



GREEN
CLIMATE
FUND

Analysis of the Expected Role and Impact of the Green Climate Fund

GCF/B.09/06

28 February 2015

Meeting of the Board

24-26 March 2015

Songdo, Republic of Korea

Agenda item 8



Recommended action by the Board

It is recommended that the Board:

- (a) Take note of the information presented in document GCF/B.09/06 *Analysis of the Expected Role and Impact of the Green Climate Fund*; and
- (b) Adopt the decision presented in Annex I to this document.

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Analysis of the Expected Role and Impact of the Green Climate Fund

Executive Summary

I. Introduction

1. At its eighth meeting, the Board requested the Secretariat to analyze the expected role and impact of the Green Climate Fund (the Fund) in its initial results areas and present options for determining investment portfolios across the structure of the Fund based on the resource level outcomes of the initial resource mobilization process.
2. Furthermore, the Board requested the impact analysis of the Fund's initial results areas to focus on, inter alia:
 - (a) The identification of appropriate types of investment opportunities in the Fund's results areas that can achieve a paradigm shift towards low-emission and climate-resilient pathways; and
 - (b) What impacts the Fund can/will generate in (each of) the initial result areas that would advance the Fund's initial investment criteria and sub-criteria, and are not currently being adequately supported by existing finance channels.
3. This document presents an executive summary, a draft decision for the Board's consideration (Annex I), and the above-mentioned detailed analysis and findings (Annex II).

II. Approach

4. This impact assessment considers opportunities for the Fund to maximize its impact in the agreed results areas. These eight results areas (presented in Figure 1) are derived from decision B.07/04, paragraph (b), which details the intended Fund-level impacts for mitigation and adaptation. It seeks to provide an analytical basis by which the Fund can develop a strategic approach to programming and portfolio development.
5. The assessment considers the following factors:
 - (a) Emission reduction potential;
 - (b) Adaptation costs and needs;
 - (c) Level of poverty and vulnerability;
 - (d) Co-benefits;
 - (e) Cost efficiency;
 - (f) Current programming priorities of existing sources of climate finance, particularly other climate-related funds; and
 - (g) The potential to catalyse private sector investment.
6. It is based on an extensive literature review and analysis of key information relevant to the Fund's results areas, including registered nationally appropriate mitigation actions (NAMAs), national adaptation programs of action (NAPAs), and technology needs assessments (TNAs). It was complemented with inputs and guidance from representatives of United Nations Framework Convention on Climate Change (UNFCCC) secretariat supporting the thematic

bodies,¹ Board members, as well as experts from civil society, think tanks and the private sector, including the Private Sector Advisory Group (PSAG).

7. The impact assessment complements the three central elements of the Fund’s programming process, namely:

- (a) Country-driven programming;
- (b) The investment framework, which lays out the criteria against which proposals will be considered; and
- (c) The results management framework, which sets out the metrics by which the results and impact will be monitored and assessed.

8. The analysis of global opportunities through which the Fund can make a difference is to be considered in the context of the imperative to ensure that the Fund’s investments respond to country circumstances, needs and priorities, as well as practical considerations such as accredited entities’ capacity and ability to deliver. The “sweet spots” between national priorities, potential to deliver concrete climate benefits, and opportunities to deliver co-benefits are to be sought. Section VI briefly reflects on the implications of this analysis for portfolio development.

9. As country programming and operational work proceeds, the Secretariat and its stakeholders will gain a better grasp of these crucial issues, and collect useful feedback.

10. The findings of this exercise are necessarily preliminary, and limited by available data. Furthermore, the considerations that underpin this analysis are dynamic and shaped by the evolution of technologies (and their costs), markets, national economic trajectories and policies. The analysis nevertheless identifies potentially high value areas of investment for the Fund, around which focused efforts can be made to both support country programming and steer investment.

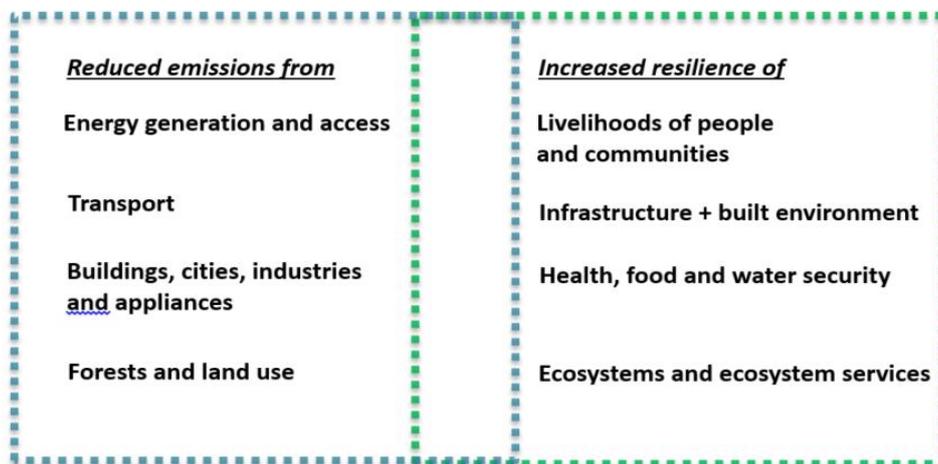


Figure 1: Expected results areas of the Fund.

III. Overview of mitigation and adaptation potential

11. Figure 2 summarizes the best available estimates of global mitigation potential until 2030 from the four mitigation results areas, taking both cost considerations and regional potential into account. Each pie chart relates to a result area of the Fund, and its size roughly indicates mitigation potential; the colouring of the pie chart indicates the opportunities by region. The placement of the pie chart indicates how expensive it is, as the axes represent

¹ The Adaptation Committee, the Technology Executive Committee, and the Climate Technology Centre and Network.

estimates of lifetime and upfront costs. Options in the lower left corner of Figure 2 (Cities, buildings, industries and appliances; forestry and agriculture) may therefore be relatively more cost-effective.

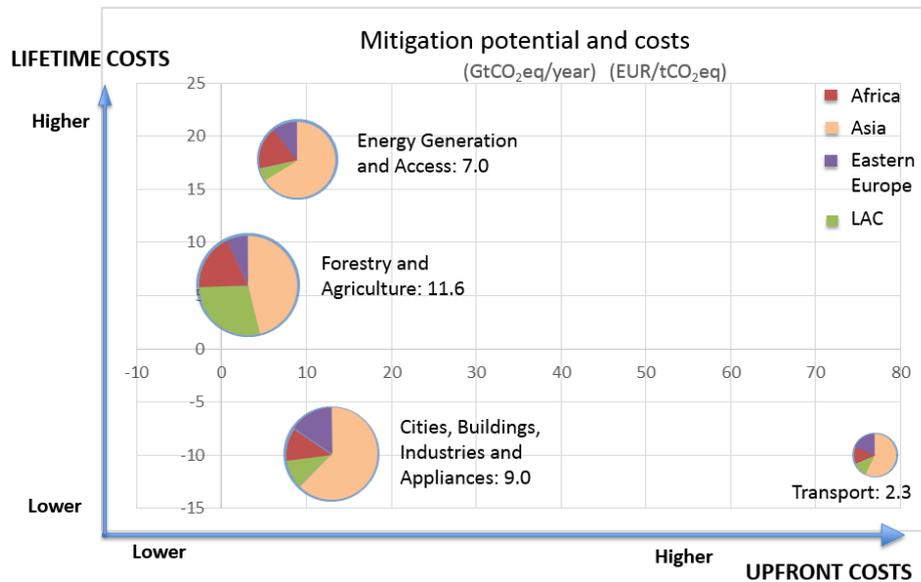


Figure 2: Estimated mitigation potential and costs.

Abbreviation: LAC = Latin America and Caribbean. GtCO₂eq = gigatonnes of CO₂-equivalent. Based on data from the Global Greenhouse Gas abatement cost curve (2013)

12. Adaptation potential cuts across expected results areas and intertwines with wider sustainable development objectives. It is widely acknowledged that the poorest people and poorest countries may be least able to deal with the impacts of climate change. Potential economic and financial losses, however, may be greatest where significant existing economic assets are exposed to climate induced risk.

13. As shown in Figure 3, vulnerability to climate change is inversely proportional to sovereign risk rating and prosperity. The costs of adaptation as a share of gross domestic product (GDP) will be the highest by far for countries in sub-Saharan Africa and small island developing states (SIDS) (see Figure 4). According to these figures, Africa, with one seventh of the world's population, may be poised to bear nearly 50 per cent of estimated global adaptation costs in water supply, human health, agriculture and forestry. Loss of life and of GDP are also projected to be the highest in least developed countries (LDC) and SIDS.²

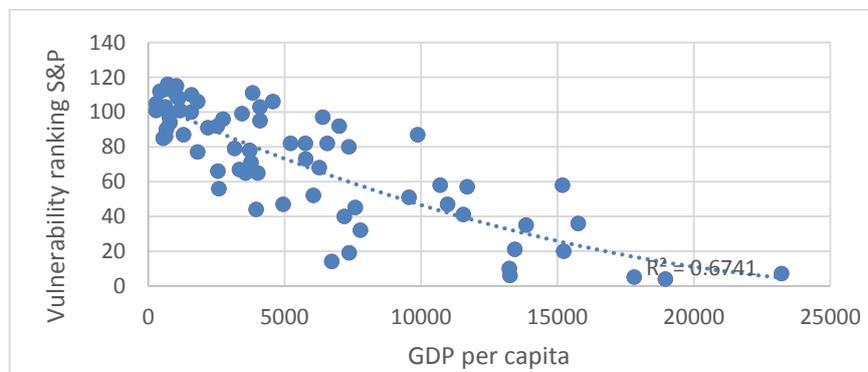


Figure 3: Prosperity and vulnerability to climate change.

Source: Standard & Poor's, "Climate Change is a Global Mega-Trend for Sovereign Risk", *CreditWeek* vol. 34. No. 20 (2014)

² World Bank. *Economics of adaptation to climate change - Synthesis report*. (Washington, DC, 2010).

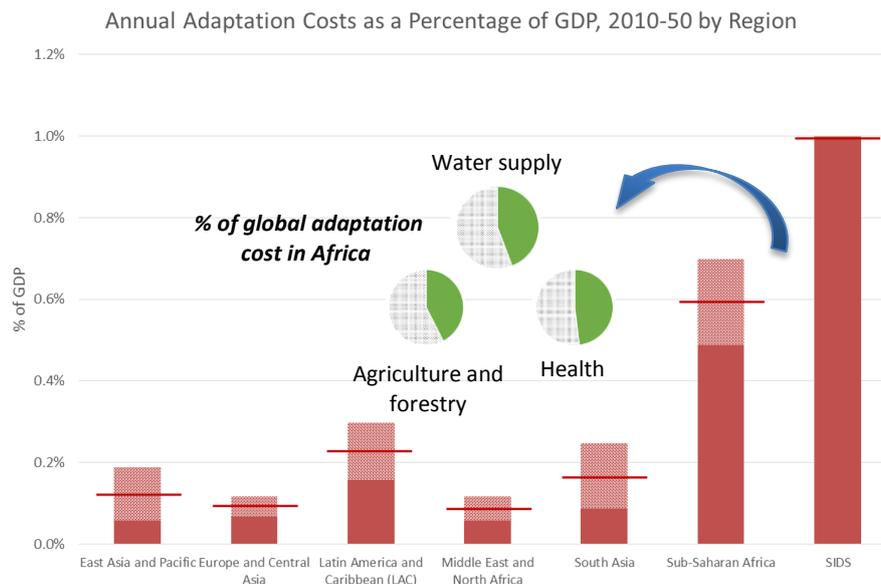


Figure 4: Costs of adaptation to climate change.

Source: World Bank, *Economics of adaptation to climate change*, 2010.

14. The 2013 Global Assessment Report for Disaster Risk Reduction reports that approximately 5 per cent (US\$ 4 trillion) of annual global GDP is at risk from climate change in any given year.³ Insurers are taking note of these risks: Allianz SE reports numbers as high as 30 per cent for some countries; and Munich Re declared US\$ 124 billion of reported asset losses in 2013 due to climate related natural catastrophes.

IV. The Private Sector Facility proposed approach

15. The private sector has focused on financing “supply side” solutions to climate change to date: 78 per cent of climate finance has supported renewable energy in 2013 (see Annex II, section 4.2, figure 23).

16. The world’s population is projected to grow to 9.6 billion by 2050,⁴ implying a significant increase in the demand for energy. In order to achieve global mitigation targets, not only will energy production need to be made more efficient in terms of carbon dioxide (CO₂), but energy consumers will need to use significantly less energy than they do today. This demand reduction will need to be achieved both by encouraging behavioural changes in consumers and by increasing energy efficiency in buildings and transportation, which combined received only 17 per cent of climate finance flows in 2013. The Private Sector Facility (PSF) can amplify its mitigation impact by finding innovative ways to scale up increased supply of clean energy, while also mobilizing private sector activity on the demand side in order to trigger more efficient energy use, and more climate-compatible business practices.

17. Projected population growth will also cause significant stresses on natural resources such as land and water. The PSF can therefore seek opportunities through which to mobilize private sector activity in agriculture and forestry in order to increase the efficiency with which these sectors use both energy and increasingly scarce natural resources. By doing so, the Fund will contribute to both climate change mitigation impacts, as well as in adaptation by increasing the resilience of people, communities and ecosystems that operate in these sectors to a

³ United Nations Office for Disaster Risk Reduction, *From Shared Risk to Shared Value – The Business Case for Disaster Risk Reduction. Global Assessment Report for Disaster Risk Reduction* (Geneva, 2013).

⁴ Rakesh Kochhar, “10 projections for the global population in 2050”, 3 February 2014. Available from <<http://www.pewresearch.org/fact-tank/2014/02/03/10-projections-for-the-global-population-in-2050/>>.

changing climate. The PSF can tailor its investments to deliver mitigation and adaptation results in rural and urban-based activities, taking an integrated cluster-based approach, outlined in Figure 5, to maximize its impact:

- (a) In urban areas, the PSF may support the Fund’s efforts to create climate-compatible cities, particularly by mobilizing private investment in public transport, waste management and waste-to-energy, as well as in smart buildings and city grids. The PSF would seek to fund initiatives that are cross-cutting, scalable, and can attract capital market financing; and
- (b) In rural areas, the PSF may focus on mid-scale alternative energy, forestry and agriculture. The PSF could fund initiatives that take a programmatic approach, that are replicable, and financed through clubbed investments.

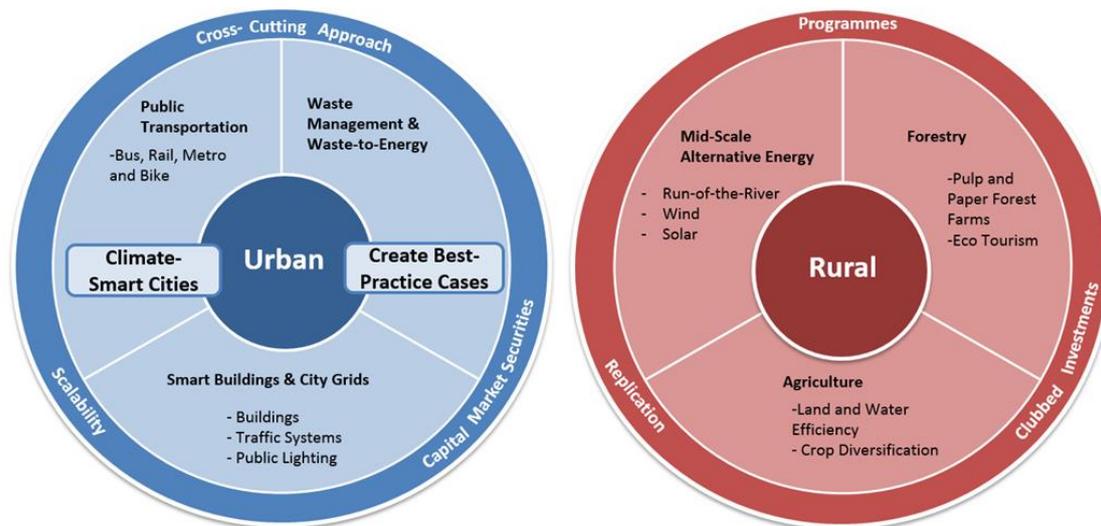


Figure 5: Urban and rural approach

V. Potential strategic investment priorities

18. Figure 6 summarizes the results of the analysis of the potential for the Fund to make a contribution in each of the eight results areas. It is derived from the in-depth analysis presented in Annex II. The assessment considered:

- (a) The potential in each of the eight agreed results areas of the Fund and by region (emission reduction potential, and adaptation costs and needs, level of poverty and vulnerability);
- (b) Co-benefits and cost efficiency; and
- (c) The value that the Fund might be able to add, particularly in the light of the programming priorities of other existing climate-related funds⁵ and the potential to catalyse private sector investment.

19. The assessment is conducted using a combination of qualitative judgment and quantitative analysis. No specific weights are assigned to the various factors (all the factors are considered equally).

20. Each result area is displayed along a gradient according to its mitigation or adaptation potential, distinguished by region. Areas on the left-hand side in dark green have strong potential. Areas on the right-hand side present relatively smaller prospects for the Fund, but

⁵ Including the Global Environment Facility, the Adaptation Fund and the Climate Investment Funds.

could be pursued on an “opportunistic” basis. On the basis of this analysis, the assessment identifies five potential entry points that entail high impact investment opportunities for the Fund (referred to as “potential investment priorities”). They are indicated in the investment priority (IP) column of Figure 6.

| | | | | <div style="display: flex; align-items: center; justify-content: center;"> Priority ←→ Opportunistic </div> | | | | | |
|---|----------------|-----|---|---|-----|--|--|--|--|
| | | | | IP | LDC | | | | |
| Energy generation and access | Africa | E | * | | | | | | |
| | Asia | E | * | | | | | | |
| | Eastern Europe | | | | | | | | |
| | Latin America | | | | | | | | |
| | SIDS | | | | | | | | |
| Transport | Africa | | | | | | | | |
| | Asia | C | | | | | | | |
| | Eastern Europe | | | | | | | | |
| | Latin America | | | | | | | | |
| | SIDS | | | | | | | | |
| Buildings, cities, industries, and appliances | Africa | C | | | | | | | |
| | Asia | C | | | | | | | |
| | Eastern Europe | C | | | | | | | |
| | Latin America | C | | | | | | | |
| | SIDS | | | | | | | | |
| Forestry and land use | Africa | A/F | * | | | | | | |
| | Asia | A/F | | | | | | | |
| | Eastern Europe | | | | | | | | |
| | Latin America | A/F | | | | | | | |
| | SIDS | | | | | | | | |
| Livelihoods of people and communities | Africa | A/C | * | | | | | | |
| | Asia | A/C | * | | | | | | |
| | Eastern Europe | | | | | | | | |
| | Latin America | | | | | | | | |
| | SIDS | S | | | | | | | |
| Food, water, and health | Africa | A/F | * | | | | | | |
| | Asia | A/F | * | | | | | | |
| | Eastern Europe | | | | | | | | |
| | Latin America | F | | | | | | | |
| | SIDS | S | | | | | | | |
| Infrastructure and built environment | Africa | C | | | | | | | |
| | Asia | C | | | | | | | |
| | Eastern Europe | | | | | | | | |
| | Latin America | | | | | | | | |
| | SIDS | S | | | | | | | |
| Ecosystems and ecosystem services | Africa | A/F | | | | | | | |
| | Asia | A/F | | | | | | | |
| | Eastern Europe | | | | | | | | |
| | Latin America | F | | | | | | | |
| | SIDS | S | | | | | | | |

Abbreviations: IP = Investment priorities. C = Cities. A = Agriculture. F = Forestry and land use. S = Resilience in SIDS. E = Energy generation/access. LDC = least developed country. * = Areas with significant potential and needs in LDCs.

Figure 6: Priority levels of each expected result area and region.

21. The particular needs of LDCs have been considered, and highlighted in the LDC column of Figure 6. Strengthening the resilience of the livelihoods of people and communities, and of food water and health systems are important needs for LDCs. As such, there is a strong case for focusing on agriculture in LDCs, as their economies are highly dependent on agriculture, and poor people may be particularly reliant on agriculture for their livelihoods. There are also opportunities to improve access to clean energy in LDCs, and seek to avoid potential deforestation and degradation.

22. The analysis suggests the following five identified potential investment priorities through which the Fund can develop a more integrated and holistic approach in order to realize mitigation and adaptation impact:

(a) **Climate-compatible cities in Asia, Africa, Latin America and Eastern Europe:**

75 per cent of global emissions come from cities, which host more than 50 per cent of the global population. Climate risks are increasing: these include rising sea levels, storm surges, heat stress, extreme precipitation, inland and coastal flooding, landslides, drought, water scarcity and air pollution. Investing in climate-compatible cities can offer substantial mitigation and adaptation benefits, through the promotion of sustainable public transport systems, more energy-efficient and resilient buildings and infrastructure; and efforts to safeguard livelihoods, particularly of the urban poor. Africa and Asia are the fastest urbanizing regions in the world; in these regions the Fund has the potential to help shift public and private investment in cities towards lower emission and more resilient systems. Latin America and Eastern Europe are already highly urbanized: in these countries the Fund can help to retrofit and upgrade existing infrastructure, and to support efforts to strengthen the resilience of urban systems.

Value add: Despite a high potential for impact, urban climate change adaptation and mitigation receive relatively modest volumes of support from existing climate funds. While cities are now part of the GEF-6 strategy, the Fund has the capacity to complement its grant funding with larger scale finance. It can help to unlock requisite investments with financing tailored to addressing the particular risks that impede greater investment in more resilient or lower emission approaches to urban development. The Fund has the potential to build on new emerging partnerships to encourage climate action in cities and to finance implementation. It is also aided by the fact that a variety of organizations, including sub-national institutions such as agencies that manage municipal financing and private sector actors, may be eligible as accredited entities.

(b) **Sustainable climate-smart agriculture, particularly in Africa and Asia with a focus on LDCs:**

Agriculture accounts for 10 to 12 per cent of global emissions and is highly vulnerable to the impacts of climate change. Tackling climate change and agriculture linkages is already high on developing countries' agendas: more than 80 per cent of countries included agriculture in their national adaptation programmes of action (NAPAs),⁶ and agriculture is also prominent in the nationally appropriate mitigation actions (NAMAs) that countries are developing and registering with the UNFCCC. Adaptation measures in agriculture can increase the resilience of food systems and strengthen food security, while also supporting improvement of livelihoods, safeguarding of access to food and water, and strengthening the resilience of ecosystems. Land-use change for agriculture is a major driver of deforestation in forest-rich Latin American and Caribbean, African and Asian countries; redirecting such expansion away from forested areas can also help to reduce pressures on forests. Asia and sub-Saharan Africa may be particular priorities for investment in more resilient climate-smart agriculture. Many of the poorest people

⁶ Consultative Group on International Agricultural Research (CGIAR), Big facts. Available from <<http://ccafs.cgiar.org/bigfacts/#>> (accessed 16 February 2015).

in these two regions depend on agriculture for their livelihoods. They are therefore highly impacted by disruptions to agricultural systems, and the risk of such disruption is high. Asia and sub-Saharan Africa may therefore be priority areas for engagement

Value add: Strengthening agricultural systems has long been a focus of international development efforts, with mixed results. Despite the significant potential of climate-smart agriculture, there has been relatively modest emphasis on it in existing climate-related funds (about 5 per cent of approved finance to date). The Fund can scale up this focus, offering a wider range of instruments to facilitate actions, particularly by private sector and community level actors. This could include support for smallholder farmers, that will help to deliver direct benefits to communities and poor and vulnerable farmers, particularly women, and strengthen the resilience of their livelihoods. It will also be necessary to shift the practices of agribusiness and larger producers to support mitigation, wider food security benefits, and adoption of climate-smart agriculture approaches. Such programming must of course align with national priorities, with due regard for environmental and social sustainability. The environmental and social safeguard policies of the Fund will be essential in realising these opportunities appropriately.

