sectors***. An analysis of 378 projects identified in the National Adaptation Programmes of Action (NAPAs) of least developed African countries reveals that more than half focus on the agriculture and water resources sectors (Figure 9). All the projects funded by the Adaptation Fund in Africa are in the agriculture or coastal sectors (Table 3). Though health is a critical area of concern in the light of climate change, it is relatively less represented in the NAPA proposals. While this can be taken as a reflection of the fact that different types of adaptation needs can be met from different sources of funding (so that interventions in health or sanitation can continue to be funded by ODA), there is a need to formulate priority projects for funding.

Figure 9. Sectoral distribution of projects identified in NAPAs from Africa



Source: UNFCCC (2012)

Table 3. Sectoral and geographical distribution of projects funded by the Adaptation Fund

Country	Amount approved (US$)	Sector
Eastern Africa	**30,412,135**	
Djibouti	4,658,556	Agriculture
Eritrea	6,520,850	Agriculture and water resources
Madagascar	5,104,925	Agriculture
Mauritius	9,119,240	Coastal
Tanzania	5,008,564	Coastal
Northern Africa	**6,904,318**	
Egypt	6,904,318	Food security
Western Africa	**16,422,605**	
Mauritania	7,803,605	Food security
Senegal	8,619,000	Coastal

Source: Adaptation Fund website www.adaptation-fund.org (accessed on 24 May 2013)

Fourth, African countries could ***target the financing window for small-size projects and programmes*** in the Adaptation Fund, which has not been used yet. Small-scale projects do offer design challenges but are invaluable for building adaptive capacity at the local level.

Fifth, it has been recognized that LDCs face information bottlenecks and procedural complexities in accessing the LDCF. The ***GEF can improve the flow of information*** and make available standard guidelines (UN 2011).

5. Key strategies and options for African negotiators

Raising funds

- Upfront commitments from developed countries are urgently needed. African negotiators should continue to lobby for increased financial contributions by countries with historical responsibility, particularly those not meeting the 0.7% GNP aid target. They can also support proposals which are expected to generate predictable and high levels of funds, such as the Swiss proposal of a global carbon tax and the possibility of using reserve assets such as IMF SDRs.
- Intra-regional flows of finance can supplement existing public (Annex I and multilateral) adaptation funds and be used to secure more private finance. One option is the Africa Green Fund proposed by the AfDB, which can include contributions from African countries.

Accessing a range of funding sources to scale up adaptation

- A range of different types of adaptation projects is needed in Africa — capacity building, policy mainstreaming, building new infrastructure (e.g., for water or mobility), improving access (e.g., to clean energy and water), providing social services (e.g., health and education), managing natural resources (e.g., wetlands and mangroves), etc. These can be funded by different types of funding sources by attempting to match motivations and expectations.
- Social sector aid constitutes the largest component (40%) of aid to Africa. It includes education, health, water, and sanitation. In fact, even though overall aid declined in 2011, aid for water and sanitation increased (OECD 2012). Development aid can be used to continue to fund health and education for improving local adaptive capacity to climate change.
- Building institutional capacity for policy mainstreaming or creating an enabling environment will take time. A continuing programme of building policy capacity can be funded by donors (e.g., through the PPCR).
- Infrastructure can be funded by the private sector but can be treated and funded differently since it will generate returns for investors more readily than (say) drought resilience programmes.
- Climate change adaptation and development are very strongly linked for Africa. Typically in this context, capacity building projects are funded rather than "hard" adaptation projects (Fankhauser and Burton 2011). But considerations of project additionality and precise definitions of incremental cost should not become barriers to funding adaptation interventions. Instead, Africa should look to a variety of funding sources to meet different types of adaptation needs and to scale up present adaptation projects. Unlike CDM, where a loose definition of additionality would mean leakage of GHG emissions (since CDM credits offset Annex I mitigation), adaptation projects should be seen as win-win options.

Managing risks to attract private capital

Government bodies can act as aggregators and provide credit guarantees for small-scale projects that are crucially important for building local resilience but are not taken up due to high transaction costs. Another way of managing risks for private capital is through a 'fund of funds' approach. Such a fund can use equity to invest in a portfolio of funds, which in turn invest in a diverse range of projects (Nassiry and Wheeler 2011). While this approach has

been implemented for mitigation (in the UK Innovation Investment Fund, California Green Wave Initiative, and California Clean Energy Fund), the same logic can work for adaptation also.

Host country governments can also play an important role in supplementing adaptation projects with insurance (e.g., Pakistan's mandatory state-subsidized flood insurance) that is backed by donor money (e.g., Turkey Catastrophe Insurance Pool).

Offering a pipeline of projects

- Targeted adaptation investments (AfDB 2011) may make more sense when institutional capacity for policy mainstreaming is low (Przyluski and Hallegatte 2010). African countries need to generate a pipeline of pilot adaptation projects, perhaps by groups of countries together.
- A pipeline of projects is also important for getting projects funded in priority sectors with high vulnerability to climate change, such as health, water, and ecosystems. (In this context, a parallel can be drawn to science and technology policies adopted by late starters such as Korea: in order to catch up with science and technology leaders such as the United States and Japan, the Korean government explicitly identified priority technologies with targets and timetables.)

Appendix

A list of countries included for sub-regional analysis is given below:

Eastern Africa	Northern Africa
Burundi	Algeria
Comoros	Egypt
Djibouti	Libya
Eritrea	Morocco
Ethiopia	South Sudan
Kenya	Sudan
Madagascar	Tunisia
Malawi	Western Sahara
Mauritius	
Mayotte	**Southern Africa**
Mozambique	Botswana
Réunion	Lesotho
Rwanda	Namibia
Seychelles	South Africa
Somalia	Swaziland

Uganda	
Tanzania	**Western Africa**
Zambia	Benin
Zimbabwe	Burkina Faso
	Cape Verde
Middle Africa	Cote d'Ivoire
Angola	Gambia
Cameroon	Ghana
Central African Republic	Guinea
Chad	Guinea-Bissau
Congo	Liberia
Democratic Republic of the Congo	Mali
Equatorial Guinea	Mauritania
Gabon	Niger
Sao Tome and Principe	Nigeria
	Saint Helena
	Senegal
	Sierra Leone
	Togo

Source: United Nations website http://unstats.un.org/unsd/methods/m49/m49regin.htm#africa

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