- (c) **Scaling up finance for forests and climate change in Latin America, Asia and Africa:** The Fund has an opportunity to help to maintain and scale up the progress made on efforts to reduce emissions from deforestation and degradation, which has the potential to offer multiple benefits, sometimes at relatively low cost. More than 7 million hectares of forests are lost each year,⁷ and the greatest mitigation potential is estimated to be through avoided deforestation. The largest tracts of intact tropical forest and regions with the largest mitigation potential are Latin America (the Amazon) followed by Asia (notably Indonesia), and finally Africa.⁸

Value add: Relatively few multilateral climate funds are currently offering support for demonstrated implementation of REDD+ strategies, which receives about 10 per cent of total finance through existing multilateral climate funds. The Fund could explore providing results-based finance for implementation of REDD+ strategies in a few jurisdictions that show momentum in countries where there is clear potential for mitigation, alongside ecosystem services, livelihood results and other co-benefits. The Fund's REDD+ results-based payments mechanism will be operationalized in alignment with the methodological guidance provided by the Conference of Parties (COP). It will also take relevant UNFCCC processes into account, for example technical assessments and biennial update reports on emission reductions. The Fund might consider offering additional finance in order to sustain political momentum around the implementation of REDD+ programmes in key countries, targeting a particular dimension that could make a difference in the given context. The potential for the Fund to partner with a broad range of stakeholders, including emergent multi-stakeholder bodies, may present new opportunities to address some of the underlying barriers to REDD+ action.

- (d) **Enhancing resilience in small island developing States (SIDS):** Many SIDS face an existential threat as a result of climate change, and are highly vulnerable to its impacts. The costs of climate change adaptation are projected to total as much as 1 per cent of GDP in SIDS, five times higher than those in other regions.⁹ Both coastal and terrestrial ecosystems are threatened by climate change. But some SIDS may be able to avoid 90 per cent of potential damage through cost-effective adaptation measures. Nevertheless, there is substantial heterogeneity amongst SIDS. Programming

⁷ Food and Agriculture Organization of the United Nations (FAO). *Global Forest Resources Assessment 2010* (Rome, 2010). Note this figure refers to net losses.

⁸ IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014).

⁹ World Bank. *Economics of adaptation to climate change*. (Washington, DC, 2010).

approaches will need to be targeted to the different circumstances of Caribbean, Pacific and Indian Ocean SIDS. Many SIDS confront fiscal constraints following the financial crisis, which may undermine their resilience to new climate-induced shocks. Unsustainable development patterns in many SIDS exacerbate climate risks. Freshwater supplies are under intense pressure, including as a result of population growth, increasing urbanization, and tourism.

Value add: While support for adaptation in SIDS has increased substantially, there is a clear need to build on ongoing efforts, and use a suite of instruments to realise opportunities to adapt to climate change. There is a strong case for the Fund to support efforts to incorporate climate risks and opportunities into national economic development and planning strategies. In this context, there is also scope to help countries to reduce expenditures on conventional energy imports, and electricity generation by improving energy policy and regulatory frameworks to encourage the adoption of clean energy, and to improve the efficiency of energy provision, buildings and industries. Partnerships with regional financial institutions and emerging centres of excellence on climate change can help the Fund to advance such efforts at larger scale. Several such organisations have expressed interest in seeking accreditation to the Fund. The Fund can also explore opportunities to partner with private sector actors in SIDS, including in the financial sector, in order to scale up such efforts.

(e) **Transforming energy generation and access in Africa and Asia:**

Reducing emissions associated with electricity generation and energy use is central to climate change mitigation. As noted, energy is a cross-cutting input into most segments of the economy. The Fund will need to address two complementary but distinct challenges: first to shift investment toward increases in large scale deployment of low-carbon electricity to avoid continued dependence on fossil fuels, and second to support the extension of access to sustainable energy services for poor and underserved communities. There is a huge opportunity to partner with public and private investors and implementers in taking on both challenges. There is a need to support programmes aimed at supporting further innovations and breakthroughs in key technologies such as concentrated solar thermal power, which can provide base-load power but is falling in cost much more slowly than wind or solar photovoltaic (PV). In this context there is a need to strengthen both the global and national level ecosystem in innovation for renewable energy technology and integrated approaches to the deployment of these technologies in developing countries, in potential partnership with the Technology Centre and Network of the UNFCCC. There is also potential to contribute to scaling up financing for energy services for the poor, particularly in Asia and Africa, through innovative business and financing models.

Value add: Financing renewable energy has been a priority for many existing climate funds, which have directed the majority of their finance to this purpose. There is growing private sector investment in low emission approaches to electricity generation and use, though in developing countries investment in conventional energy continues to be much larger. But the scale and scope of these efforts remains inadequate: the Fund will need to find a niche in this crowded space. The Fund can take an integrated approach to addressing policy, regulatory, and institutional issues alongside financing renewable energy technologies such as wind and solar that are increasingly cost competitive but are still confronted by barriers to their deployment. Existing climate funds have not been able to take such an approach. Multilateral climate funds have generally spent much less funding on improving access to energy for the poor, and helping them make the transition to low emission development trajectories. The Fund has an opportunity to complement existing efforts, with a focus on heating, cooking and cooling rather than electricity and lighting (which is presently the dominant focus of international finance, including from development agencies). It could partner with

specialized businesses and intermediaries that have a track record in bundling small and micro-programmes together in order to get catalytic funding to key businesses and enterprises that can make material contributions to this goal.

The Fund might consider options for supporting intermediaries that have a good track record on incubating new businesses and deployment models, in order to achieve both goals.

Table 1: Potential investment priorities and expected results of the Fund

| Potential investment priority | Expected results area | Geographical region targeted |
|--|--|---|
| 1: Climate-compatible cities | Transport (M) Buildings, cities, industries and appliances (M) Livelihoods of people and communities (A) Infrastructure and built environment (A) | Africa, Asia, Latin America, Eastern Europe |
| 2: Sustainable climate-smart agriculture | Forestry and land use (M) Livelihoods of people and communities (A) Food and water security and health (A) Ecosystems and ecosystem services (A) | Africa, Asia, with an emphasis on LDCs |
| 3: Scaling up finance for forests and climate change | Forestry and land use (M) Food, water and health (A) Ecosystems and ecosystem services (A) | Africa, Asia, Latin America |
| 4: Enhancing resilience in SIDS | Livelihoods of people and communities (A) Food, water and health (A) Infrastructure and built environment (A) Ecosystems and ecosystem services (A) | SIDS |
| 5: Transforming energy generation and access | Energy generation and access (M) | Africa, Asia, with a special focus on energy access in LDCs |

Abbreviations: A= adaptation. M = mitigation. LDCs = least developed countries. SIDS = small island developing states.

23. Table 1 above shows how each of the expected results areas relates to the proposed investment priorities, and highlights regions where the potential may be particularly high. Efforts to invest in climate-compatible cities may deliver impacts related to emission reductions from transport; and buildings, cities, industries and appliances. They may also support adaptation, particularly by helping to strengthen the resilience of the livelihoods of urban people and communities; and to increase the resilience of urban infrastructure (while also reducing associated emissions). Similarly, investments in efforts to reduce emissions from deforestation and degradation can also help to strengthen the resilience of food, water and health; and of ecosystems and ecosystem services. Indeed, to reduce emissions from forests requires the tackling of the drivers of deforestation, which include agriculture.

24. Figure 7 illustrates that the five potential investment priorities essentially cluster the eight results areas in an integrated and holistic manner, aiming to achieve cross-cutting benefits in an efficient and impactful way. While the case for action on all five counts is clear, they represent great challenges. There is a need for greater concerted effort to address the interlinked climate and development challenges that they involve, and a need for the Fund to create incentives for more innovative and effective approaches. Because of their cross-cutting nature, the priority areas largely contribute to both adaptation and mitigation, and indeed create new and holistic entry points for realizing the balance across adaptation and mitigation that the Fund seeks.

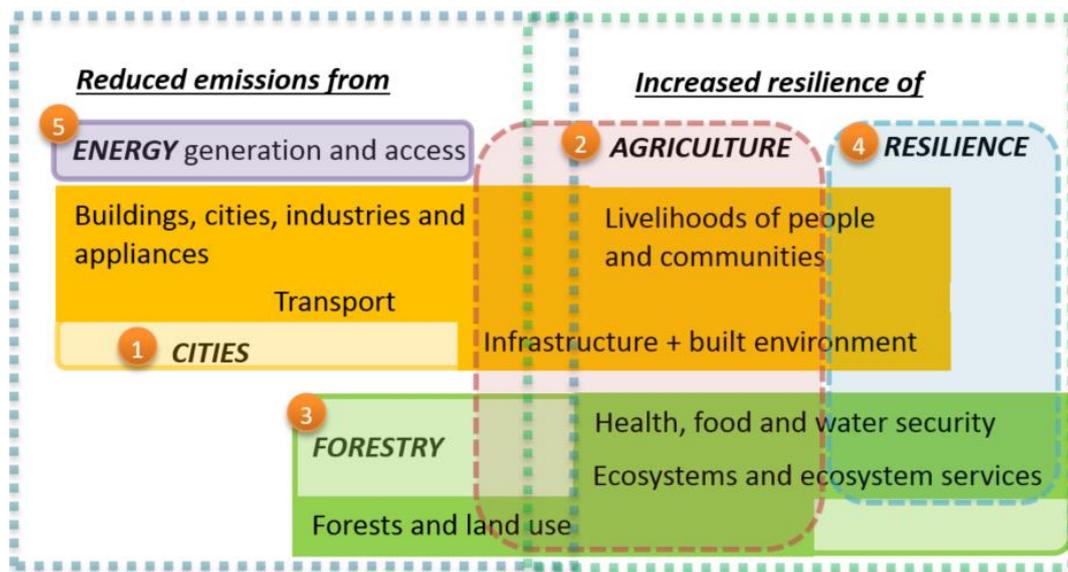


Figure 7: Potential investment priorities: clusters of expected results areas

25. There is, of course, great heterogeneity within the regions that the Fund targets, and country programming efforts will need to capture each country’s unique needs. In all cases there is a strong linkage between national and international policy, institutional incentives, and the outcomes that the Fund will need to help to realize. Through its readiness programming, the Fund can identify key policy, regulatory and institutional underpinnings for change, which can then complement efforts to ensure that proposed interventions take these considerations into account. The Fund can also support programmatic approaches that enable countries to pursue policy, regulatory and institutional reforms that address relevant issues. The Fund will need to be able to complement investments with “softer” technical assistance and capacity-building efforts, likely requiring grant finance, to help realise the long-term success and sustainability of funded programs, and allow them to have a truly paradigm shifting impact.

VI. Implications for portfolio development

26. The analysis can inform efforts to develop the Fund’s investment portfolio in several ways.

27. First, the assessment provides a key point of reference for the country-driven processes that are getting underway in developing countries to engage with the Fund and access its resources. As noted, the analysis presents potential investment opportunities that can inform the efforts of NDAs and Focal Points, accredited or potentially to be accredited entities, and other stakeholders in identifying opportunities or developing proposals that the Fund could support.

28. Second, the Fund may consider launching calls for proposals in the coming months in one or more of the five potential investment priorities identified in section V. The Fund would need to undertake further work to design appropriate terms for such calls for proposals. Experience from the Climate Investment Funds and other institutions shows that it can take significant amount of time to design such calls well (at least six months). It also confirms the importance of setting appropriate parameters and processes for seeking proposals. In the near term (i.e. in 2015), the spontaneous submissions directly from accredited entities represents the faster and more feasible route to developing a pipeline for the Fund. Calls for proposals can complement the process, but it will take some time for this process to yield results.

29. Alternatively or additionally, the analysis is an input into the Fund’s ongoing monitoring of its investment portfolio. If monitoring efforts suggest that investment in certain key results

areas and regions is inadequate, the Fund could consider issuing targeted calls for proposals in these areas, with a view to proactively exploit their potential and rebalance the portfolio. Using calls for proposals as a means to complement and fill possible gaps in the emerging portfolio would allow targeted efforts to optimize it. For example, in the case of the CIF, calls for proposals under private sector set aside programmes were introduced once it became clear that there were gaps in the existing portfolio to fill. Monitoring of portfolio composition and its alignment with the identified priority areas will be an ongoing process. Periodic reporting (for example every twelve months) of the investment portfolio to the Board can allow it to make informed decisions.

30. All proposals will be assessed based on their contribution to the Fund's objectives and performance against the criteria articulated in the investment framework in a consistent manner. This principle should apply regardless of the channel through which they are submitted (whether through calls for proposals or spontaneous submissions) or the results areas involved (whether expressly linked to the identified investment priority areas or not). In principle, well-designed proposals involving the identified investment priority areas are likely to have higher potential to achieve the Fund's paradigm shift objectives, and a stronger fit with the six investment criteria.¹⁰

31. There will be a number of parameters to consider in designing a call for proposals, including whether to assign it a resource envelope, and the size of the envelope. A resource envelope can provide a signal of the amount of funding available. This advantage may be less relevant for the Fund given the early stage of portfolio development. Furthermore, it is challenging to predict market demand for Fund resources across the proposed investment priorities given the many uncertain variables such as country needs and priorities, entity capacity, and proposal readiness. There is a risk of setting aside resources that then are not fully utilized, or creating incentives for entities to inflate the amount of finance that they need from the Fund, which leads to suboptimal utilization of resources. In addition, setting the resource envelope implies that there will be a parallel proposal review, assessment and approval process associated with the call for proposals, opposed to the normal process for spontaneous submissions. It may create challenges in maintaining a consistent approach to assessment of proposals received in response to calls and those received spontaneously. The process of setting out investment priorities and launching targeted calls for proposals should itself send a strong signal.

32. As highlighted at the outset, the goal of the process should be to find the sweet spot between potential investment opportunities and national needs and priorities. The role of the scarce public resources entrusted to the Fund is to help step up the ambition of efforts in diverse country contexts consistent with technical, economic and political opportunities. The draft decision in Annex I presents the proposed options to achieve this end.

¹⁰ Impact potential, paradigm shift potential, sustainable development potential, needs of the recipient, country ownership, and effectiveness and efficiency.

Annex I: Draft decision of the Board

The Board, having considered document GCF/B.09/06 *Analysis of the Expected Role and Impact of the Green Climate Fund*,

- (a) Takes note with appreciation of the findings of the completed analysis undertaken by the Secretariat;
- (b) Acknowledges the following identified potential investment priority areas, through which the Fund may be able to maximize its results and impact:
 - (i) Climate-compatible cities in Asia, Africa, Latin America and Eastern Europe;
 - (ii) Climate-smart agriculture in Africa and Asia;
 - (iii) Scaling up finance for forests and climate change in Latin America, Asia and Africa;
 - (iv) Enhancing resilience in Small Island Developing States (SIDS); and
 - (v) Transforming energy generation and access in Africa and Asia;
- (c) Decides to adopt option[s] [1] [and] [2] for determining Fund level investment portfolios across the structure of the Fund:
 - (i) *Option 1*: The Secretariat should prepare calls for proposals in the Fund's identified potential investment priority areas, in order to complement spontaneous proposals received directly from accredited entities;
 - (ii) *Option 2*: Based on ongoing monitoring and reporting of the investment portfolio by the Secretariat, the Board may request the Secretariat to arrange calls for proposals in order to align the portfolio composition to reflect the Fund's identified potential investment priority areas;
- (d) Affirms that issuing targeted calls for proposals is one means to supplement the spontaneous submissions by accredited entities in identifying good quality projects or programmes in the potential investment priority areas; and
- (e) Agrees that the identified potential investment priority areas should be implemented flexibly and updated as circumstances evolve and additional information becomes available.

Annex II: Fund impact assessment

I. Introduction and objectives

1. This impact assessment seeks to identify strategic priority areas and investment opportunities, which can be used to maximize the Fund's impact with reference to the strategic results areas and which are not adequately supported by existing climate finance mechanisms. The assessment will help to identify a strategic approach to programming and portfolio development.
2. The impact assessment complements the three central elements of the Fund's programming process, namely:
 - (a) Country-driven programming;
 - (b) The investment framework, which lays out the criteria against which proposals will be considered; and
 - (c) The results framework which set out the metrics by which the results and the impact will be monitored and assessed.
3. The analysis of global opportunities for the Fund to make a difference is to be considered in the context of the imperative to ensure that the Fund's investments respond to country circumstances, needs and priorities, as well as practical considerations such as the capacity and ability to deliver. The "sweet spots" are to be sought between national priorities, the potential to deliver concrete climate benefits, and opportunities to deliver co-benefits.
4. As the Fund's country programming and portfolio development proceeds, the Secretariat and its stakeholders will gain a better grasp of these crucial issues, and collect related information. The findings of this exercise are necessarily preliminary, and there are limitations to the data we have been able to draw on so far. Furthermore, the considerations that underpin this analysis are dynamic, and shaped by the evolution of technologies (and their costs), markets, national economic trajectories and policies: how the Fund can have the most impact shifts over time (and often quite quickly).¹ The analysis nevertheless identifies potentially high value areas of investment for the Fund, around which focused efforts can be made in order to both support country programming efforts, and steer investment.

II. Approach

5. The assessment began with an extensive literature review including recent reports from the Intergovernmental Panel on Climate Change, the first Biennial Assessment of Climate finance, the New Climate Economy report, the World Bank's analysis of the Economics of Adaptation to Climate Change, Global Greenhouse Gas abatement cost curve analysis, the Landscape of Climate Finance by the Climate Policy Initiative (CPI), and the recent review of the effectiveness of climate funds by the Overseas Development Institute (ODI). The literature review is complemented by inputs and guidance from United Nations Framework Convention on Climate Change (UNFCCC) secretariat thematic bodies,² Board members and others. In addition, the Fund engaged think tanks, experts, civil society organizations, and representatives of the private sector including the Private Sector Advisory Group. Written inputs were also received from several observer groups. The assessment uses the Fund's agreed strategic results

¹ For example, the cost of solar energy in 2014 was more than 20 per cent lower than in 2012. Source: UNEP Bloomberg New Energy Finance Frankfurt School. *Global Trends in Renewable Energy Investment 2014* (Frankfurt, 2014).

² The Adaptation Committee, the Technology Executive Committee, and the Climate Technology Centre and Network.

areas, as shown in Figure 1 below, as a starting point for assessing mitigation and adaptation potential. It considers the opportunities by region and potential roles for private sector actors.

6. Key considerations in the analysis include:
 - (a) Emission reduction potential;
 - (b) Adaptation costs and needs;
 - (c) Level of poverty and vulnerability;
 - (d) Co-benefits;
 - (e) Cost efficiency;
 - (f) Current programming priorities of existing sources of climate finance, particularly other climate-related funds; and
 - (g) The potential to catalyse private sector investment.
7. The assessment is conducted using a combination of qualitative judgment and quantitative analysis. No specific weights are assigned to the various factors, which means all the factors are equally considered. Country conditions, including its overarching financial and economic circumstances and access to finance shape the role that the Fund’s resources can play. The role of private investors and access to private capital markets, alongside the policy and regulatory framework that shapes private activities related to the results areas of the Fund, will also shape the opportunities for harnessing private sector implementation capacity, and partnering with the private sector. The Fund must take a variegated approach that takes unique country and regional circumstances into account.

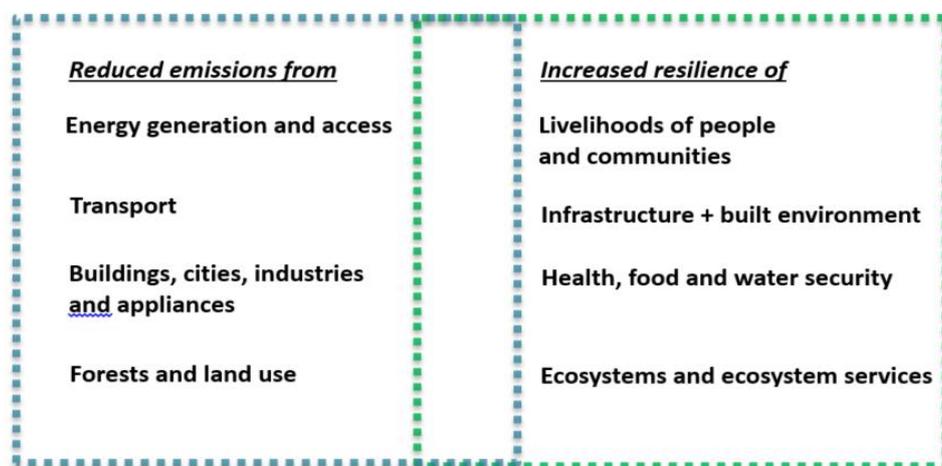


Figure 1: Strategic impacts and expected results of the Fund.

2.1 Global mitigation potential

8. Supporting countries to make the transition to low emission development trajectories and seize mitigation opportunities is a central goal of the Fund. Figure 2 summarizes the best available estimates of global mitigation potential through 2030 by sector and theme, taking both cost and regional potential into account. Each pie chart relates to a result area of the Fund, and its size roughly indicates mitigation potential; the colouring of the pie chart indicates the opportunities by region. The placement of the pie chart indicates how expensive it is, as the axes represent estimates of lifetime and up-front costs. Areas in the lower left corner of Figure 2 (forestry and agriculture; buildings, cities, industries and appliances) appear relatively more appealing from a cost-effectiveness perspective. The relatively small size of the transport pie

chart reflects the timeframe of the data: beyond 2050 emissions from transport are expected to grow substantially if a major deviation from business as usual is not realized.

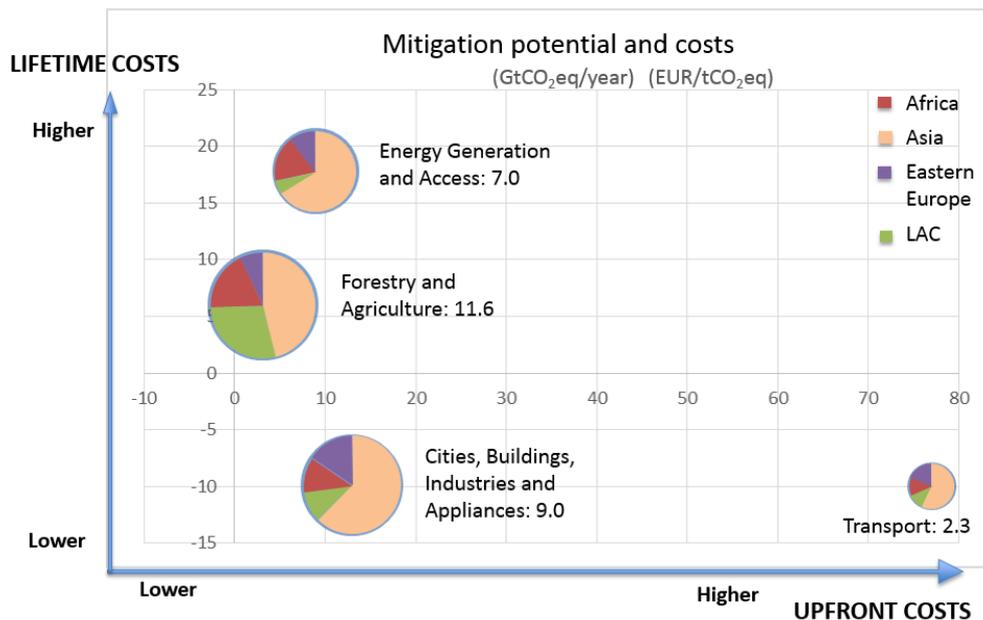


Figure 2: Mitigation potential and costs.

Based on data from the Global Greenhouse Gas abatement cost curve (2013)

9. To understand mitigation impact potential, it is also helpful to consider available information on where countries have already identified particular needs. To this end, we reviewed nationally appropriate mitigation actions (NAMAs) registered with the UNFCCC secretariat's NAMA Registry, and technology needs assessments (TNA) for mitigation. The largest number of NAMAs relate to the energy sector so far, particularly around energy efficiency in industries, buildings and wider demand side approaches. Technology needs assessments have also suggested the largest number of identified needs related to energy generation and use.

2.2 Adaptation potential, short-term and long-term

10. **Climate risk affects GDP output and puts existing assets at risk.** Geophysical characteristics, as well as basic levels of development and the prevalence of poverty, are major factors that shape vulnerability to climate change.³ The poorest people, and poorest countries will be most affected by the impacts of climate change. Adaptation is highly context-specific and dynamic, and must respond to the particular and evolving risks and opportunities that manifest themselves in a certain country, or region within it. Adaptation is often highly localized, and can be difficult to distinguish from larger efforts to pursue sustainable development.

11. Studies suggest that the costs of adaptation as a share of gross domestic product (GDP) will be the highest by far for countries in sub-Saharan Africa (SSA) and small island developing States (SIDS) (See Figure 3). SIDS and SSA countries are highly vulnerable and affected by adverse climate events. Climate change is projected to cost SIDS 1 per cent of GDP, five times higher than average. Africa, with one seventh of the world's population, is poised to bear nearly 50 per cent of estimated global adaptation costs in health, water supply, and agriculture and forestry. Loss of life and of GDP are also likely to be the highest for least developed countries

³ IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014).

and SIDS.⁴ In many cases, good development and reductions in poverty may strengthen overarching resilience, including to the impacts of climate change.⁵

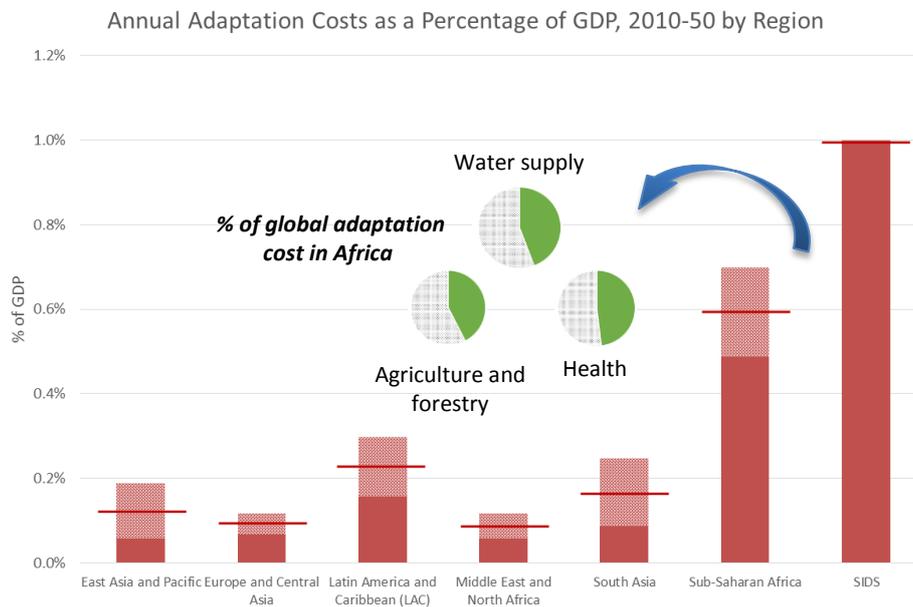


Figure 3: Annual adaptation costs by region in the period 2010-2050.
Source: World Bank, “Economics of adaptation to climate change”, 2010.

12. Unlike mitigation, consensus was not achieved on common metrics for adaptation, which must be tailored to meet the particular stresses and risks that countries confront in the face of climate change.⁶ Ultimately, adaptation finance will have to respond to a range of diverse risks and opportunities in order to strengthen resilience and adaptive capacity that manifest in different contexts. These risks and needs will change over time. Nevertheless, the impact assessment considers the potential to maximize the impact of investments in the results areas of the Fund, recognizing that all countries are exposed to climate change, and that interventions will need to be tailored to address the particular risks that they confront. The assessment also recognizes the strong linkages between many resilience enhancing activities and appropriately designed mitigation interventions. The challenge before the Fund will be to link major development needs and trends with opportunities to strengthen resilience and to support adaptation to climate change, building on ongoing efforts to develop climate change adaptation strategies including through national adaptation plans (NAPs) and national adaptation programmes of action (NAPAs). The four results areas of the Fund on adaptation generally link to expressed high-level developmental and economic priorities, and thereby lend themselves to such an approach.

III. Making a difference: a review of the eight results areas

13. The report first reviews the impact potential of the Fund’s eight results areas by region, building on previous analytical work conducted by the Secretariat, an extensive literature review, and other inputs as detailed in section I. For each area the assessment considers its relevance and potential, the best available estimates of costs and financing needs, and the niche of the Fund and value that it can add to existing efforts to respond to climate change and invest

⁴ World Bank, “Economics of adaptation to climate change”, 2010.

⁵ S. Fankhauser and I. Burton. “Spending adaptation money wisely”. *Climate Policy* vol. 11, No. 3 (2011).

⁶ Ian Noble, *Options for Resource Allocation in the Green Climate Fund (GCF) Possible Allocation Principles and Criteria – Adaptation*, Climate Analytics (Berlin, 2013).

in solutions. It considers regional variations. The assessment considers the current priorities of existing climate funds, recognizing that these priorities may also shift over time. It also seeks to consider sustainable development co-benefits, including gender aspects.

3.1 Energy generation and access

3.1.1 Relevance and potential

14. Reducing the emissions associated with electricity generation and energy use is a core part of the climate change mitigation challenge. In the electricity sector, a central need is to reduce reliance on fossil fuels. Energy is a cross-cutting input into most segments of the economy, and is linked to many of the result areas of the Fund. The majority of the potential is renewable energy (5.7 gigatonnes of carbon dioxide equivalent (GtCO₂eq) worldwide). There is an urgent need to step up efforts to shift investment towards low emission sources of energy, as many countries are embarking on major new initiatives to invest in energy and other infrastructure.⁷

15. There are two complementary but distinct dimensions of reducing emissions from energy production: the first is to support increases in large-scale deployment of low carbon electricity as an alternative to conventional fossil fuels. These investments can offer co-benefits including improving air quality and associated health benefits; they can also foster the creation of new jobs and industries and offer energy security benefits.⁸ Actions to this end include scaling up the deployment of technologies the use of which is already increasing and having significant additional resource potential such as wind, solar photovoltaic (PV), and mini-hydro. Indeed new renewable energy industries were the top mitigation need identified by countries in their technology needs assessments:⁹ Figure 4 shows the key technologies to which developing countries seek improved access. There is also a need to enable further cost reductions for technologies such as concentrating solar thermal power that have the potential to provide base-load energy, but whose costs remain relatively high, and deployment relatively low. Another near commercial technology that receives significant attention in this context is geothermal power. A “systems approach” to the deployment of low emission energy technologies is needed, by supporting “energy smart technologies” such as more responsive grid infrastructure and power storage. This is essential in order to enable further scale up of technologies, such as wind and solar, that provide intermittent power.

⁷ International Monetary Fund. *World Economic Outlook* (Washington, DC, 2014).

⁸ Global Commission on the Economy and Climate, *Better Growth, Better Climate: The New Climate Economy Report* (Washington, DC, 2014).

⁹ UNFCCC Subsidiary Body for Scientific and Technological Advice document FCCC/SBSTA/2013/INF.7, available at <<http://unfccc.int/resource/docs/2013/sbsta/eng/inf07.pdf>>.

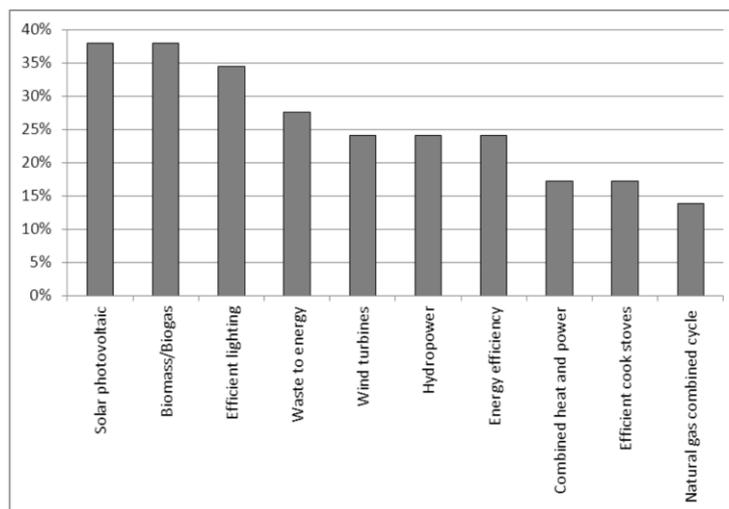


Figure 4: Prioritized technologies for the energy industries subsector as reported in the technology needs assessment (TNA) reports, in percentage of the Parties that undertook TNA.

Source: UNFCCC Subsidiary Body for Scientific and Technological Advice document FCCC/SBSTA/2013/INF.7, available at <<http://unfccc.int/resource/docs/2013/sbsta/eng/inf07.pdf>>

16. The second challenge is to seize the significant mitigation potential associated with increasing access to low emission energy technologies. Such interventions may be highly relevant in least developed countries (LDCs) where an estimated 2.6 billion people are still using biomass for cooking and more than 1 billion people still lack access to electricity. These issues are also high on the agenda of the international community. Access to modern energy services for lighting and cooking are the two key needs usually highlighted. As noted in previous board papers, the mitigation potential from such interventions is significant: up to 1 GtCO₂eq per year by replacing conventional biomass cooking methods with cook stoves alone. The immediate term mitigation potential from these interventions is nevertheless relatively small compared to other possible interventions; but the co-benefits are substantial, and can help to support the transition to low emission development particularly in LDCs. Small-scale electricity generation technologies to meet lighting and cooling needs exist, and in many cases can be cost-competitive against fossil fuel expenditure, although meeting capital costs remains a challenge for poor households. There are many market and sociocultural challenges to overcome, in principle the total cost requirements of extending access to low emission energy is low relative to global energy and infrastructure investment needs.¹⁰

3.1.2 Costs of low emission electricity

17. Energy as a whole often lies in the middle to high range of capital intensity per unit of CO₂. Global Environmental Facility (GEF) and Clean Development Mechanism (CDM) project data indicates that investments in renewable and other low-carbon energy can be two to ten times as costly as some energy efficiency or forest projects. However, the costs of clean technologies are falling quickly, and the International Energy Agency (IEA) notes that new trends are giving renewable energy technologies a prominent role in even relatively mainstream energy scenario projections.¹¹ In 2012 and 2013, 43 per cent of renewable energy investment took place in developing countries.¹² The costs of photovoltaic solar systems and onshore wind turbines continue to fall;¹³ costs of wind energy, in turn, have reduced by 15 per

¹⁰ Sustainable Energy for All (2014). Achieving Universal Energy Access. http://www.se4all.org/wp-content/uploads/2014/12/fp_se4all_access.pdf.

¹¹ International Energy Agency, *Energy Technology Perspectives 2014* (Paris, 2014).

¹² UNEP Bloomberg New Energy Finance Frankfurt School. *Global Trends in Renewable Energy Investment 2014* (Frankfurt, 2014).

¹³ International Energy Agency, *Energy Technology Perspectives 2014* (Paris, 2014).

cent and costs of crystalline solar by 53 per cent since the 2009.¹⁴ As Figure 5 shows, in a large number of developing countries, including African countries and SIDS, these technologies are already less expensive than conventional industrial power prices. An increasing number of programmes are now being supported without subsidy support. Figure 6 summarizes how these costs are changing. Despite their flexibility, concentrating solar power plants are being deployed much more slowly, with a slower decline in costs.

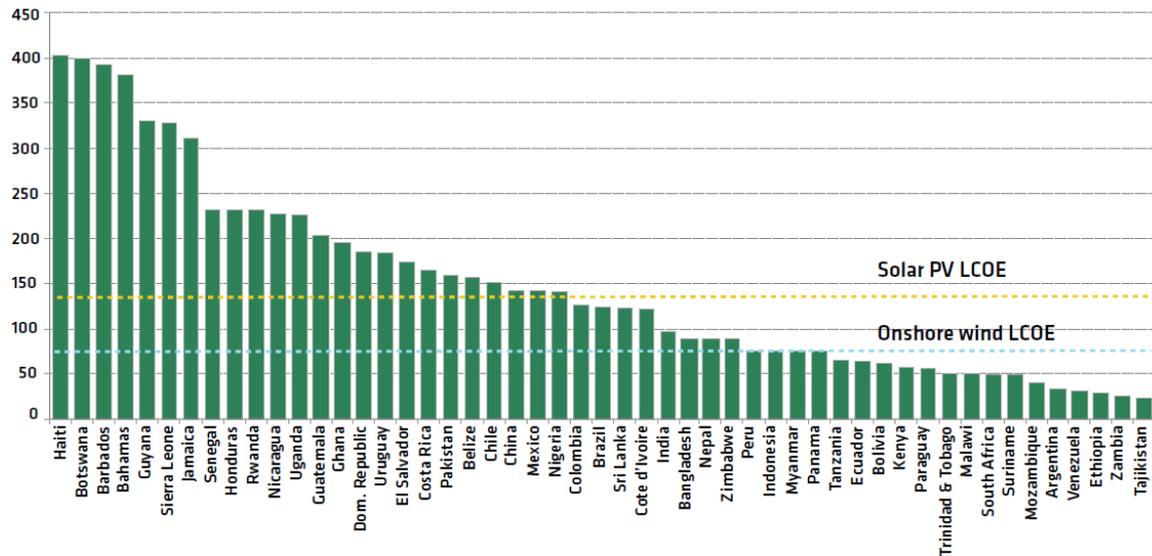
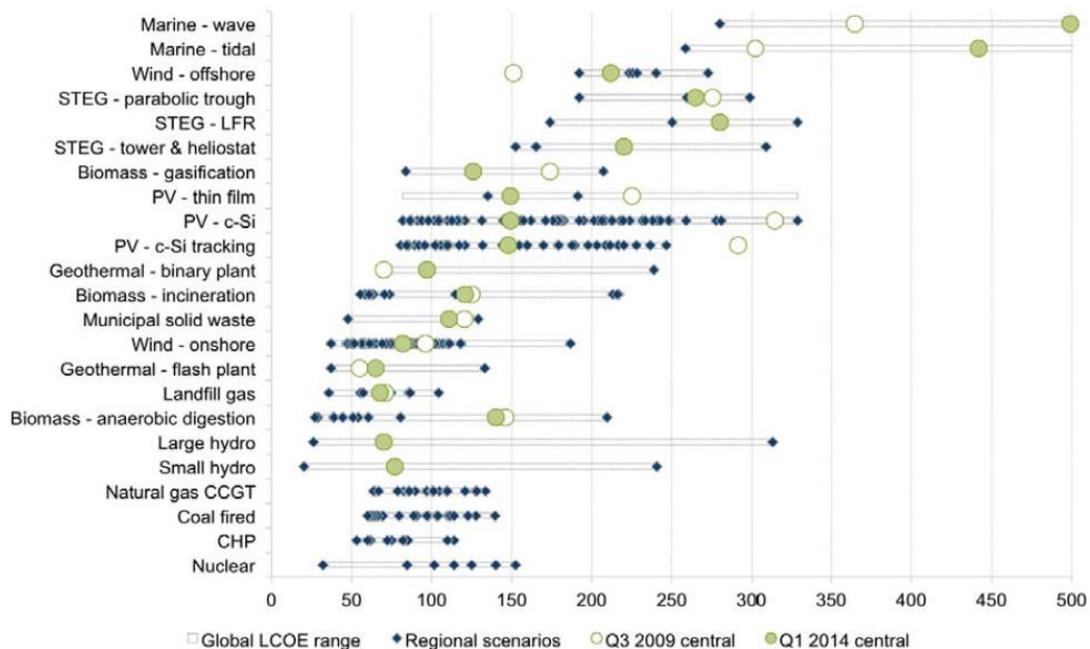


Figure 5: Industrial power prices versus onshore wind and solar photovoltaic LCOE in 2013 (\$/MWh). Abbreviations: LCOE = levelized cost of electricity, PV = photovoltaic.
Source: Bloomberg New Energy Finance, *Climatescope* (2014).



CHP = combined heat and power; c-Si = crystalline silicon; STEG = solar thermal electrical generation or concentrated solar power; CCGT = combined cycle gas turbine

Figure 6: Levelized cost of electricity (LCOE) for different generation technologies.
Source: Bloomberg New Energy Finance and UNEP, *Global Trends in Renewable Energy Investment*, 2014.

¹⁴ UNEP Bloomberg New Energy Finance Frankfurt School. *Global Trends in Renewable Energy Investment 2014* (Frankfurt, 2014).

3.1.3 Costs of access to energy

18. The costs of extending access to clean energy to the 1.3 billion people living without it has been estimated at US\$ 50 billion per year.¹⁵ Some analyses suggest that greater use of distributed renewable energy instead of grid-based energy may further reduce the costs involved. Consumers (including poor people at the bottom of the pyramid) are often willing to pay for energy services if they are reliable, though they may face barriers when trying to access upfront finance. The Sustainable Energy for All report highlights barriers in accessing finance for manufacturing, distribution, and consumer access to services that may be addressed by investors and lenders. The potential for the dissemination of cleaner and more efficient cook stoves has also been proposed as a key means to reducing black carbon emissions, improving indoor air quality and delivering associated health benefits, and enhancing quality of life for the poor. Several global initiatives to this end have been launched, but upscaling is needed, and can be delivered in order to offer concrete development benefits, particularly for women who are often tasked with gathering fuelwood and cooking for families.¹⁶ The Intergovernmental Panel on Climate Change (IPCC) highlights the strong co-benefit potential of such interventions.¹⁷

3.1.4 Potential by region and niche for the Fund

19. **Large-scale low-carbon energy deployment.** As Figure 7 shows, renewable energy investment has been heavily concentrated in a few key developing country economies (notably Brazil, India, and China), but has been growing steadily, and the range of countries involved is also expanding. In Africa, the adoption of the renewable energy bid (REBID) programme in South Africa has resulted in a major market for private investment in renewable energy; private equity and venture capital investment has also been identified in Kenya, Mauritius and Burkina Faso.¹⁸ Investment in renewables has been more constant in Latin America, though highly concentrated in Brazil. While the region has historically had a relatively clean energy mix through its reliance on hydropower and natural gas, this is shifting as climate related changes reduce the reliability of hydro resources,¹⁹ and countries in the region begin to exploit abundant fossil fuel resources.²⁰ International support may help these countries keep their energy mix clean rather than resorting to high carbon sources.

20. As noted, however, the largest amount of climate finance has been spent on renewable energy to date: 70 per cent of total mitigation funding through dedicated climate funds (and 43 per cent of total climate finance). Existing funds, however, have often had limited tolerance for risk. There has been a dearth of funding for innovation; and too often individual project or program transactions have not been linked to efforts to strengthen the underlying policy, regulatory or enabling environment.

¹⁵ Sustainable Energy for All (2014). Achieving Universal Energy Access. Accessible at: <http://www.se4all.org/wp-content/uploads/2014/12/fp_se4all_access.pdf>.

¹⁶ C. Lee and M. Lazarus, Assessing the Climate Impacts of Cookstove Projects, Stockholm Environment Institute (Stockholm, 2013).

¹⁷ IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014).

¹⁸ UNEP Bloomberg New Energy Finance Frankfurt School. *Global Trends in Renewable Energy Investment 2014* (Frankfurt, 2014).

¹⁹ Studies have found climate-related decreases of 30 to 50 per cent in hydropower in several Latin American countries by the last quarter of the twentieth century. Source: IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

²⁰ United Nations Economic Commission for Latin America and the Caribbean (UNECLAC), IDB and WWF. *The Climate and Development Challenge for Latin America and the Caribbean - Options for Climate-Resilient, Low-Carbon Development* (New York, 2013).

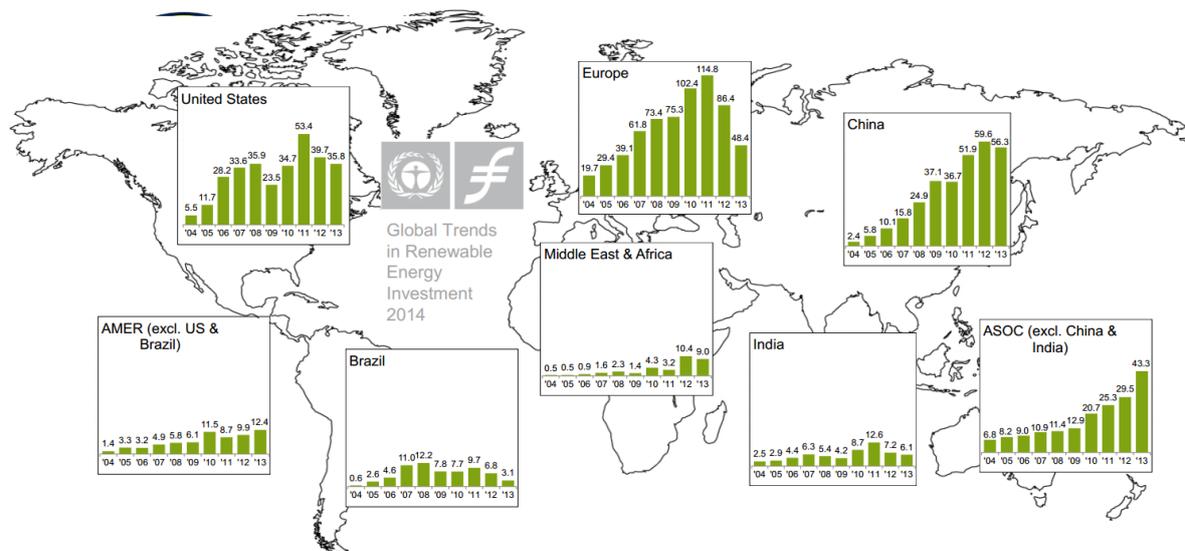


Figure 7: Renewable energy investment by region, adjusting for reinvested equity.

Source: UNEP Bloomberg New Energy Finance Frankfurt School.

Global Trends in Renewable Energy Investment 2014 (Frankfurt, 2014).

21. **Access to energy.** Of the 1.2 billion people worldwide without electricity in 2010, nearly 90 per cent were in Sub-Saharan Africa and Southern Asia, of which more than 80 per cent lived in rural areas.²¹ By contrast, only 7 per cent of the population in Latin America still lacks access to energy. Dependence on polluting biomass for cooking is most prevalent in the rural areas of South Asia and sub-Saharan Africa, particularly LDCs.²² Considering both the opportunities and needs for large-scale deployment and access to energy, Africa and Asia have been identified as the geographical focus of interventions in energy generation and access.

Table 1: Access to electricity across regions.

| | Population with Access (%) | Population Lacking Access (millions) |
|------------------------------|----------------------------|--------------------------------------|
| Latin America and Caribbean | 93.4 | 30 |
| North America | 100.0 | 0 |
| East Asia | 97.8 | 29 |
| Western Europe | 100.0 | 0 |
| POECD | 100.0 | 0 |
| Sub-Saharan Africa | 32.4 | 487 |
| Middle East and North Africa | 93.7 | 23 |
| South Asia | 62.2 | 607 |
| Economies in Transition | 100.0 | 0 |
| South East Asia and Pacific | 74.3 | 149 |
| Total | 79.5 | 1330 |

Source: IPCC WG3 report, Chapter 14, 2014.

²¹ Sustainable Energy for All (2013). Global Tracking Framework Report.

²² International Renewable Energy Agency, "REthinking Energy: Towards a New Power System" (Abu Dhabi, 2014).

22. There is now a substantial international focus on scaling up investment in energy infrastructure in Sub-Saharan Africa in particular, buttressed by the global Sustainable Energy for All initiative which has helped trigger several public private partnerships aimed at increasing private investment, including to increase access to energy for the poor. While there is a new focus on electrification in regions where the poor currently lack access to modern energy services, there has been a dearth of international finance for other clean energy services which may have particular benefits for the poor such as cooking fuels. Opportunities for the Fund to make a difference in supporting the transition to low emission sources of electricity and energy services for the poor are discussed further in section 5.5.

3.2 Buildings, cities, industries, and appliances

3.2.1 Relevance and potential

23. Increasing the efficiency of buildings and appliances has significant estimated mitigation potential (3.3 to 4 GtCO₂eq/year according to the IPCC), and can offer substantial economic returns. Industry and energy efficiency programmes dominate the NAMAs that countries have submitted to the UNFCCC secretariat's NAMA registry so far.²³ The adoption of better technologies, energy-efficient design practices, as well as technologies systems and incentives that change behaviour can help reduce energy use in buildings (50 to 90 per cent in new buildings, 50 to 75 per cent in existing buildings). Regional data for abatement potential indicates that the largest potentials are in Asia (1.1 GtCO₂eq/year), and Eastern Europe (0.5 GtCO₂eq/year). As urbanization proceeds in Africa, and efforts to improve the resilience of cities in Latin America make progress, there is interest and potential to make progress on efficiency measures. The IPCC highlights the emergence of a competitive market for green buildings, and the potential to engage the real estate industry in order to improve construction and design standards and approaches. At a consumer level, the potential for energy efficiency measures to reduce household expenditure on energy services is a recognized co-benefit.

24. The IEA estimates global mitigation potential for industry overall (including both efficiency measures and the adoption of lower emission sources of energy) at 5.5 to 7.5 GtCO₂eq for the year 2050, with more than 40 per cent of this potential in India and China. The need to make rapid progress in improving the efficiency of energy consumption, and the importance of financing to address the often high upfront costs associated with such investments, is well documented²⁴. There are relatively low-cost and easily implementable options in some sectors - for example in the cement industry, a large source of emissions (5 per cent of total emissions projected for 2030).

3.2.2 Cost

25. Estimates of the costs of interventions aimed at increasing energy efficiency through buildings, industry and appliances vary greatly and are shaped by a myriad of factors including energy costs, and construction costs and options.²⁵ For energy-intensive industry, the main barrier is the initial investment cost for retrofits, while barriers for other industries include both cost and a lack of information. For material efficiency, product-service efficiency, and demand reduction, there is a lack of experience with implementation of mitigation measures, and often there are no clear incentives for either the supplier or the consumer. Some countries are now experimenting with new programmes and regulations that will incentivize energy

²³ UNFCCC secretariat, NAMA Registry. Available from <<http://www4.unfccc.int/sites/nama/SitePages/Home.aspx>> (accessed January 2015).

²⁴ Global Commission on the Economy and Climate, *Better Growth, Better Climate: The New Climate Economy Report* (Washington DC 2014).

²⁵ IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014).

efficiency. Performance-based consumer energy efficiency financing programmes are also being explored. In the case of new green buildings, very high performance construction may be achieved at very low or even negative cost.^{26,27} Upfront financing needs may be large, but the savings associated with scaled up adoption of more energy-efficient approaches often pay for themselves.

3.2.3 Potential by region and value add of the Fund

26. The IPCC suggests that there is a high potential for energy efficiency in Eastern Europe and economies in transition, particularly to reduce demand for energy (40 per cent against baselines), and to reduce carbon and technical efficiency. Most of the NAMAs for energy efficiency submitted to the UNFCCC secretariat are from countries in these regions. Significant technical efficiency improvement potential has been identified in Asia (30 to 50 per cent against baselines). Increased efficiency of buildings in urban environments is a significant potential source of emission reductions.²⁸ As the most urbanised region in the developing world, there is substantial potential in municipal energy efficiency programs in Latin America. The possibility of financing green buildings that meet high standards of efficiency are likely to be highest in places where new construction is underway, including growing cities, such as those in Africa.

27. Energy efficiency programmes, with a particular focus on buildings, have been a significant focus for existing mitigation funds, particularly the CTF and the GEF, which have approved respectively US\$ 409 and US\$ 175 million in the last ten years, and are increasingly supported by other actors in international public finance such as multilateral development banks, reflecting growing recognition of their increasing commercial viability.²⁹ Nevertheless, they represent a relatively smaller focus of international climate finance so far: 12 per cent of approved mitigation finance from dedicated climate funds. It is widely recognized that the potential for energy efficiency and green building construction in developing countries, particularly in Eastern Europe, Latin America, and rapidly urbanizing Asia and Africa, remains untapped. Levels of identified finance in energy efficiency are small relative to identified investment in renewable energy. The potential to develop and pilot innovative instruments that scale up available financing for larger scale investments, potentially in partnership or tandem with efforts to strengthen policy, pricing, standards and other incentives for efficiency, may present a possible niche for the Fund.

3.3 Land use, deforestation, forest degradation

3.3.1 Relevance and potential

28. Agriculture, Forestry and Other Land Use (AFOLU) are responsible for close to a quarter of global greenhouse gas (GHG) emissions: 10–12 GtCO₂e/year.³⁰ These emissions are predominantly from deforestation and agricultural emissions from livestock, soil and nutrient management, while other land use and land-use changes (e.g. forest degradation and biomass burning) contribute to a smaller degree. Forests are both a source and a sink of GHG emissions, and are affected by climate change as an ecosystem. The co-benefits of interventions to address forest and climate change are wide-ranging. There are major synergies between interventions

²⁶ IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014).

²⁷ McKinsey. *Global Greenhouse Gas Abatement Cost Curve* (2010).

²⁸ Stockholm Environmental Institute, Bloomberg Philanthropies and C-40. *Advancing climate ambition: cities as partners in global climate action* (Stockholm, 2014).

²⁹ IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014).

³⁰ IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014).

that target forests and other strategic results areas of the Fund including livelihoods and ecosystem-based adaptation.³¹

29. Deforestation as a mitigation measure has commanded substantial attention in the last decade. Gross forest losses are estimated in the region of 13 million hectares a year over the last decade.³² With afforestation and reforestation factored in, forests account for an estimated 11 to 18 per cent of total GHG emissions (estimates vary substantially depending on modelling assumptions).³³ Nevertheless, reducing emissions from deforestation and forest degradation may account for 24 to 30 per cent of global mitigation potential, and offer a wide array of co-benefits (see Figure 8).³⁴ There is broad consensus that efforts made to reduce deforestation offer greater mitigation potential at a lower cost than afforestation and other forest management interventions.

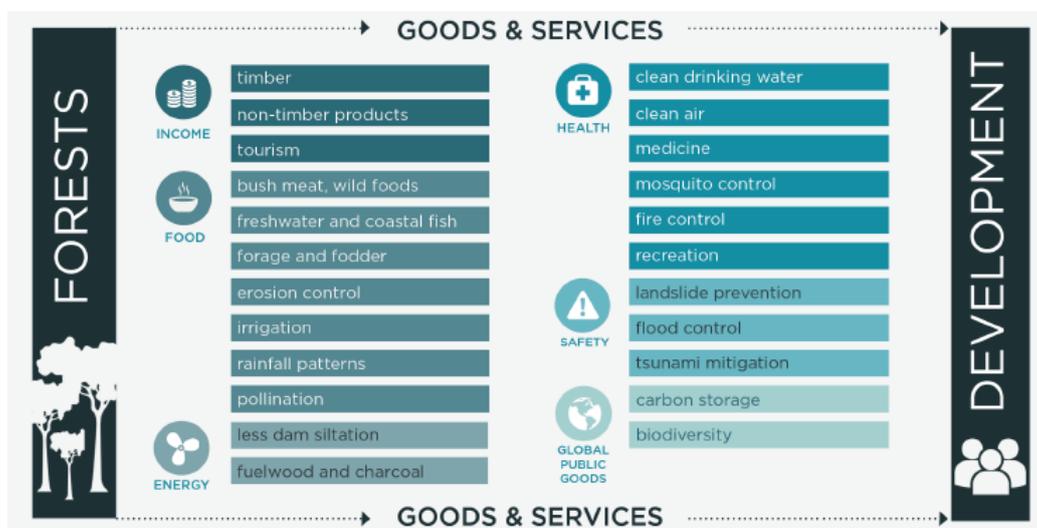


Figure 8: Co-benefits associated with forest conservation.

Source: Center for Global Development. "Why Forests? Why Now?" (2014).

3.3.2 Costs

30. Reducing emissions from deforestation and degradation has been cast as a low cost mitigation option. As highlighted in Figure 2, mitigation from forestry and agriculture has a high potential (over 10 GtCO₂eq/year) at a relatively low cost though estimates vary greatly³⁵ as shown in Figure 9. The cost of action also varies by region: there is significant relatively low and moderate cost mitigation potential from forests in Latin America and Asia (see Figure 9). Regardless of the wide variation in costs depending on the intervention and underlying assumptions, there is broad recognition that forests are highly undervalued. To a large degree, their loss reflects governance and market failures and further emphasizes the benefits of reducing forest losses.

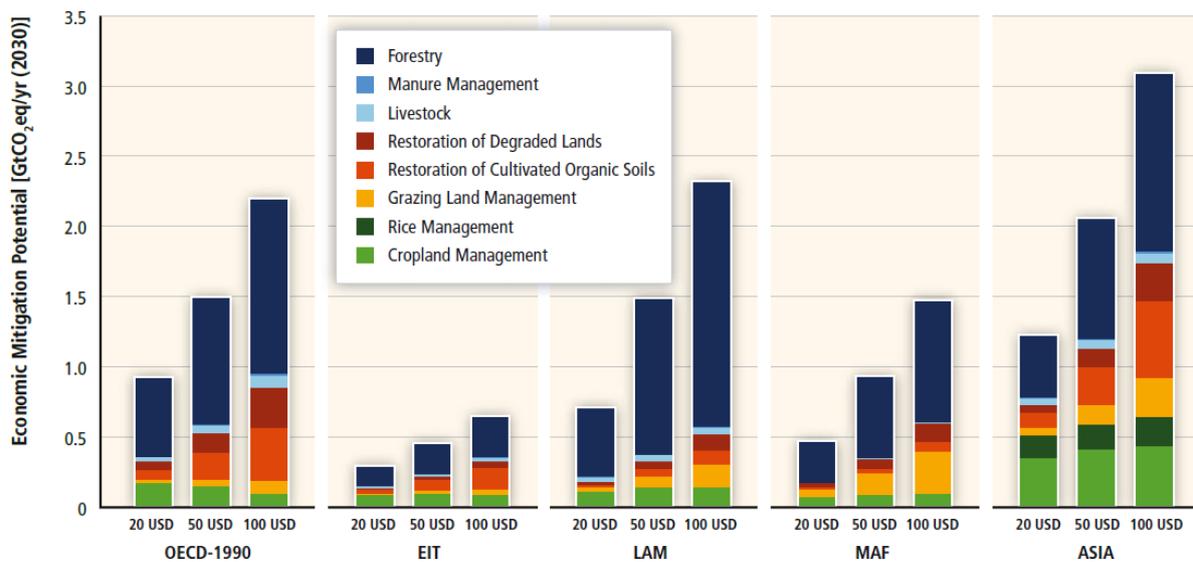
³¹ UNEP. Building Natural Capital: How REDD+ can Support a Green Economy, Report of the International Resource Panel, United Nations Environment Programme, (Nairobi, 2014).

³² Food and Agriculture Organization (FAO). *Global Forest Resources Assessment 2010* (Rome, 2010).

³³ IPCC. *Working Group III Contribution to the Fourth Assessment Report* (New York, 2007).

³⁴ Center for Global Development. "Why Forests? Why Now?", (2014).

³⁵ Around 2.5 tonnes are available at a cost of less than US\$ 20 per tonne, although the majority of forest-related abatement potential comes at higher levels. Source: IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014).



Abbreviations: EIT = economies in transition. LAM = Latin America. MAF = Middle East and Africa.

Figure 9: Mitigation potential by region at costs under US\$ 20, US\$ 50, and US\$ 100.

Source: IPCC. Working Group III Contribution to the Fifth Assessment Report (New York, 2014).

3.3.3 Regional potential and value add of the Fund

31. Tropical forests, by and large, have the highest carbon density in biomass per hectare.³⁶ Large swathes of tropical forest remain in Latin America and the Caribbean (LAC), Central Africa and Asia, which is where the highest physical potential for emissions reductions lies. While some countries in the Asia Pacific region (notably China) have successfully reversed trends of forest loss through reforestation and plantations, in many Asian countries natural forest continue to be lost at a daunting pace. As noted, costs of action are estimated to be relatively lower in Latin America and Asia.

32. Multilateral finance for REDD+ activities to date accounts for about 10 per cent of total climate finance through multilateral climate funds.³⁷ Several dedicated funds have now been created to finance action on forests and climate change including the Forest Investment Program of the Climate Investment Funds, the Congo Basin Forest Fund, the Forest Carbon Partnership Facility, the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries and the World Bank's BioCarbon Fund Initiative for Sustainable Forest Landscapes. Much of this funding has supported "readiness" activities aimed at laying the groundwork for performance based payments for action. In addition there has been significant bilateral finance (particularly from Norway), which has been concentrated in Brazil, Indonesia, Guyana, the Democratic Republic of Congo and now Peru.³⁸ While around US\$ 9 billion in public and private finance has been provided for REDD+ activities since 2006, funding has fallen substantially since 2010.

33. In 2014, several new commitments to reduce deforestation and improve forest management were announced, as well as some new commitments of funding for key countries. This includes the non-legally binding statement of forest principles at international level, private sector commitments to make supply chains deforestation-free, and country commitments for zero deforestation. There is a clear need to engage the private sector on REDD+ action given that many of the drivers of deforestation are linked to private activity

³⁶ IPCC. Working Group III Contribution to the Fifth Assessment Report (New York, 2014).

³⁷ Note this figure excludes contributions through the biocarbon fund.

³⁸ M. Norman and S. Nakhooda. *The State of REDD+ Finance*. Center for Global Development, Working Paper 378 (Washington, 2014).

related to agriculture and timber, including through supply chains. To date, however, despite high expectations, there is limited track record in raising significant private finance to execute forest and land use-related activities.

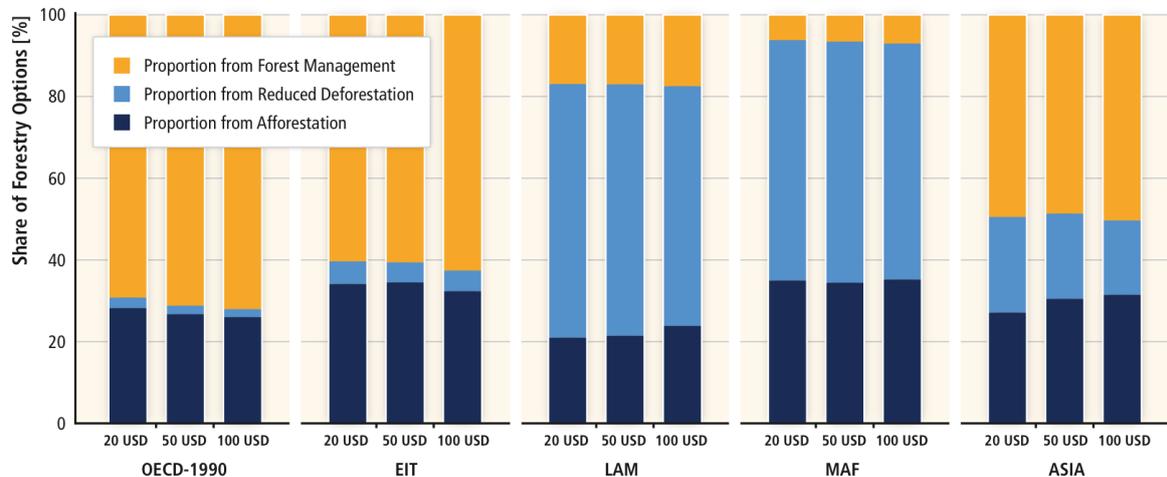


Figure 10: Relative importance of mitigation options in forestry subsectors across regions.
Source: IPCC. Working Group III Contribution to the Fifth Assessment Report (New York, 2014).

34. The physical potential for mitigation, however, is shaped by a myriad of other factors. The drivers are diverse: from commercial to small-scale agriculture, and from global to local demand for timber and forest products. These are complex and highly political to address, not least because changes in transport infrastructure, labour markets and agricultural prices can all play a role in positive or negative ways.³⁹

35. Creating and sustaining an enabling environment for REDD+ can involve forest governance reform, land use rights clarification and reform, and removal or creation of subsidies. Efforts of the Fund towards meeting the potential from forest activities will need to be context specific. Latin American activities, for example, may focus around drivers linked to large-scale agriculture and unsustainable timber harvest, while small-scale agriculture would be a key driver to focus on in Africa, whereas in Asia, multiple interests often overlap. These include the extent to which there is clarity on land use rights, and the quality of forest governance (including law enforcement capacity), alongside the extent to which high level development policy encourages activities that drive deforestation.

36. There will be good potential for the Fund to utilize the REDD+ results-based payment mechanism, in an effort to build on and foster new political momentum in order for the key countries to stick with the progress that has been made. This potential niche is further elaborated in section 5.3.

3.4 Transport

3.4.1 Potential and relevance

37. Transport contributes 13 per cent of global CO₂ emissions. Given current trends, emissions might increase by 25 per cent by 2030;⁴⁰ beyond this date, growth in emissions under business-as-usual scenarios may accelerate as demand for travel in developing economies rise. Several countries are now developing NAMAs that target emissions from the transport sector,

³⁹ K. Chomitz et al. *At Loggerheads? Agricultural Expansion, Poverty Reduction, and Environment in the Tropical Forests*. World Bank Policy Research Report (Washington DC, 2006).

⁴⁰ International Energy Agency, *Energy Technology Perspectives 2012* (Paris, 2012).

notably in Latin America as well as in several African countries.⁴¹ Estimates of the potential contribution of low emission transport to mitigation vary significantly, and are closely linked to national development needs. Mitigation can result both from the adoption of new technologies and approaches (e.g. higher efficiency engines and standards, alternative fuels, and electric and hybrid technologies) as well as from modal shifts and more sustainable approaches to national and urban transport and infrastructure planning.⁴² Countries that completed technology needs assessments identified transport as one of the top sectors in which technology support was needed.

38. Shifts in planning can make the largest contributions to GHG emission reduction, but are a function of policy and institutional incentives rather than finance alone. Indeed, as with all sectors, policy and regulatory measures and investment outcomes are closely linked. For example, fuel efficiency standards have been found to play a central role in reducing GHG emissions from transport. Fuel subsidies also affect transport choices and associated emissions. In the past, there has been strong interest in switching to alternative fuels to reduce emissions, particularly biofuels, including from the private sector. In completing technology needs assessments, countries have highlighted the potential for switching from petrol and diesel to natural gas, and the potential for electric vehicles.⁴³ Recent analysis, however, suggests that biofuels can have substantial negative knock-on effects including on food security due to the large areas of land required for cultivation.⁴⁴ As such switching to biofuels may be a more difficult investment area for the Fund.

3.4.2 Costs

39. The costs associated with different transport sector interventions can vary substantially, but capital investment requirements are often quite high. Economic returns, however, may often be positive.⁴⁵ Infrastructure investments (US\$/tCO₂ avoided) may appear expensive at the margin, but sustainable urban planning and related policies offer significant co-benefits, such as improved health and accessibility, which may offset some or all of the mitigation costs. Realizing co-benefits depends on the regional context in terms of economic, social, and political feasibility, as well as having access to appropriate and cost-effective advanced technologies. Investment in transport infrastructure is central to national development strategies in many cases.

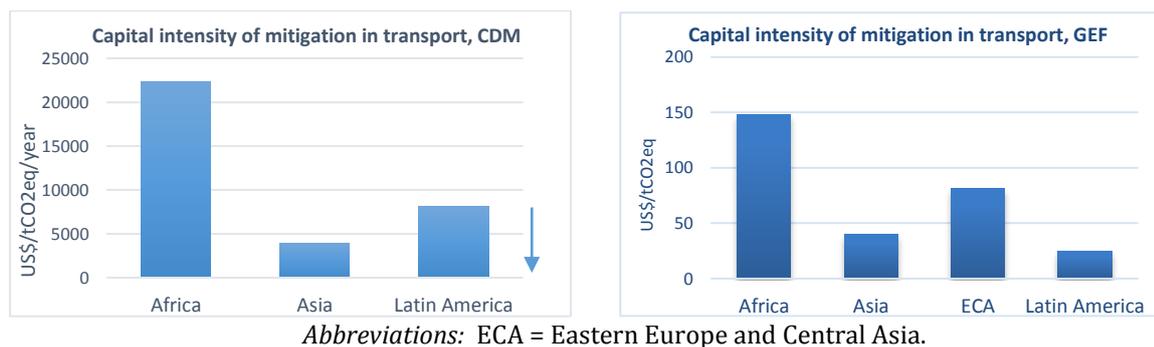


Figure 11: Full cost of transportation projects per tonne of CO₂ abated.

Source: CDM and GEF databases.

⁴¹ UNFCCC secretariat, NAMA Registry. Available from <<http://www4.unfccc.int/sites/nama/SitePages/Home.aspx>> (accessed January 2015).

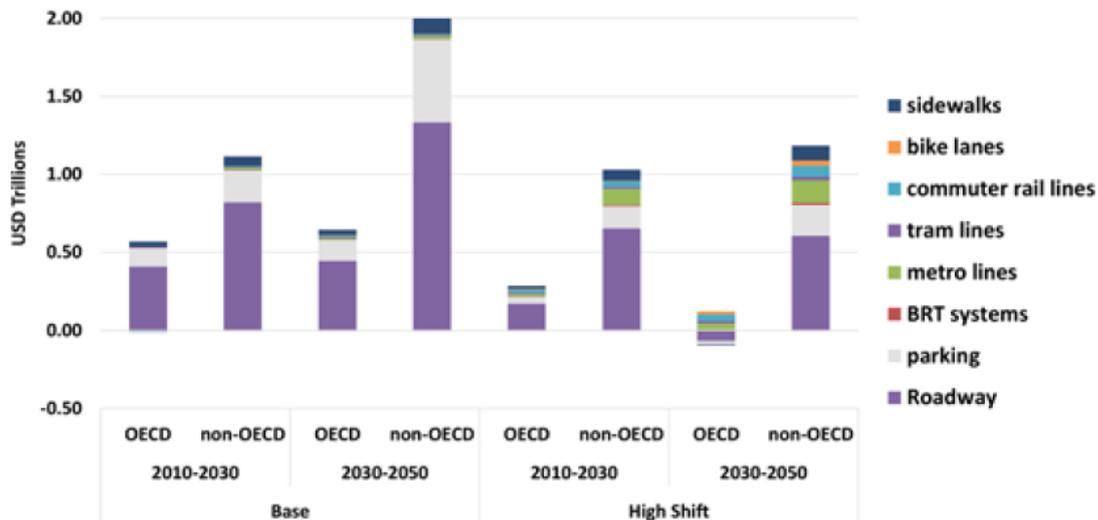
⁴² IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014) and McKinsey. *Global Greenhouse Gas Abatement Cost Curve* (2010).

⁴³ UNFCCC Subsidiary Body for Scientific and Technological Advice document FCCC/SBSTA/2013/INF.7, available at <<http://unfccc.int/resource/docs/2013/sbsta/eng/inf07.pdf>>.

⁴⁴ IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014) and World Resources Institute (2015).

⁴⁵ McKinsey. *Global Greenhouse Gas Abatement Cost Curve* (2010).

40. Investments in more sustainable approaches to meeting transport needs can reduce net spending on transport infrastructure (see Figure 12), and have the potential to dramatically reduce necessary investment in roads, particularly in cities in developing countries.



Abbreviations: BRT = bus rapid transport.

Figure 12: Infrastructure cost estimates, annual averages for 2010-2030 and 2030-2050 by type, scenario and mode.

Source: University of California Davis and International Transport and Development Institute, 2014.

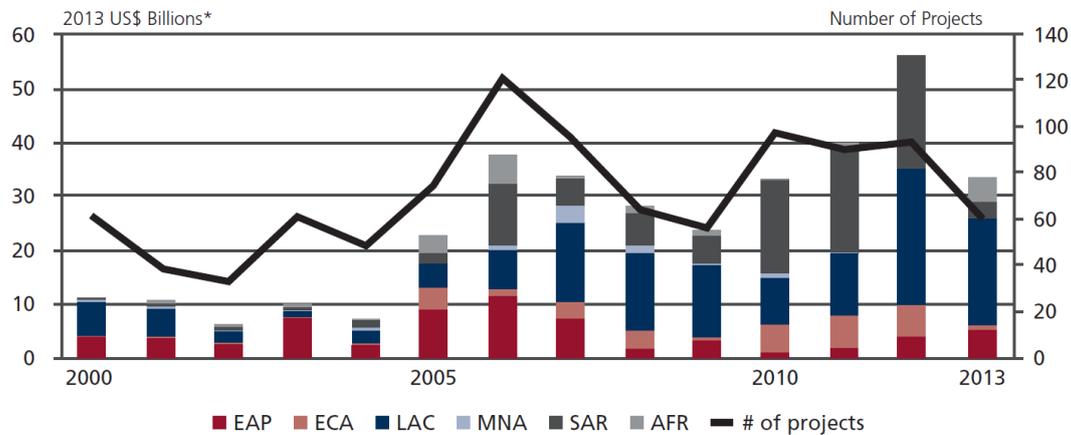
3.4.3 Potential by region and value add of the Fund

41. Urban transport will have a distinct impact on future emissions: cities in Asia and Africa in particular are making decisions now on how to meet needs that will affect development over the next several decades. There is an urgent need to encourage compact, connected urban forms linked by sustainable transit solutions, instead of sprawling, car-dominated and high-emission development. It is worth noting that Asia concentrates the majority of its potential emission reductions in the transport sector.

42. Motorization trends vary substantially across and within regions: car use is growing fastest in China and India, whereas two-wheelers dominate in South-East Asia. Many Latin American cities have been pioneers in introducing more sustainable transport systems, notably bus rapid transport (BRT), but there remains a need to scale up their reach, coverage and functionality as an attractive alternative to conventional car use; opportunities to reduce emissions from freight transport have also been highlighted. Transport systems in Sub-Saharan Africa are typified by high transport costs, with low population densities. The region is also expected to experience the highest rate of urbanization over coming decades, with city densities poised to increase significantly, and a large investment gap for urban transport infrastructure.

43. Low carbon transport programmes, including at urban level, account for a growing though relatively modest share of the mitigation finance provided through existing climate funds. As Figure 13 shows, the largest volumes of private investment in transport are observed in Latin America as well as South Asia and Eastern and Central Europe. This suggests there may be greater scope in seeking to direct that investment towards lower emission and more resilient approaches. A few large projects largely supported by the Clean Technology Fund dominate pipelines of existing climate funds. This suggests that the Fund may be well served to find some niche approaches to supporting mitigation through the transport sector, particularly in cities.

The Group of 20 has recognized the need for a grant-based facility in order to support the preparation of urban transport projects.



Abbreviations: EAP = East Asia and Pacific. ECA = Eastern Europe and Central Asia. LAC = Latin America and the Caribbean. MNA = Middle East and North Africa. SAR = South Asia, AFR = Rest of Africa.

Figure 13: Investment in transport infrastructure in low and middle income countries with private participation, by region.

Source: World Bank and PPIAF, PPI Project Database. Enhanced livelihoods of vulnerable people and communities

3.5 Enhanced livelihoods of vulnerable people and communities

3.5.1 Relevance and potential

44. A livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base'.⁴⁶ Climate change compounds the complexity of efforts to secure sustainable livelihoods, acting as a threat multiplier.⁴⁷ The IPCC Fifth Assessment Report highlights the need to ensure access to natural, human, physical, financial, social and cultural capital in order to sustain livelihoods; climate-related hazards impact on livelihoods through, for example, direct losses in yields, property lost or damaged, or food insecurity, and indirectly, through increased food prices.⁴⁸ The report notes that "poor people...are not all equally affected, and not all vulnerable people are poor": livelihoods may be affected in all countries. However, "climate-related hazards exacerbate other stressors, often with negative outcomes for livelihoods, especially for people living in poverty". There is strong evidence that gender inequality is exacerbated as a result of weather events and climate related disasters,⁴⁹ as well as a large body of literature on gender and livelihoods.

45. The incidence of weather events and climate extremes will have increasing livelihood impacts, both ruinous, as well as more minor shifts in patterns of rainfall, or short periods of extreme weather.⁵⁰ The incidence of extreme events can place a high burden on national systems which ultimately shape adaptive capacity. Figure 14 below overlays poverty,

⁴⁶ R. Chambers and G. Conway, *Sustainable rural livelihoods: practical concepts for the 21st century*. Institute for Development Studies, Discussion Paper No. 296. (Brighton, 1992).

⁴⁷ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

⁴⁸ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

⁴⁹ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

⁵⁰ Scott et al. (2014); D. Wheeler, *Quantifying Vulnerability to Climate Change: Implications for Adaptation Assistance* (Center for Global Development, Washington DC, 2011).

vulnerability and exposure to climate related hazards in selected countries, in order to present a very high level insight into where there may be a specific need to target funding for adaptation. It highlights the need for particular attention to be given to the adaptation needs of sub-Saharan African countries, LDCs and SIDS, as well as to South Asian countries.

46. People are often discriminated against on the basis of their gender, age, income, disability, ethnicity, culture, religion and so on. These groups are more likely to be disproportionately affected and suffer the effects of disasters, as they often face ‘poor living conditions, inadequate infrastructure, a lack of income diversification and limited access to basic services’.⁵¹ People’s vulnerability to natural hazards and their capacity to cope, manage and respond to disasters is dependent upon different social, economic cultural and political processes: people are affected in different ways. A growing number of people and assets are in areas prone to hazards, and are therefore exposed to disasters. This is often as a result of population and economic pressure, more people living in coastal and exposed areas in order to secure life-sustaining livelihoods, and the degradation or loss of natural ecosystems.⁵² As a result of increased exposure and vulnerability to natural hazards, the total number of people dying in disasters globally has increased from a yearly average of 65,000 in 1980 to 72,000 in 2013.⁵³

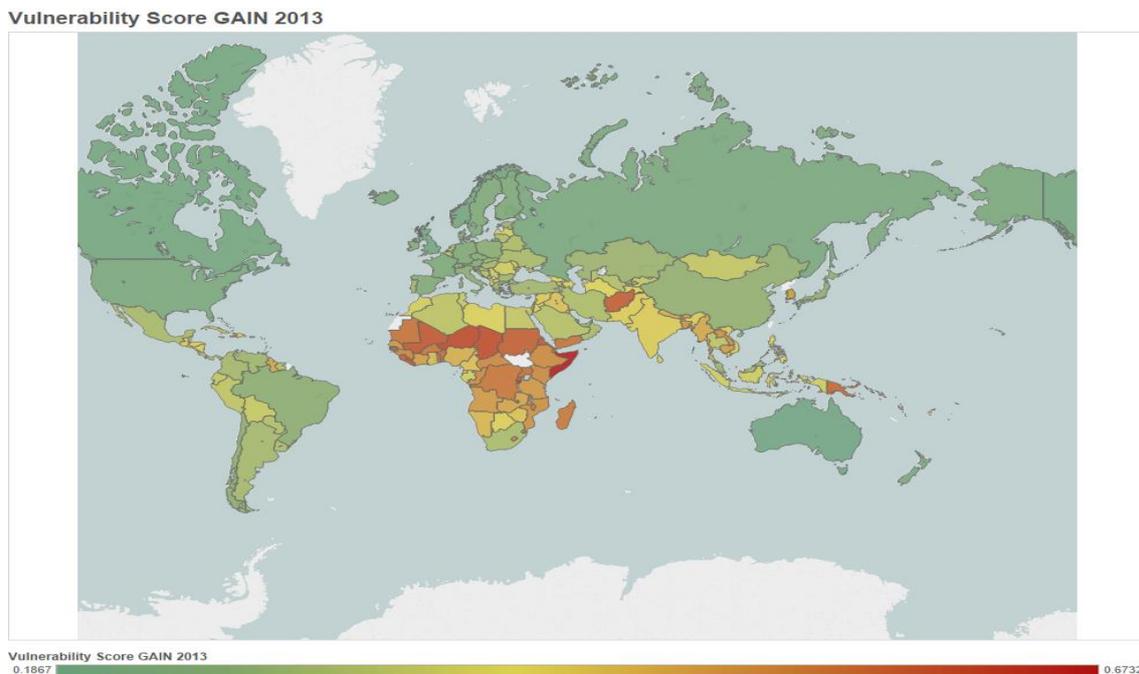


Figure 14: Vulnerability to climate change, poverty and exposure to climate-related hazards

Interactive version available online:

<<https://public.tableausoftware.com/profile/gbantton#!/vizhome/VulnerabilityNDGAIN2013/OverallVulnerabilityandHazard>>

⁵¹ E. Lovell, and V. le Masson, *Equity and Inclusion in disaster risk reduction: building resilience for all* (London, Climate and Development Knowledge Network and Overseas Development Institute, 2014).

⁵² IPCC, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Special Report of Working Groups I and II of the IPCC* (Cambridge and New York, 2012); Foresight, *Reducing Risks of Future Disasters: Priorities for Decision Makers, final project report* (London, Government Office for Science, 2012).

⁵³ T. Mitchell, D. Guha-Sapir, J. Hall, E. Lovell, R. Muir-Wood, A. Norris, L. Scott, L. and P. Wallemacq, “Setting, measuring and monitoring targets for reducing disaster risk: recommendations for post-2015 international policy frameworks” (London, Overseas Development Institute, 2014); *In: E. Lovell, and V. le Masson, (2014), Equity and Inclusion in disaster risk reduction: building resilience for all* (London, Climate and Development Knowledge Network and Overseas Development Institute, 2014).

47. The role of disaster risk reduction measures, social protection programmes, and efforts to strengthen the people's assets, and the policies, institutions and processes that shape their livelihoods in adaptation to climate change are increasingly recognized.⁵⁴ In order to achieve these measures, and in order to address vulnerability to risk adequately, disaster risk reduction and development planning must be inclusive, based on context-specific analyses of people's needs, vulnerabilities, expectations and capacities, taking inequalities into account. It is worth noting that priority within communities is often given to "everyday problems", including livelihood security, as opposed to natural hazards.⁵⁵ Interventions to enhance livelihoods may include protecting: natural assets such as water sources or coastlines; physical assets, such as preventing erosion and landslides, or providing insurance in such events; financial assets; human assets, such as preventing food insecurity or undernourishment; and social and cultural assets.

3.5.2 Needs and costs

48. Declines in primary sector productivity as a result of climate change have the potential to keep 250-500 million people in extreme or moderate poverty (less than US\$ 2/day at purchasing power parity). More than 2.5 billion people globally depend on the primary sector as their main source of income.⁵⁶ People with climate-sensitive livelihoods, including agricultural smallholdings, fishing, pastoralism, and tourism, will feel the effects of climate change most directly and strongly. Agricultural production losses of all developing regions outside Asia may be greater than 10 per cent until 2050. Losses may be as high as 20 per cent in Central Africa, and 1.5 to 12 per cent in Asia,⁵⁷ which as discussed exacerbates food insecurity. It is also important to recognize the growing concentration of poor people in urban areas, and the direct and indirect impacts of climate change on the urban poor (who, for example, may be more severely impacted by changes in food prices).

3.5.3 Regional distribution

49. Climate change will create new poor between now and 2100, in low, medium, and high income countries. The IPCC suggests that "the majority of severe impacts are projected for urban areas and some rural regions in sub-Saharan Africa and South-East Asia". Climate variability, change and extreme events are an additional burden to those in poverty. Figure 15 shows the global concentration of poverty by geography alongside vulnerability to climate change as measured by the Notre Dame Global Adaptation Index (ND GAIN); large populations of poor are presently concentrated in South Asia and Sub-Saharan Africa. Poor people in these regions, in turn, largely depend on agriculture for their livelihoods. This means that efforts to strengthen the resilience of the agriculture sector, and those who depend on it for their livelihoods, may offer major impact potential for the Fund.

⁵⁴ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

⁵⁵ M. van Aalst, T. Cannon, and I. Burton "Community level adaptation to climate change: the potential role of participatory community risk assessment", *Global Environmental Change* 18(1): 165-179, p.169 (2007). In: E. Lovell, and V. le Masson, *Equity and Inclusion in disaster risk reduction: building resilience for all* (London, Climate and Development Knowledge Network and Overseas Development Institute, 2014).

⁵⁶ I. Granoff et al. *Zero Zero: Achieving zero extreme poverty and zero net emissions*. Overseas Development Institute, Working Paper (London, 2014).

⁵⁷ D. Wheeler. "Quantifying Vulnerability to Climate Change: Implications for Adaptation Assistance" (Center for Global Development, 2011).

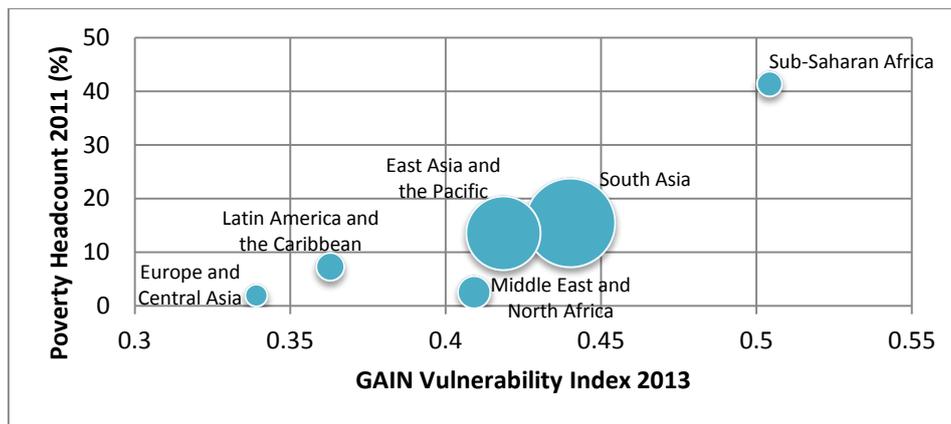


Figure 15: Poverty and vulnerability to climate change, by region.

Source: ND-GAIN Index 2014 and World Bank Poverty Indicators.

50. Support for livelihood enhancement has increasingly focused on increasing resilience, that is, the ability to avoid significant deterioration or to restore one’s livelihood quickly after a shock. The need to “mainstream” climate risk into national development policies has attracted increasing attention in this context, as have the linkages between adaptation and disaster risk reduction (DRR) programming. The low levels of funding for DRR (particularly in contrast to the high costs of—and willingness to finance—disaster recovery and response) has been highlighted.⁵⁸ Adaptation funds, in particular the Pilot Program for Climate Resilience (PPCR) and the Least Developed Countries Fund (LDCF), however, are increasingly investing in disaster risk reduction and early warning systems.

51. The potential for expanded access to insurance, particularly for poorer people and countries for whom there is presently very limited access to insurance, has attracted attention in this context. There is also scope to use social protection programmes to help to support poor communities to deal with challenges and impacts that are linked to climate change (given that many programs already target climate vulnerable people and communities in order to secure their access to food, for example) through “adaptive social protection” programmes.

52. The need to support and nurture “autonomous adaptation” of people, communities and private sector actors is also recognized. Other livelihood initiatives include: diversification of livelihoods, migration, food storage, communal pooling, market responses, and saving, credit societies and systems of mutual support.⁵⁹ Many of these require some resource investment at the outset that climate finance could support.

53. Interventions that aim to enhance livelihoods need to proactively take poverty into account. But a significant consideration for the Fund’s investment strategy is the inextricable linkage between livelihood-enhancing interventions and development efforts. Difficulties in delineating the distinction between adaptation efforts and development efforts have sometimes discouraged the financing of such approaches by the LDCF. The PPCR, however, has been less constrained by such requirements, and has begun to finance programmes aimed at supporting climate resilient livelihoods in several countries including Zambia, Nepal and Tajikistan.

54. There are a range of approaches that could be built on in order to strengthen the resilience of livelihoods to the impacts of climate change, many of which are inextricable from wider efforts to support development, disaster risk reduction, and poverty reduction in the poorest countries. Adaptation finance can have an important role in raising the profile of climate risk in development, disaster risk, and policy programming in recipient countries, and in exploring programmatic approaches to this end. In many countries, those dependent on

⁵⁸ J. Kellet and A. Caravani. “Financing Disaster Risk Reduction” (Overseas Development Institute, 2014).

⁵⁹ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

agriculture for their livelihoods are particularly vulnerable to climate change, and are also often amongst the poorest people in society.

55. The use of social protection programmes to help to address climate related shocks and pressures on farmers, for example, has been piloted in several countries, and may have the potential to be scaled up. There is also significant potential to work with the insurance industry in order to extend access to insurance programmes that address climate related risks, seeking to create incentives for adaptive action at the national level. These efforts could build upon the experiences of existing programmes such as CARIBRISK, and the efforts of the Africa Risk Capacity centre to develop new approaches. Tourism-based livelihoods in SIDS are also poised to come under immense direct pressures. The Fund may also explore options for funding for community-based adaptation programs in rural areas.⁶⁰ Investing in the resilience of agriculture and those who depend on it for their livelihoods can be a key target for the Fund, as discussed further in section 4.3.

3.6 Food, water security, and health

3.6.1 Relevance and potential

56. Climate change is expected to have major effects on health and well-being in developing countries, and on food and water systems.⁶¹ There is high confidence that climate change may affect all aspects of food security, including food access, utilization and price stability, in large part as a result of disruptions to agriculture and food production systems. Food and water disruptions as a result of climate change may in turn result in health impacts: these three result areas are therefore quite interconnected. Climate change further exacerbates the risks of hunger and malnutrition through extreme weather events including sea level rise and accelerated glacial melt which have the potential to destroy crops and critical infrastructure.⁶²

57. **Food:** Disruptions to food production systems, particularly agriculture, are a major source of concern when it comes to the potential impacts and costs of climate change, and manifest themselves against a backdrop of projected increases in demand for food of 50 to 70 per cent by 2050.⁶³ However, access to and utilization of food, as well as the nutritional value of food, may all be affected by climate change. Analysis from the World Food Programme suggests that 10 to 20 per cent more people will be hungry as a result of climate change by 2050 than otherwise, and the number of malnourished children will increase by 21 per cent; sub-Saharan Africa is likely to be the worst affected region. Action to strengthen the resilience of agricultural systems, as well as their resource efficiency (particularly around water), are crucial elements of adaptation.

58. The adoption of more resilient crops and farming techniques in this context is of interest. While the exact impacts of future climate change on agriculture and food production systems are difficult to predict, there is a strong case for strengthening the capacity of systems that deal with current climate and weather impacts, in order to be prepared to manage future potential disruptions. The IPCC notes that there is the potential for agronomic adaptation to improve yields by 15 to 18 per cent, but the effectiveness of adaptation is highly variable. There are significant benefits to investing in food security interventions: some estimates suggest that for every United States dollar invested in risk reduction, US\$ 2-4^{64,65} are returned in terms of

⁶⁰ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

⁶¹ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

⁶² Met Office and World Food Programme. *Climate impacts on food security and nutrition* (London, 2012).

⁶³ FAO, World Food Programme and IFAD (2012). *The state of food insecurity in the World* (Rome, 2012).

⁶⁴ Global Commission on the Economy and Climate (2014). *Better Growth, Better Climate: The New Climate Economy Report* (Washington, DC, 2014).

⁶⁵ Institution of Mechanical Engineers, "Global Food: Waste Not, Want not" (London, 2013).

avoided or reduced disaster impacts. There is also growing recognition of the potential to reduce food waste, and improve the efficiency of food supply chains as a whole as a means by which to strengthen food security in the face of climate change as well as reduce pressure on land and forests in order to meet growing demand for food. There is particular scope to reduce food losses after harvest during processing and consumption, where 1.2-2 billion tonnes of food are estimated to be lost annually.

59. **Water security:** Climate change is likely to result in increases in the share of the global population facing increased water scarcity, and the fraction affected by major river floods. Renewable surface water and groundwater resources are expected to be significantly reduced in dry subtropical regions. Freshwater withdrawals are of particular importance for agriculture in many regions, particularly South Asia, as well as industry and domestic use (Table 2). In addition, timings and quantities of precipitation are expected to be far less predictable, affecting rain-fed agricultural production. Raw water quality may also fall, and water treatment systems may need to be enhanced in order to deal with changing factors such as temperature, sediment, nutrient, or pollutants. The access and quality of sanitation facilities has much broader development implications, with access lowest in LDCs and SSA countries and in rural areas, and expansion must take climate impacts on water availability into account (Table 3). The health of water systems is linked to the health of ecosystems, including oceanic systems and terrestrial systems such as rivers. The IPCC further note that adaptive water management techniques including scenario planning and flexible low regret solutions may help to create resilience to uncertain hydrological changes.

Table 2: Annual freshwater withdrawals for agriculture, domestic and industrial use, as a percentage of total freshwater withdrawal (World Development Indicators, 2013).

| Region | Agriculture withdrawals | Domestic withdrawals | Industry withdrawals |
|------------------------------|-------------------------|----------------------|----------------------|
| East Asia and Pacific | 66.37 | 17.63 | 16.00 |
| Europe and Central Asia | 27.14 | 26.46 | 46.40 |
| Latin America and Caribbean | 65.05 | 24.56 | 10.38 |
| Middle East and North Africa | 68.11 | 27.25 | 4.64 |
| South Asia | 81.30 | 16.39 | 2.31 |
| Sub-Saharan Africa | 58.78 | 30.20 | 11.02 |
| SIDS | 52.12 | 32.97 | 14.91 |
| LDC | 65.70 | 25.51 | 8.79 |

Table 3: Access to improved sanitation facilities (percentage of rural and urban population, World Development Indicators, 2013).

| Region | Total | Rural | Urban |
|------------------------------|-------|-------|-------|
| East Asia and Pacific | 74.35 | 68.82 | 84.53 |
| Europe and Central Asia | 96.51 | 94.70 | 97.55 |
| Latin America and Caribbean | 82.56 | 73.99 | 86.51 |
| Middle East and North Africa | 91.19 | 85.62 | 95.12 |
| South Asia | 55.53 | 49.73 | 67.51 |
| Sub-Saharan Africa | 33.83 | 25.64 | 44.56 |
| SIDS | 71.15 | 65.26 | 80.01 |
| LDC | 34.29 | 25.53 | 49.11 |

60. **Health:** Health may be affected through the direct impacts of extreme weather including heat, drought and heavy rain; through natural systems such as vector-borne and water-borne diseases; and finally, through human systems such as occupational impacts, under-nutrition, and mental stress (IPCC WGII, 2014). Surveillance of infectious diseases, improved

management of environmental determinants of health (such as provision of water and sanitation), and strengthening health systems (their preparedness for extreme weather events, and their ability to deal with shifts in the incidence and geographic range of diseases) can all support adaptation. The IPCC notes that “at present the worldwide burden of human ill-health from climate change is relatively small compared with effects of other stressors and is not well quantified.” While the impacts of unfettered climate change on health are likely to be significant, they may not manifest for some time. Most health adaptation in developing countries so far has therefore been aimed at meeting “deficits” in existing systems for example through better disease surveillance or monitoring of environmental exposures.

3.6.2 Costs and needs

61. Estimates of the costs of adaptation and relevant needs are highly uncertain. The World Bank’s Economics of Adaptation to Climate Change study estimates the costs of adaptation in the water sector at US\$ 14.4 to 19.7 billion per year; human health at US\$ 1.5 to 2.0 billion; and agriculture and fisheries at US\$ 2.5 to 3.0 billion. The World Health Organization has estimated that current commitments to health adaptation internationally amount to less than 1 per cent of the annual health costs attributable to climate change in 2030. While agriculture is one of the most prioritized sectors in the NAPAs that LDCs have developed (46 per cent of estimated financing needs), other relevant sectors such as water and sanitation account for only 12 per cent of identified needs. Fishing, the disruption of which can have substantial implications particularly for nutrition, accounted for 3 per cent of needs, and health was one of the sectors for which the least support was sought.⁶⁶ This may reflect perceptions that such interventions can be less directly linked to climate change.

3.6.3 Regional effects and value add of the Fund

62. Health adaptation in Africa and South Asia is projected to incur at least three-quarters of future annual global health adaptation costs.⁶⁷ Most of the increase of climate-related hunger risk is projected to be in sub-Saharan Africa and parts of South Asia, particularly in terms of child malnutrition, and is confirmed by multiple studies.^{68,69} A combination of factors make these regions particularly vulnerable in terms of food security: climate risks such as floods, droughts and storms, as well as high poverty rates and high sensitivity to the effects of climate change.⁷⁰ About 65 percent of the global total increase in climate-related hunger is projected to occur in Africa.⁷¹ Growing demand for agricultural land including to meet needs for food are amongst the drivers of deforestation in Latin America. Indeed recent studies suggest that the impacts of climate change on food crop availability in Latin America could be severe, including in the near term.⁷² They may reduce regional agricultural exports by US\$ 32 to 54 billion per year by 2050.

63. The majority of adaptation finance identified in the CPI landscape of climate finance supported activities in the water sector (US\$ 14 billion of US\$ 25 billion), and US\$2 billion

⁶⁶ UNFCCC Standing Committee on Finance, *2014 Biennial Assessment and Overview of Climate Finance Flows Report* (Bonn, 2014).

⁶⁷ World Bank. *Economics of adaptation to climate change - Synthesis report*. (Washington, DC, 2010).

⁶⁸ M. Parry et al, *Climate Change and Hunger: Responding to the Challenge*, World Food Programme (Rome, World Food Programme, 2009).

⁶⁹ Nelson et al, *Food Security, Farming, and Climate Change to 2050: Scenarios, Results, Policy Options*, (Washington, DC, International Food Policy Research Institute, 2009).

⁷⁰ Met Office and World Food Programme. *Climate impacts on food security and nutrition* (London, 2012).

⁷¹ M. Parry et al, *Climate Change and Hunger: Responding to the Challenge*, World Food Programme (Rome, World Food Programme, 2009).

⁷² United Nations Economic Commission for Latin America and the Caribbean (UNECLAC), IDB and WWF. *The Climate and Development Challenge for Latin America and the Caribbean - Options for Climate-Resilient, Low-Carbon Development* (New York, 2013).

supported agricultural resilience. All three of these result areas are very closely linked to development efforts, and it may often be challenging to distinguish climate-related components from wider efforts to strengthen food, water and agriculture systems in developing countries.

64. Adaptation funds, among these three result areas, have prioritised water activities for a total amount approved of US\$ 244 million, while food and health have received respectively US\$ 119 and US\$ 6 million. Many climate funds have also begun to support the development of hydro meteorological systems in order to improve the availability of information on weather and climate forecasting including for those who depend on agriculture. The use of information technology to both gather and disseminate such information, and its particular applications for the poorest, is gaining growing attention⁷³, though such approaches have yet to be deployed at scale.

65. It is clear that there are multiple “no regrets” entry points into supporting better outcomes. These include support for environmentally and socially sustainable climate-smart agriculture, which can reduce food security risks as well as pressures on water supply. Efforts to improve the resilience of cities can also deliver integrated outcomes in this result area, by improving water sanitation and management systems and infrastructure within urban areas, notably in Asia, Africa and Latin America. The Fund can also seek to improve water management systems, including through efforts to improve the quality of relevant infrastructure, and to support ecosystem management including at a regional and trans-boundary levels.

3.7 Infrastructure

3.7.1 Relevance and potential

66. Infrastructure in both urban and rural areas is subject to significant risks in the face of climate change, and cuts across multiple results areas of the Fund. It is at the heart of the climate change mitigation challenge: efforts to reduce emissions from energy, buildings, transport and cities require fundamental shifts to the way in which relevant infrastructure services are built and delivered. Efforts to increase the resilience of water supply systems can also affect relevant infrastructure choices. The challenge for the Fund will be to help shift investment decisions so these facilities are both less emission-intensive, and more resilient to climate impacts.

67. Reducing basic service deficits and building resilient infrastructure systems (water supply, sanitation, storm and waste water drains, electricity, transport and telecommunications, health care, education and emergency response) can reduce exposure to hazards and vulnerability to climate change.⁷⁴ The World Economic Forum estimates a US\$ 1 trillion annual global infrastructure investment gap. Developing countries face particular challenges raising finance for infrastructure,⁷⁵ including from the private sector. Perceptions of country risk and the long time frames of the investments involved compound the challenge.

3.7.2 Needs and costs

68. The World Bank’s economics of adaptation to climate change study highlighted the large costs of infrastructure adaptation (see Figure 16). Middle income countries including Brazil, Indonesia, Mexico, Mongolia, the Philippines, South Africa and Viet Nam are in the process of

⁷³ A. Maheshwari, A. Miller and S. Patel, *Mobilizing Public and Private Funds for Inclusive Green Growth* (Washington, DC, International Finance Corporation, 2014).

⁷⁴ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

⁷⁵ International Monetary Fund. *World Economic Outlook* (Washington, DC, 2014).

seeking scaled-up investment in infrastructure in order to improve the quality and coverage of their services.⁷⁶ Many African countries, on the other hand, confront substantial infrastructure deficits, related to transport, water and energy.^{77,78}

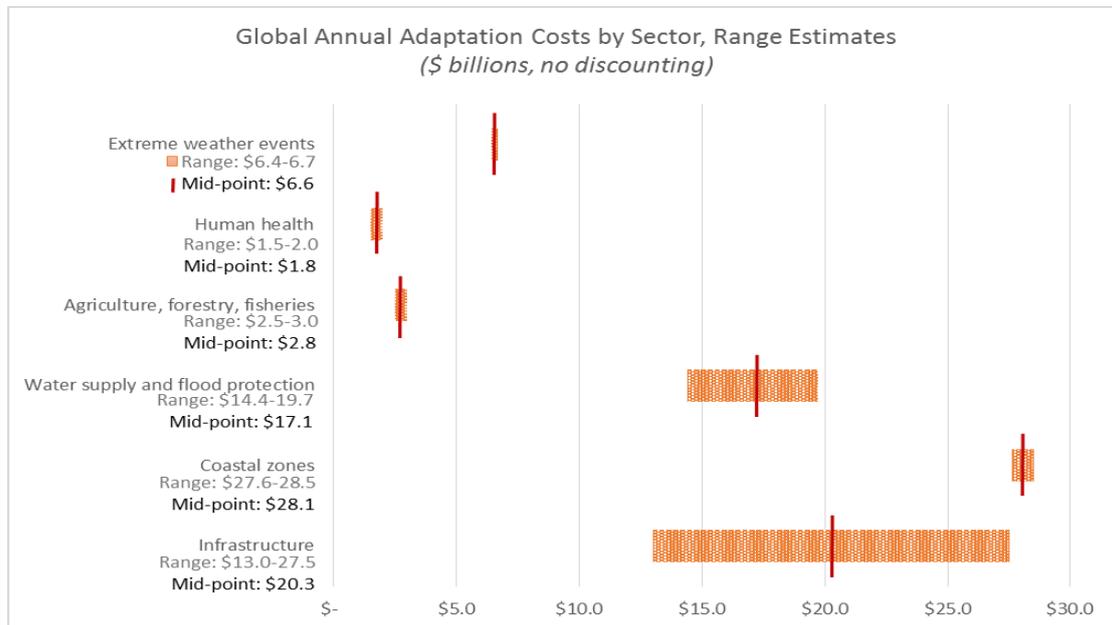


Figure 16: Global annual costs of adaptation, by sector.

Source: World Bank. *Economics of adaptation to climate change - Synthesis report*. (Washington, DC, 2010).

3.7.3 Value add and regional distribution

69. The most obvious risk to infrastructure from climate change is in coastal areas as a result of sea level rise and flooding. While only a third of low elevation coastal zone (LECZ) land below 10 meters is in Asia, the region accounts for 73.5 per cent of low elevation coastal populations because of very high population densities. The largest low elevation coastal populations are generally in large Asian countries with substantial delta regions. Globally, and particularly in Asia, urban populations are more likely to be in the LECZ than rural populations, and especially so for large urban populations (cities with populations over 5 million). Africa confronts an infrastructure gap at present (greater access to infrastructure services is needed in order to meet development needs), which is linked to the relatively weak resilience of the countries in the region to the impacts of climate change. Yet there is massive investment in infrastructure underway in Africa at present as part of efforts to meet development needs. Strengthening the resilience of these investments to climate change and ensuring their coherence with the imperatives of realizing low emission and climate resilient pathways in the long term is a key challenge.

⁷⁶ Urban Land Institute and Ernst & Young. *Infrastructure 2013: Global Priorities, Global Insights*. (Washington, D.C., Urban Land Institute, 2013).

⁷⁷ Urban Land Institute and Ernst & Young. *Infrastructure 2013: Global Priorities, Global Insights*. (Washington, D.C., Urban Land Institute, 2013).

⁷⁸ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

Table 4: Population and land area in the Low Elevation Coastal Zone (LECZ) by region in 2000.

| Region | Population and land area in LECZ | | | | Share of population and land area in LECZ | | | |
|---------------------------|----------------------------------|------------|------------------------------|------------|---|-----------|----------|----------|
| | Population (million) | | Land ('000 km ²) | | Population (%) | | Land (%) | |
| | Total | Urban | Total | Urban | Total | Urban | Total | Urban |
| Africa | 56 | 31 | 191 | 15 | 7 | 12 | 1 | 7 |
| Asia | 466 | 238 | 881 | 113 | 13 | 18 | 3 | 12 |
| Europe | 50 | 40 | 490 | 56 | 7 | 8 | 2 | 7 |
| Latin America | 29 | 23 | 397 | 33 | 6 | 7 | 2 | 7 |
| Australia and New Zealand | 3 | 3 | 131 | 6 | 13 | 13 | 2 | 13 |
| North America | 24 | 21 | 553 | 52 | 8 | 8 | 3 | 6 |
| Small Island States | 6 | 4 | 58 | 5 | 13 | 13 | 16 | 13 |
| World | 634 | 360 | 2,700 | 279 | 10 | 13 | 2 | 8 |

Source: McGranahan, G., Balk, D. and Anderson, B. "The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones". *Environment and Urbanization*, 19(1): 17-37.

70. A growing volume of adaptation finance is now being directed to help to meet infrastructure-related needs in developing countries including roads and transport, and water, particularly through the Pilot Programme for Climate Resilience (PPCR) (see Figure 17).

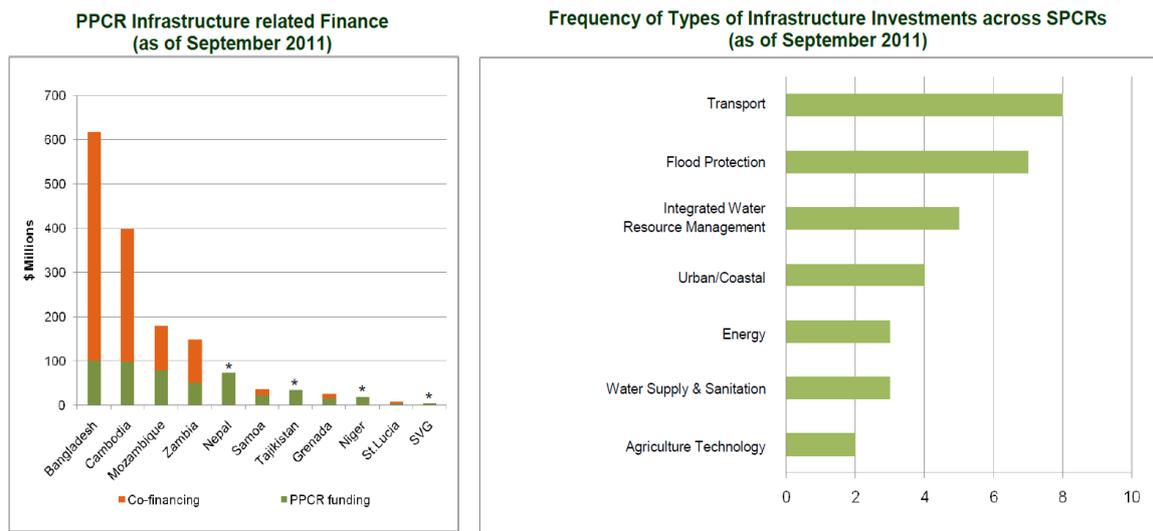


Figure 17: Overview of PPCR infrastructure investment data.

Source: PPCR, 2011.

71. At least 17 per cent of adaptation finance (US\$ 366 million) includes infrastructure components in its multi sectorial activities with a particular focus on Sub-Saharan Africa and Asia and Pacific.

72. Through a focus on financing climate-compatible cities, the Fund may be able to help support an integrated approach to infrastructure that offers both resilience and mitigation benefits. The risk of "maladaptation" (i.e. investments that in fact do not support the ability to weather or respond to the impacts of climate change) needs to be managed carefully. This potential is discussed further in section 4.1.

3.8 Ecosystems and ecosystem services

3.8.1 Relevance and potential

73. Ecosystem services are the benefits to humans that arise from the interactions between components of an ecosystem, which include provisioning, regulating, cultural and supporting services.⁷⁹ Climate change will further impact natural systems, affecting ecosystem service flows. The Millennium Ecosystem Assessment noted that climate change was the driver of ecosystem degradation the impact of which was increasing most rapidly, although there is uncertainty about scope and the specific economic implications of this change.⁸⁰ Ecosystem-based adaptation (EbA) offers flexible and cost-effective measures to address risks at multiple scales that can also deliver co-benefits for mitigation, livelihood protection and poverty alleviation.⁸¹ Ecosystem services have been shown to reduce exposure to natural hazards and build adaptive capacity, which also contributes to resilient outcomes. While the contribution of ecosystem services to human resilience is only beginning to be understood, there is a strong economic case for investing in EbA and ecosystem-based approaches.⁸² Understanding of how ecosystem-based adaptation works is still evolving. However, there are obvious linkages with other results areas of the Fund, including water, agriculture and forests.

74. The IPCC Working Group II Contribution to the Fifth Assessment Report includes analysis of natural and managed resources, their systems and their uses. It focuses on freshwater resources, terrestrial and inland water system, coastal systems and low-lying areas, the ocean system, and food security and food production systems. These resource areas capture key ecosystems and ecosystem services that will be affected by a changing climate and that should be considered for adaptation investments. It is reasonable to assume that the impact of interventions in these areas would be felt in countries that contain key ecosystems, and where economic activity and human wellbeing depend most significantly on natural resources. Table 3 indicates possible area-based impact by region for some key ecosystems. Underpinning ecosystem services, biodiversity is also of relevance. Asia and LAC have a particularly high biodiversity potential; it is somewhat lower in sub-Saharan Africa. There is of course huge variation amongst countries within these regions, and there are many countries in Africa with biodiversity wealth to safeguard (Figure 18).

⁷⁹ Millennium Ecosystem Assessment. *Provisioning services include food, fuel and water; regulating services include natural hazard mitigation, erosion control and water purification; supporting services include soil formation and nutrient cycling; and cultural services include recreational and other nonmaterial benefits.* (Washington, DC, 2005).

⁸⁰ James Boyd. "Ecosystem Services and Climate Adaptation", Issue Brief 10-16 (Resources for the Future, 2010).

⁸¹ Richard Munang et al. "The role of ecosystem services in climate change adaptation and disaster risk reduction". *Current Opinion in Environmental Sustainability*, No.5 (2013).

⁸² E. Carabine, C. Cabot Venton, T. Tanner, and A. Bahadur. (2014) "The Contribution of Ecosystem Services to Human Resilience: A Rapid Review. Rapid review paper for the Rockefeller Foundation. (Overseas Development Institute (ODI), UK, 2014).

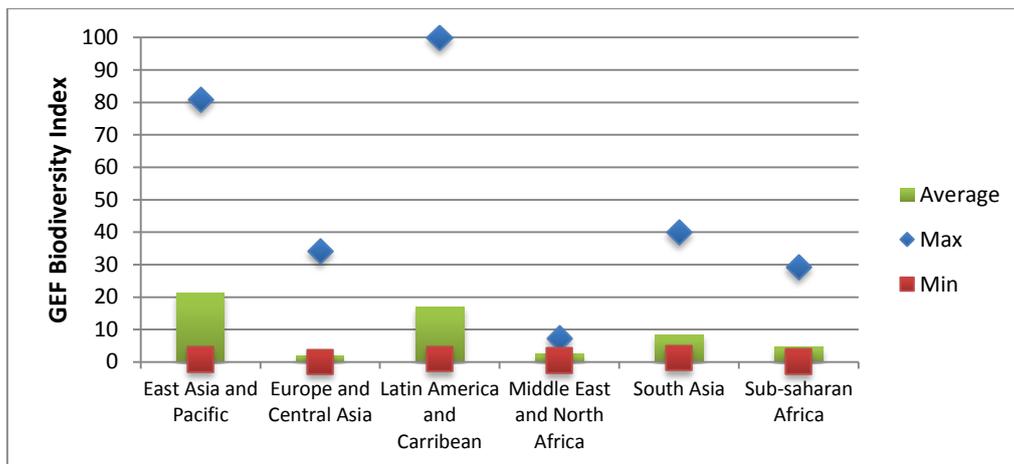


Figure 18: Average Biodiversity Index of the Global Environmental Facility by region and range (highest: 100)

75. Holistic investment in ecosystem services is complex as their provision involves and incorporates many systems over multiple scales, and interacts with national considerations (such as land use rights, environmental governance and policy responses). Often, hybrid measures combining ecosystem-based and traditional approaches can be most effective and efficient. An assessment of ecosystem services projects has found that the benefit to cost ratios of over 200 investments in ecosystem restoration (based on net present values) ranged from a worst-case scenario of 0.05:1 for coral reefs and coastal systems, to as much as 35:1 for grassland systems.⁸³ These estimates are conservative and the majority of these projects should be considered not only as profitable but also as high-yielding investments. Coastal wetlands and inland wetlands, followed by tropical forests, offered the most value for ecosystem restoration investment.

Table 5: Exemplary ecosystems and area by region

| Region | Forest ('000 ha) | Coral reefs (km ²) | Mangroves (km ²) |
|---------------------------------|------------------|--------------------------------|------------------------------|
| East Asia and Pacific | 6,600 | 137,690 | 56,537 |
| Europe and Central Asia | 10,325 | - | - |
| Latin America and the Caribbean | 9,474 | 14,860 | 39,988 |
| Middle East and North Africa | 226 | 5,700 | 217 |
| South Asia | 817 | 15,440 | 10,343 |
| Sub-Saharan Africa | 6,657 | 17,980 | 27,808 |

3.8.2 Value add of the fund

76. Existing ecosystem-based adaptation is being funded in a small number of cases through existing climate funds. While there are an increasing number of projects that focus on the role of forests in ecosystem service provision and on ecological infrastructure through ecosystem-based adaptation approaches, much less attention has been paid to the impact of climate change on coral reefs, the longer term viability of which is likely to be threatened over 350 parts per million. Such projects may be of particular relevance in SIDS, where threats of climate change to coastal ecosystems are large. In the Maldives, for example, more than three-quarters of the islands are one meter above sea level. Coral reefs and coastal ecosystems protect communities from storms and erosion, reducing damage costs and potentially saving lives. The costs of

⁸³ R. De Groot and others, "Benefits of Investing in Ecosystem Restoration", *Conservation Biology* vol. 27 No. 6 (2013).

seawalls or other hard infrastructure may well be more than the cost of protection of the existing reefs that serve similar functions.

IV. Private sector opportunities

77. This section outlines the opportunities for the private sector and the Private Sector Facility's approach. In addition to the eight initial results areas analysed above, this section will further refine the focus spectrum using some additional criteria. These are as follows:

- (a) ***The propensity for private sector actors to be involved in a sector in a manner that leverages the Fund's limited resources.*** For example, one can expect a private sector actor to be heavily involved in building up climate-resilient residential and commercial real estate. However, the private sector will presumably play only a limited role in building up and managing coastal protection infrastructure.
- (b) ***The availability of local capital in the geographic region.*** The Fund's approach to a region and country may need to be dynamically adjusted based on local availability and access to capital.

For example, the Fund could approach countries with large capital markets with a predetermined "exit" strategy for its investment, and a focus on "crowding-in" third party funding. In this case, the Fund will most likely identify future investors and exit the project post-construction, as the construction phase is generally too risky for longer-term private sector investors. Investments made by the Fund could be seen as a bridge aimed at crowding in private sector money into climate-sensitive investments.

Conversely, the Fund could approach countries with small or non-existent capital markets with a focus on "additionality". That is, the Fund could adopt a "hold" strategy where the intention is to undertake possible projects and investments that will have a "demonstrative effect" for other investors and project developers, and subsequently exit the project as it reaches maturity. Through this approach the Fund would aim to help to foster the capacity of the local financial sector with regards to financing climate change adaptation and mitigation projects and programmes.

The availability of local capital could also have an effect on the type and size of projects on which the Fund focuses. For example, in the energy sector, large capital markets could be conducive to making investments in large on-grid alternative energy projects. Medium-sized capital markets could be conducive to medium-sized on-grid alternative energy projects, or medium-sized decentralized distributed grid systems. Small capital markets could suggest an approach focused on financing low-emission and climate-resilient expansions of existing power plants rather than greenfield projects, and off-grid small-scale projects. In the case of small-scale projects, the Fund would work with accredited entities that work with micro-, small- and medium-sized enterprises to implement such projects. This would reduce transaction costs and allow the Fund to rely on entities' local expertise.

- (c) ***The expected time frame of disbursement.*** The aforementioned balanced approach between large scale, medium scale and small scale projects will have the ancillary benefit of affecting the timing over which approved projects are disbursed. One of the lessons learned from existing climate finance is that there is a gap between project approvals and the disbursement of committed funds. The Fund could consider a balanced approach between mega, medium and small projects as a partial solution to this existing issue in order to reduce approved but undisbursed balances.

4.1 Private sector involvement in adaptation

78. **The Private Sector Facility has a material role to play in both adaptation and mitigation.** The Fund has a particular opportunity to differentiate itself from other climate finance channels by catalysing private sector investments in adaptation, as these have to date focused primarily on mitigation.

79. The existing predominant view that the private sector’s primary role lies in mitigation may be flawed, as it overlooks the operational risk that climate change poses to the private sector.

80. **Standard & Poor’s have identified climate change as one of only two mega trends that are expected to have a material adverse change on global economic prosperity** (the other is aging). Therefore the potential impact of climate change on the viability of existing and future private investments is an externality that has been underestimated. The private sector is increasingly affected by climate change through loss of assets and disrupted supply chains. Climate change is an operational risk that can have a material adverse impact on corporate risk ratings. It is in part for this reason that Standard & Poor’s participates in the United Nations Environment Programme’s inquiry into a sustainable financial system.

81. **Climate risk affects GDP output and puts existing assets at risk.** The 2013 Global Assessment Report on Disaster Risk Reduction reports that approximately 5 per cent (US\$ 4 trillion) of annual global GDP is at risk from climate change in any given year.⁸⁴ Allianz SE reports numbers as high as 30 per cent for some countries. In addition, Munich Re put forth US\$ 124 billion of reported asset losses in 2013 due to climate related natural catastrophes.⁸⁵ Guangzhou (China) alone has US\$ 3.5 trillion of capital at risk from climate related events.⁸⁶

82. Vulnerability to climate change is inversely proportional to sovereign risk rating and gross domestic product, as can be seen from Figures 19 and 20.

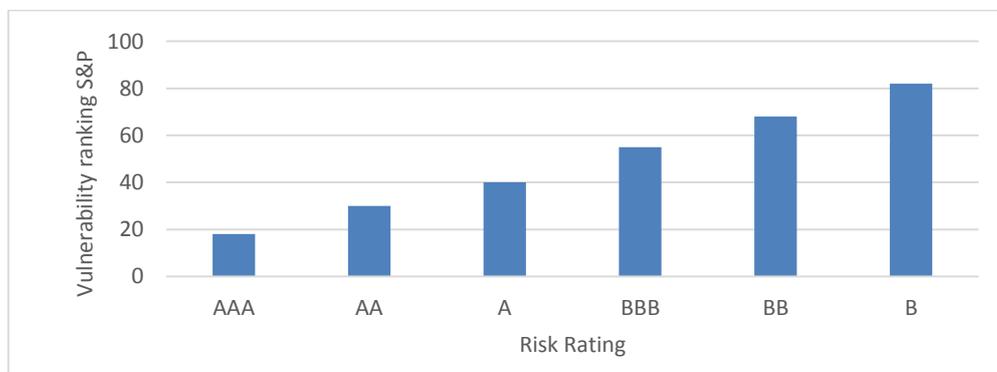


Figure 19: Sovereign risk rating and vulnerability to climate change.

Source: Standard & Poor’s, “Climate Change is a Global Mega-Trend for Sovereign Risk”, *CreditWeek* vol. 34. No. 20 (2014)

⁸⁴ United Nations Office for Disaster Risk Reduction, *From Shared Risk to Shared Value –The Business Case for Disaster Risk Reduction. Global Assessment Report for Disaster Risk Reduction* (Geneva, 2013).

⁸⁵ Source: Standard & Poor’s, “Climate Change is a Global Mega-Trend for Sovereign Risk”, *CreditWeek* vol. 34. No. 20 (2014).

⁸⁶ United Nations Office for Disaster Risk Reduction, *From Shared Risk to Shared Value –The Business Case for Disaster Risk Reduction. Global Assessment Report for Disaster Risk Reduction* (Geneva, 2013).

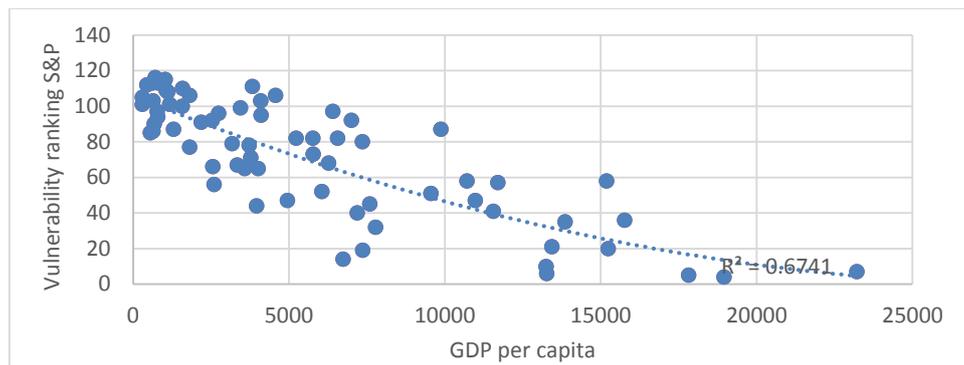


Figure 20: GDP and vulnerability to climate change.

Source: Standard & Poor's, "Climate Change is a Global Mega-Trend for Sovereign Risk", *CreditWeek* vol. 34. No. 20 (2014)

83. Vulnerability is positively correlated with national dependence on agriculture and forestry, as highlighted in Figure 21, and 21 of the top 25 vulnerable countries are found in Africa and Asia, as can be seen in Table 6.⁸⁷

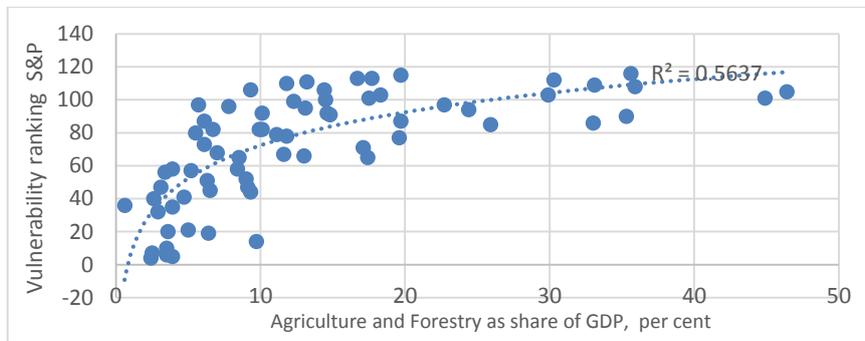


Figure 21: Dependence on agriculture and vulnerability to climate change.

Source: Standard & Poor's, "Climate Change is a Global Mega-Trend for Sovereign Risk", *CreditWeek* vol. 34. No. 20 (2014).

⁸⁷ The OECD countries, countries of the Gulf Cooperation Council and Gabon are not included.

Table 6: Top 25 countries most vulnerable to climate change.

| | S&P overall vulnerability ranking | Country | Population living under 2000 meters, in percentage | Agriculture and forestry as share per GDP, in percentage | GAIN vulnerability index ⁸⁸ |
|----|-----------------------------------|----------------------------|--|--|--|
| 1 | 116 | Cambodia | 10.6 | > 36 | 0.5 |
| 2 | 115 | Vietnam | 42.8 | > 20 | 0.381 |
| 3 | 114 | Bangladesh | 14 | > 18 | 0.495 |
| 4 | 113 | Senegal | 14.8 | > 17 | 0.472 |
| 5 | 112 | Mozambique | 6.2 | > 30 | 0.513 |
| 6 | 111 | Fiji | 11 | > 13 | 0.422 |
| 7 | 110 | Philippines | 10.5 | > 12 | 0.382 |
| 8 | 109 | Nigeria | 3 | > 33 | 0.503 |
| 9 | 108 | Papua and New Guinea | 2 | > 36 | 0.502 |
| 10 | 106 | Indonesia | 11.2 | > 14 | 0.335 |
| 11 | 106 | Suriname | 68.2 | > 9 | 0.306 |
| 12 | 105 | Ethiopia | 0.4 | > 46 | 0.547 |
| 13 | 103 | Albania | 8.2 | > 18 | 0.333 |
| 14 | 103 | Kenya | 1.4 | > 30 | 0.53 |
| 15 | 101 | Congo, Democratic Republic | 0 | > 45 | 0.572 |
| 16 | 101 | India | 3.8 | > 18 | 0.427 |
| 17 | 100 | Egypt | 25.6 | > 15 | 0.284 |
| 18 | 99 | Thailand | 13.8 | > 12 | 0.308 |
| 19 | 97 | Ghana | 2.3 | > 23 | 0.473 |
| 20 | 97 | Grenada | 21.7 | > 6 | 0.355 |
| 21 | 96 | Cape Verde | 13.8 | > 8 | 0.349 |
| 22 | 95 | Belize | 15.8 | > 13 | 0.293 |
| 23 | 94 | Pakistan | 1.3 | > 24 | 0.43 |
| 24 | 92 | Malaysia | 9.5 | > 10 | 0.31 |
| 25 | 92 | Morocco | 3.8 | > 15 | 0.365 |

Source: S&P Credit Week (2014).

84. As such, the PSF could play a particularly meaningful role under the Fund's adaptation objective by financing climate change resilience in agriculture and forestry in Africa, Asia, Latin America and SIDS. Projects and programmes financed by the PSF could include:

- (a) Diversification of crop and seed varieties;

⁸⁸ The Standard & Poor's rating is ranking the sum of the ranks for each of the three indicators, with a ranking of 116 representing highest vulnerability, and 1 the lowest. GAIN is a Notre Dame University Global Adaptation Index, which measures if a system is susceptible to and is not able to cope with the adverse effects of climate change. Three indicators are used in the index: exposure, sensitivity and adaptive capacity. The higher the value the higher is the vulnerability of the country.

- (b) Forest farming and combating deforestation;
- (c) Irrigation extension and efficiency;
- (d) Rainwater harvesting; and
- (e) Other diversification of water sources.

85. Such projects would not only improve resilience, they would also contribute to economic development and employment in countries largely dependent on agriculture and forestry, and would produce a material improvement in the lives of people living in these countries.

86. The private sector’s involvement in agriculture and forestry could be a game changer. Analysis of adaptation potential in this document shows that the agriculture and forestry sectors represent the greatest impact potential for adaptation to climate change, yet they have thus far attracted less than 10 per cent of climate finance globally (Figure 22). Moreover, agriculture and forestry are more suited to the private sector’s needs than other adaptation projects, such as infrastructure and coastal protection, which do not typically generate revenue flows.

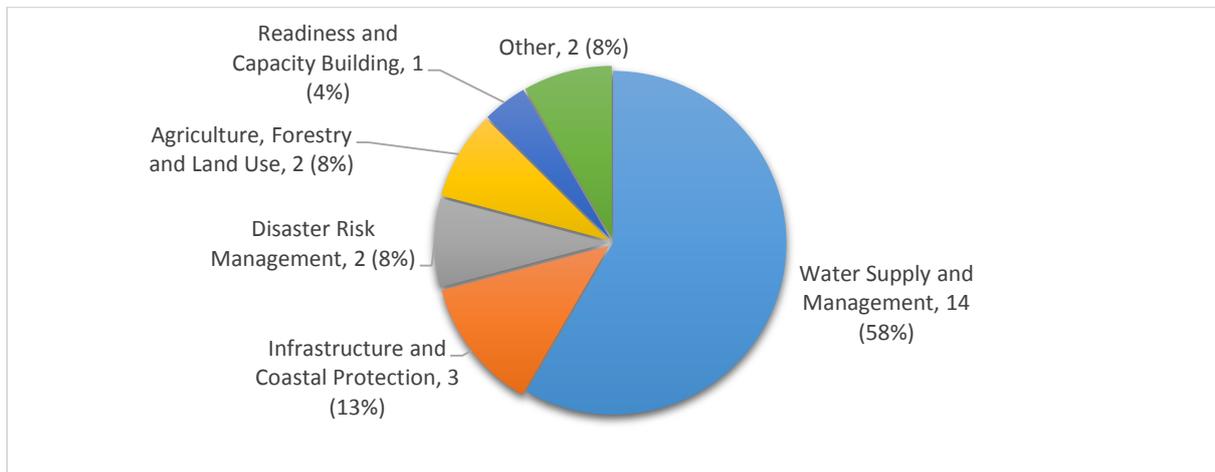


Figure 22: Global adaptation finance flows in 2013, totaling US\$ 25 billion.

Source: Barbara Buchner and others, *The Global Landscape of Climate Finance, Climate Policy Initiative (CPI) Report* (San Francisco, CPI, 2014).

87. There is large potential for climate-sensitive investment in agriculture and forestry by the private sector:
- (a) The rising global demand for food is being met through the use of increasingly scarce water and land (agricultural production is expected to need to rise by 70 per cent by 2050 in order to cope with a 40 per cent increase in world population).⁸⁹ There is a need to improve, diversify and safeguard access to water, and to increase the caloric output per litre of water and hectare of land. Furthermore, the need to afforest land can be translated into business opportunities in Africa, Asia, Latin America and SIDS. Some companies are beginning to take steps to this end by relying on afforestation for operations, and receiving recognition for their efforts to this end.
 - (b) Currently, investing in farmland is still a nascent asset class for private investors, although it is a growing phenomenon that has the potential to attract large scale private sector actors. South America and Africa are attracting an increasing amount of capital

⁸⁹ Klaus Deininger and others, *Rising Global Interest in Farmland* (Washington, D.C., World Bank, 2011).

for investment in the sector.⁹⁰ It is recognized that investment in agricultural land by foreign private players can in certain countries be a sensitive area. However, a clear and transparent land tenure system and ownership framework, coupled with options such as leasehold contracts, can allay such concerns and prevent land grab. Furthermore, the Fund will aim to encourage the local private sector to invest in agriculture in order to help to foster the local financial environment and local agricultural development.

4.2 Private sector involvement in mitigation

88. The private sector is a critical component of some mitigation opportunities identified in this document – energy, transportation, construction and industry. In particular, the private sector is the primary owner and supplier of technology and equipment in these fields.

89. In African states, Asia and SIDS the private sector could play a particularly meaningful role in alternative energy projects. As stated previously, energy needs are concentrated in Africa and Asia. Sustainable Energy for All (2013) reports that, of the 1.2 billion people without electricity in 2010, 87 per cent lived in sub-Saharan Africa and Southern Asia, the predominance being in rural areas (85 per cent). Consequently, a significant proportion of African energy usage comes from solid biomass.⁹¹

90. The estimated large investments needed to ensure energy access suggest a potential need for the Fund's resources to be used in the energy sector given that many countries in these regions have shallow capital markets.

91. In Asia, the private sector could also play a meaningful role in energy, transportation and real estate construction by approaching these sectors with a municipality cluster-based strategy. Here, the Fund could invest in low-emission and climate-resilient activities in geographic concentrations of interconnected businesses, suppliers, and associated institutions, including transportation systems. Approximately 50 per cent of Asia's population is urban-based.⁹² In addition, 12 of the top 25 populated cities in the world are located in developing Asia.⁹³ Projects and programmes financed by the PSF could include energy efficient buildings and manufacturers; waste-to-energy; and urban mass transit. Furthermore, taking a municipality cluster-based approach would increase the productivity of the companies in the cluster, drive innovation in the field of low-emission and climate-resilient activities, and would stimulate new businesses, giving these municipality clusters a sustainable competitive advantage.

⁹⁰ HighQuest Partners, United States, "Private Financial Sector Investment in Farmland and Agricultural Infrastructure", OECD Food, Agriculture and Fisheries Papers, No. 33 (Paris, OECD, 2010).

⁹¹ IEA. *Africa Energy Outlook, World Energy Outlook Special Report* (Paris, 2012).

⁹² See <<http://data.worldbank.org/topic/agriculture-and-rural-development?display=map>>.

⁹³ See <<http://www.citypopulation.de/world/Agglomerations.html>>.

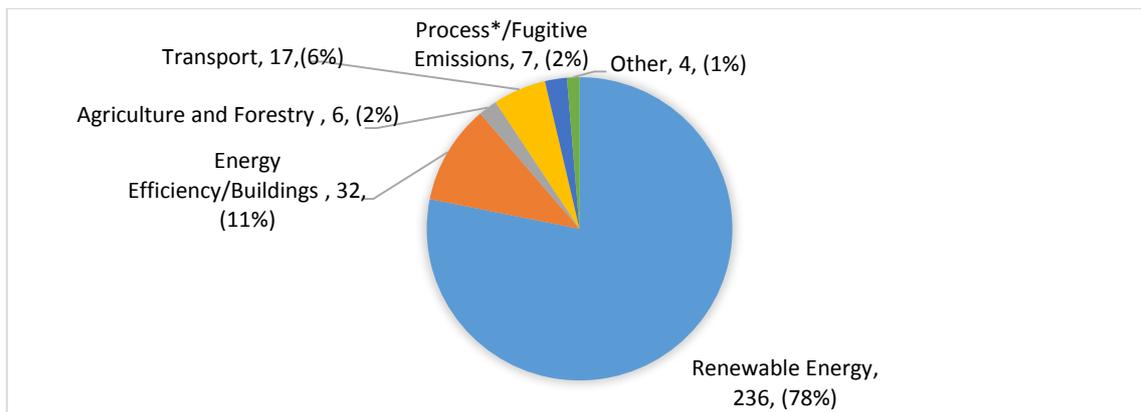


Figure 23: Global mitigation finance flows in 2013, totaling US\$ 302 billion.
*Process emissions refer to industry processes.

Source: Barbara Buchner and others, *The Global Landscape of Climate Finance, Climate Policy Initiative (CPI) Report* (San Francisco, CPI, 2014).

4.3 Private sector involvement through a holistic and integrated approach

92. The Fund's US\$ 10 billion of mobilized resources is a small portion of the world's US\$ 200 trillion pool of financial assets.⁹⁴ The Fund will therefore need to integrate into the existing global financial architecture. Approaches for using the Fund to mobilize the global pool of wealth are outlined in the document GCF/B.09/11 *Private Sector Facility: Potential Approaches to Mobilizing Funding at Scale*.

93. Likewise, the PSF should work as a mainstream part of the Fund, just as the private sector needs to be a mainstream component of climate-sensitive investing throughout developing countries. The PSF's efforts could be synchronized with efforts undertaken in the public sector where possible so as to leverage the symbiotic relationship between the public and private sector in climate sensitive investments.

- (a) Energy, transportation, and forestry all present strong opportunities for public-private partnership. To some extent, the same is true for agriculture and real estate. Real estate requires careful planning with the local municipality, and could be incorporated into municipal-wide smart grid and/or recycling programmes.
- (b) To promote an integrated public-private approach the Fund might, for example, encourage National Designated Authorities (NDAs) to incorporate a private sector component when they access Fund readiness grants to develop country programmes. The Fund could also issue requests for proposals (RFPs) targeted at the private sector in high impact areas to encourage the "crowding in" of local private sector investors and companies. In taking such approaches forward, the Fund could learn from the experiences of prior initiatives such as the Asia Pacific Partnership on Clean Climate and Energy (APP), wherein both public and private partners from developed and developing countries worked together to design the terms of engagement. Developing country stakeholders, as recipients of advanced/superior energy and environmental technologies and finance, would be actively involved in the process.

94. Adaptation and mitigation opportunities are not mutually exclusive and can often co-exist in many projects. Therefore the PSF could seek investments that concurrently address mitigation and adaptation in order to maximize the impact of its funding. Energy, transportation

⁹⁴ KPMG, Ernst&Young, Bloomberg and Accenture. *Key Facts 2012, Know Your Numbers* (2012).

and real estate present adaptation opportunities, in addition to mitigation. For example, climate change threatens the energy sector by putting at risk resource extraction and processing platforms; fuel transportation and storage capacity; and electricity generation and transmission infrastructure. Illustrative adaptation strategies are outlined in Table 7.

Table 7: Potential Adaptation Strategies

| | |
|-----------------------|--|
| Power and energy | - Decentralized and diversified sources of power - Smart Grid technology to improve energy efficiency |
| Property and industry | - Better identification and avoidance of risks at risky locations - Improved construction practices |
| Transportation | - Planning to cope with warming, flooding and drainage |

Source: Reputex Carbon Analytics

4.4 Availability of capital markets

95. The private sector in developing countries has three main sources of capital: local banks (including foreign banks with local commercial banking licenses); local capital markets; and foreign direct investment either in the form of debt or equity.

96. The Fund’s approach to a region and country may need to be dynamically adjusted based on local availability of and access to capital.

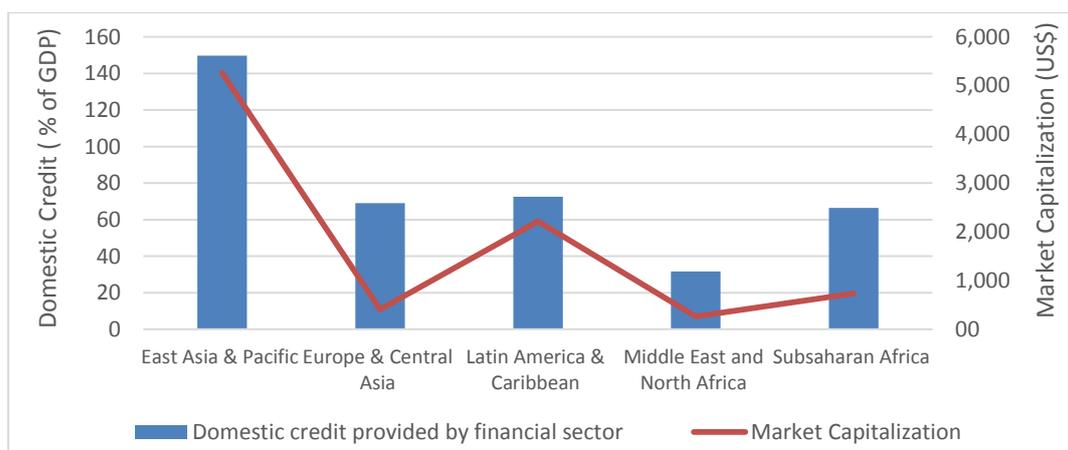


Figure 24: Domestic credit provided by the financial sector and market capitalization.

Source: World Bank, Databank (accessed 6 January 2015)

97. Countries can be categorized according to local access to capital and the liquidity of said capital (see Figure 25).⁹⁵ Countries with large capital bases that are liquid (top right corner) may have different requirements to countries with small capital bases (left side) and countries with capital bases that are not liquid (bottom half).

98. Developing Asia may present the greatest opportunity for the use of market-based instruments such as securities, and for the crowding in of local investors (see Figure 24), even if the macro picture may at times overshadow specific country-level realities.

⁹⁵ Sources: World Bank DataBank and data from the Bloomberg Terminal Professional service platform (accessed 6 January 2015).

4.5 A balanced portfolio for quicker disbursements

101. There is a material gap between approved climate finance projects and disbursement of committed funds, as noted previously (see Figure 26). Building a portfolio that is diversified in terms of size of projects and programmes; size of obligors; and type of instruments could, to some extent, help to improve the overall performance of the portfolio. For example, the time to disbursement for a programme to scale up off-grid electrification carried out by a regional/local small and medium enterprises (SME) should be significantly shorter than time to disbursement for an on-grid large power project. Likewise, time to disbursement for “greening” a portfolio of buildings in a city should be shorter than that for a rapid rail system. In addition, the Fund will have to consider the introduction of cancellation for delayed disbursement covenants in certain of its agreements in order to encourage the disbursement of funds within a reasonable time frame.

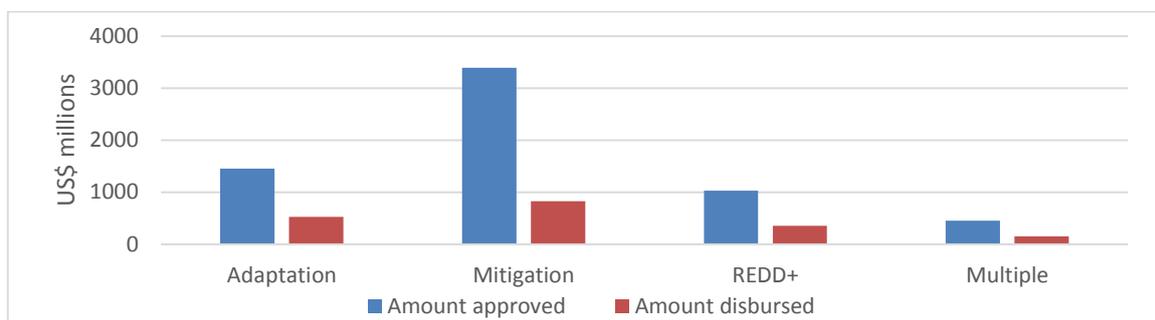


Figure 26: Global approved and disbursed funding across themes (2012–2013).

Source: Overseas Development Institute and Heinrich Böll Foundation, *Climate Funds Update 2014*

V. Findings: Potential high-impact investment priorities

102. Figure 27 synthesizes the results of the impact assessment of the eight results areas. For each results area, the analysis considered: (i) the mitigation or adaptation potential in the area, by region, (ii) the estimated cost efficiency and co-benefits, and (iii) the potential value add of the Fund, taking into account the programming priorities of other climate-related funds and the potential to catalyse private sector investment.

103. Each result area and region is displayed along a gradient according to their mitigation or adaptation potential, cost-efficiency, and niche potential for the Fund. Areas on the left hand side have strong potential in which the Fund may place particular focus, whereas areas on the right hand side present relatively smaller prospects for the Fund. Such areas could be pursued on an “opportunistic” basis.

104. The assessment identifies five potential entry points that entail high impact investment opportunities, and through which the Fund can develop a more integrated approach to realizing mitigation and adaptation impact. These are referred to as “potential investment priorities”. The five potential investment priorities identified are:

- (a) Climate-compatible cities in Asia, Africa, Latin America and Eastern Europe
- (b) Sustainable climate-smart agriculture in Africa and Asia;
- (c) Scaling up finance for forests and climate change in Latin America, Asia and Africa;
- (d) Enhancing resilience in small island developing States (SIDS); and
- (e) Transforming energy generation and access in Africa and Asia.

105. The five potential investment priorities are indicated in the investment priority (IP) column of Figure 27. They have clear synergies with the eight expected results areas.

| | | IP | | LDC | | Priority ← → Opportunistic | |
|---|----------------|-----|---|-----|--|----------------------------|--|
| Energy generation and access | Africa | E | * | | | | |
| | Asia | E | * | | | | |
| | Eastern Europe | | | | | | |
| | Latin America | | | | | | |
| | SIDS | | | | | | |
| Transport | Africa | | | | | | |
| | Asia | C | | | | | |
| | Eastern Europe | | | | | | |
| | Latin America | | | | | | |
| | SIDS | | | | | | |
| Buildings, cities, industries, and appliances | Africa | C | | | | | |
| | Asia | C | | | | | |
| | Eastern Europe | C | | | | | |
| | Latin America | C | | | | | |
| | SIDS | | | | | | |
| Forestry and land use | Africa | A/F | * | | | | |
| | Asia | A/F | | | | | |
| | Eastern Europe | | | | | | |
| | Latin America | A/F | | | | | |
| | SIDS | | | | | | |
| Livelihoods of people and communities | Africa | A/C | * | | | | |
| | Asia | A/C | * | | | | |
| | Eastern Europe | | | | | | |
| | Latin America | | | | | | |
| | SIDS | S | | | | | |
| Food, water, and health | Africa | A/F | * | | | | |
| | Asia | A/F | * | | | | |
| | Eastern Europe | | | | | | |
| | Latin America | F | | | | | |
| | SIDS | S | | | | | |
| Infrastructure and built environment | Africa | C | | | | | |
| | Asia | C | | | | | |
| | Eastern Europe | | | | | | |
| | Latin America | | | | | | |
| | SIDS | S | | | | | |
| Ecosystems and ecosystem services | Africa | A/F | | | | | |
| | Asia | A/F | | | | | |
| | Eastern Europe | | | | | | |
| | Latin America | F | | | | | |
| | SIDS | S | | | | | |

Abbreviations: IP = Investment priorities. C = Cities. A = Agriculture. F = Forestry and land use. S = Resilience in SIDS. E = Energy generation/access. LDC = least developed country. * = Areas with significant potential and needs in LDCs.

Figure 27: Priority levels of each expected result area and region.

106. LDCs have heightened needs and significant potential in certain areas that warrant special consideration, as noted in the LDC column of the Figure 27. These include strengthening

the resilience of the livelihoods of people and communities in LDCs, and the resilience of their food, water and health systems. As such, there is a particular case for focusing on strengthening the resilience of agriculture in LDCs, the economies of which are highly dependent on agriculture (and poor people may be particularly reliant on agriculture for their livelihoods). There are also opportunities to improve access to clean energy in LDCs, and to seek to avoid future deforestation and degradation.

107. Table 8 lists the five potential investment priorities and identifies the results areas to which they may contribute, as well as the geographical regions where their potential is particularly high. As shown, efforts to invest in climate-compatible cities may deliver impacts related to emission reductions from transport; and buildings, cities, industries and appliances. They may also support adaptation, particularly by helping to strengthen the resilience of the livelihoods of urban people and communities; and to increase the resilience of urban infrastructure (while also reducing associated emissions). Similarly, investments in efforts to reduce emissions from deforestation and degradation can also help to strengthen the resilience of food, water and health systems, and of ecosystems and ecosystem services. Indeed, reducing emissions from forests requires the tackling of the drivers of deforestation, which include agriculture.

Table 8: Potential investment priorities and expected results of the Fund

| Potential investment priority | Expected results area | Geographical region targeted |
|--|--|---|
| 1: Climate-compatible cities | Transport (M) Buildings, cities, industries and appliances (M) Livelihoods of people and communities (A) Infrastructure and built environment (A) | Africa, Asia, Latin America, Eastern Europe |
| 2: Sustainable climate-smart agriculture | Forestry and land use (M) Livelihoods of people and communities (A) Food and water security and health (A) Ecosystems and ecosystem services (A) | Africa, Asia, with an emphasis on LDCs |
| 3: Scaling up finance for forests and climate change | Forestry and land use (M) Food, water and health (A) Ecosystems and ecosystem services (A) | Africa, Asia, Latin America |
| 4: Enhancing resilience in SIDS | Livelihoods of people and communities (A) Food, water and health (A) Infrastructure and built environment (A) Ecosystems and ecosystem services (A) | SIDS |
| 5: Transforming energy generation and access | Energy generation and access (M) | Africa, Asia, with a special focus on energy access in LDCs |

Abbreviations: A = adaptation. LDCs = least developed countries. M = mitigation. SIDS = small island developing states.

108. The holistic, cross-cutting nature of investment priorities is graphically represented in Figure 28. The five potential investment priorities essentially cluster the eight results areas, aiming to achieve cross-cutting benefits in an efficient and impactful way. Because of their cross-cutting nature, the priority areas largely contribute to both adaptation and mitigation. They create new and holistic entry points for realizing the balance across adaptation and mitigation that the Fund seeks.

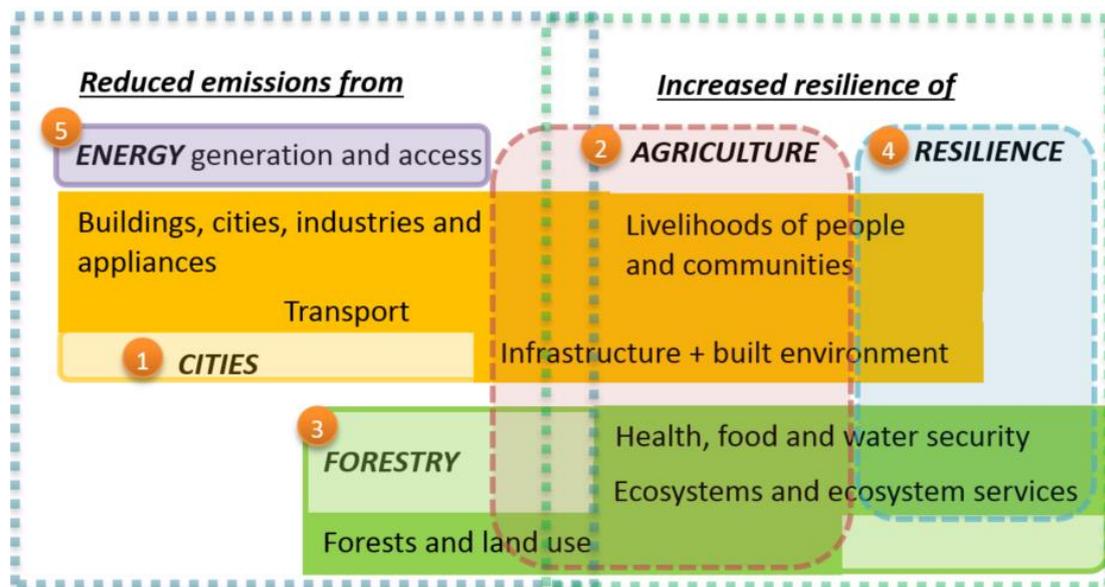


Figure 28: Potential investment priorities: clusters of expected results areas

109. In all cases, there is a strong linkage between national and international policies, institutional incentives, and the outcomes that the Fund will seek to help to realize. It is difficult to ascertain what share of the result potential hinges on strengthening the policy, regulation, institutional capacities and governance (the enabling environment) versus the mobilization of finance. It is clear that the Fund needs to take deliberate and strategic approach to these issues in programming resources. This goal can be advanced through the readiness programming that is getting underway. The Fund has the opportunity to provide programmatic finance that supports and enables countries to pursue relevant reforms, as well as concrete investments.

110. The assessment also highlights the need for cross-cutting support for innovation and relevant institutional capacity within developing countries, potentially in partnership with bodies such as the Climate Technology Centre and Network, other climate change innovation centres, and business communities. The Fund may consider providing support for better information on climate risk and impacts within countries, and mechanisms to aggregate this information globally in order to better inform and influence national and international investment decisions by both the public and private sectors.

111. Sections 5.1 to 5.5 provide a more in-depth discussion of the rationale and data underpinning each of the five investment priorities identified, and the strategic approach proposed to maximize the Fund's impact.

5.1 Climate-compatible cities in Africa, Asia, Latin America and Eastern Europe

112. Cities consume more than 75 per cent of the world's natural resources and use 60 to 80 per cent of the world's energy. They are responsible for 75 per cent of its emissions, while hosting more than 50 per cent of the global population. Emission reduction efforts in cities have the potential to make a major contribution to global mitigation (see Figure 29). In addition, cities (and the growing numbers of the poor who live in them) are likely to be highly vulnerable to the impacts of climate change. Many cities in low and middle income countries are in coastal

areas, and in many cases poor communities live in informal settlements on land at high risk from extreme weather.⁹⁶

113. Furthermore, climate change risks for cities are rising - these include rising sea levels, storm surges, heat stress, extreme precipitation, inland and coastal flooding, landslides, drought, water scarcity and air pollution. Such risks bring widespread negative impacts for people's livelihoods and health, ecosystems, and local and national economies. Investing in lower emission and more climate resilient cities therefore offers immense cross-cutting mitigation and resilience-enhancing potential.

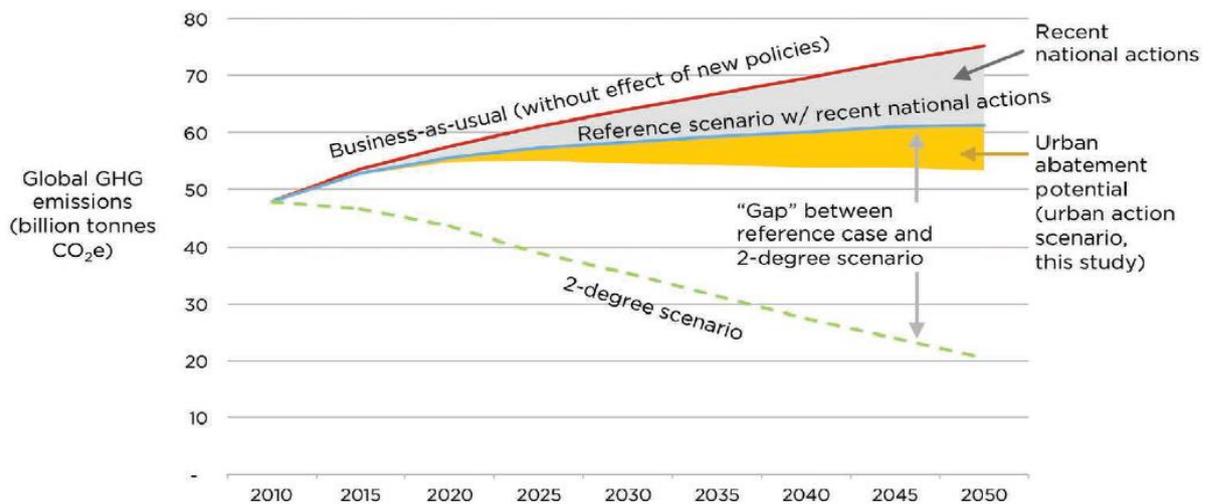


Figure 29: Urban actions have a substantial mitigation potential.

Source: Stockholm Environmental Institute, Bloomberg Philanthropies and C-40.

Advancing climate ambition: cities as partners in global climate action (Stockholm, 2014).

114. Many cities do not presently have the capacity, authority or resources to assess local energy consumption for heating and cooling, or to develop strategies to most efficiently address this consumption using local energy sources, for example district energy, and to coordinate across sectors (waste, water, buildings, transport and power) for effective implementation. Building use, waste management, and passenger and freight transport are the major areas where mitigation potential is identified.⁹⁷ Different cities will have different needs with respect to maximizing abatement and resilience opportunities however. Globally, buildings (efficiency as well as the installation of renewable energy) represent the largest potential for abatement; followed by passenger transport – largely due to modal shifts – car efficiency, electrification and urban planning.

5.1.1 Regional focus

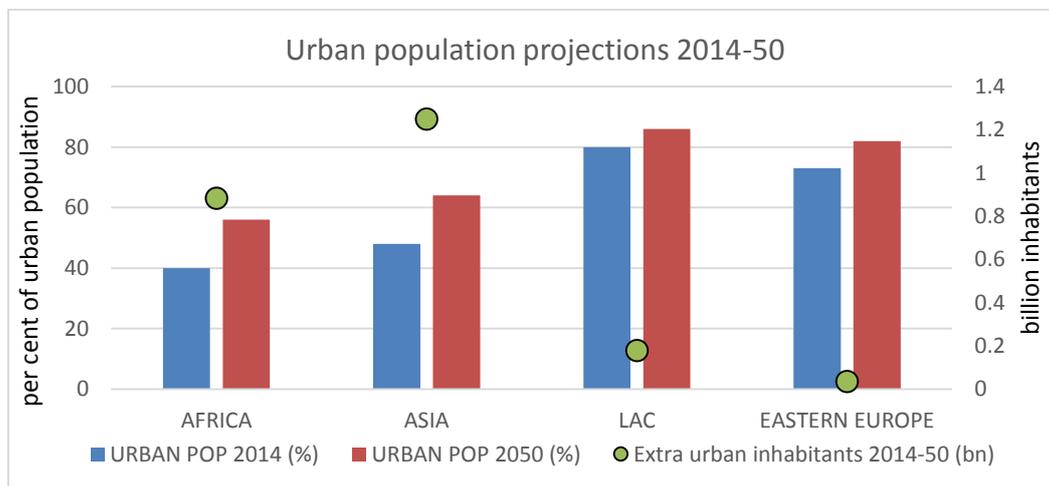
115. 66 per cent of the global population is projected to be urban by 2050 (see Figure 30 below). Africa and Asia are the fastest urbanizing regions, with about 2.25 billion more people expected to live in cities in these areas by 2050. The Fund therefore has the potential to help to shape this investment to lower emissions and be more resilient. Latin America and Eastern Europe are already highly urbanized: in these two regions there is huge potential to help to retrofit and upgrade existing infrastructure, and to support efforts to strengthen urban systems.

⁹⁶ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014)

⁹⁷ Stockholm Environmental Institute, Bloomberg Philanthropies and C-40. *Advancing climate ambition: cities as partners in global climate action* (Stockholm, 2014).

5.1.2 Value add of the Fund

116. Despite high potential, urban climate change adaptation and mitigation receive relatively modest support from existing climate funds. A review of projects approved in 2014 finds 12 projects clearly linked to cities for a total of US\$ 174 million (out of total of US\$ 1.385 billion approved).⁹⁸ There is growing recognition of the potential for cities to make a contribution to global climate action. The GEF has identified cities as a cross-cutting priority area for investment in its GEF 6 strategy. In September 2014, a new Cities Climate Finance Leadership Alliance was launched with the goal of helping to strengthen the creditworthiness and institutional capacity of cities in developing country cities. The hope is that such initiatives will help to incubate concrete actions that can be taken by public and private sector actors to address climate change. The Fund has the potential to build on such partnerships and efforts, and finance implementation. Its ability to engage on urban finance issues is aided by the fact that a wide range of entities including national, sub-national and private sector institutions which are capable of city-level interventions can become accredited entities of the Fund. It can complement the GEF and other funds by offering higher volumes of appropriately tailored risk-tolerant finance.



Abbreviation: LAC = Latin America and Caribbean.

Figure 30: Projected urban population growth.

Source: United Nations, Department of Economic and Social Affairs, Population Division (2014). *World Urbanization Prospects: The 2014 Revision, Highlights (ST/ESA/SER.A/352)*.

5.2 Sustainable climate-smart agriculture in Africa and Asia

117. Agriculture accounts for 10 to 12 per cent of global emissions, although accounting for emissions from this sector is complex (Figure 31). Tackling climate change and agriculture linkages is already high on developing country agendas: 82 per cent of countries included agriculture in their NAPAs,⁹⁹ and agriculture is also prominent in the NAMAs that countries are developing and registering with the UNFCCC secretariat.¹⁰⁰ However, progress in mainstreaming climate change into agricultural planning and systems remains nascent in many developing countries.

⁹⁸ Part of the challenge has been the relatively limited extent to which the needs of cities and local government have been prioritized in engagement with international funds.

⁹⁹ Consultative Group on International Agricultural Research (CGIAR), Big facts. Available from <<http://ccafs.cgiar.org/bigfacts/#>> (accessed 16 February 2015).

¹⁰⁰ UNFCCC secretariat, NAMA Registry. Available from <<http://www4.unfccc.int/sites/nama/SitePages/Home.aspx>> (accessed January 2015).

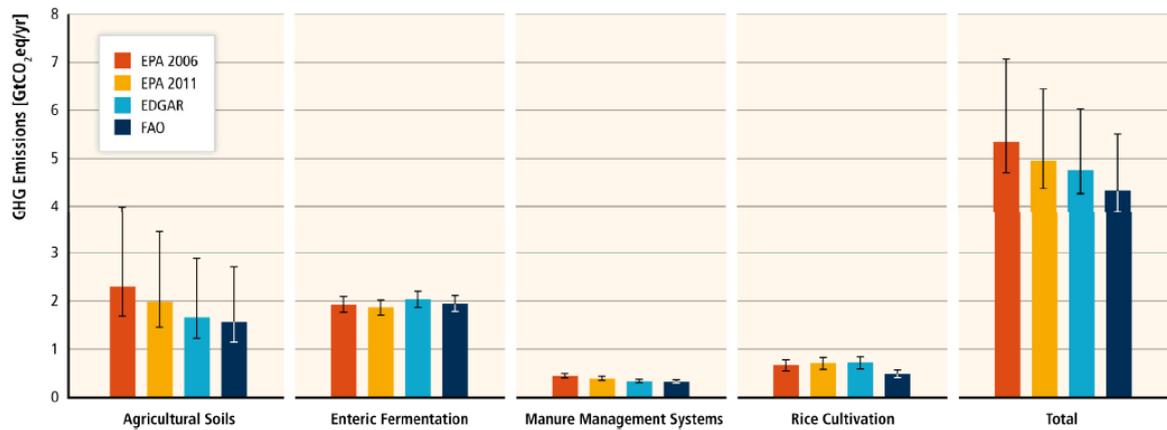


Figure 31: Emissions from agriculture, according to several methodologies.

Source: IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014)

118. Although the emissions intensity of some commodities has fallen over the last two decade, emissions from agriculture as a whole are expected to grow by 1 per cent annually until 2030. These increases will largely be driven by increased population leading to increased demand for agricultural produce together with increases in GDP leading to shifting diets which increases the demand for meat (livestock production releases more emissions than crop production). The IPCC reports a potential increase in emissions of between 0.5 and 10.6 GtCO₂eq/year by 2030.

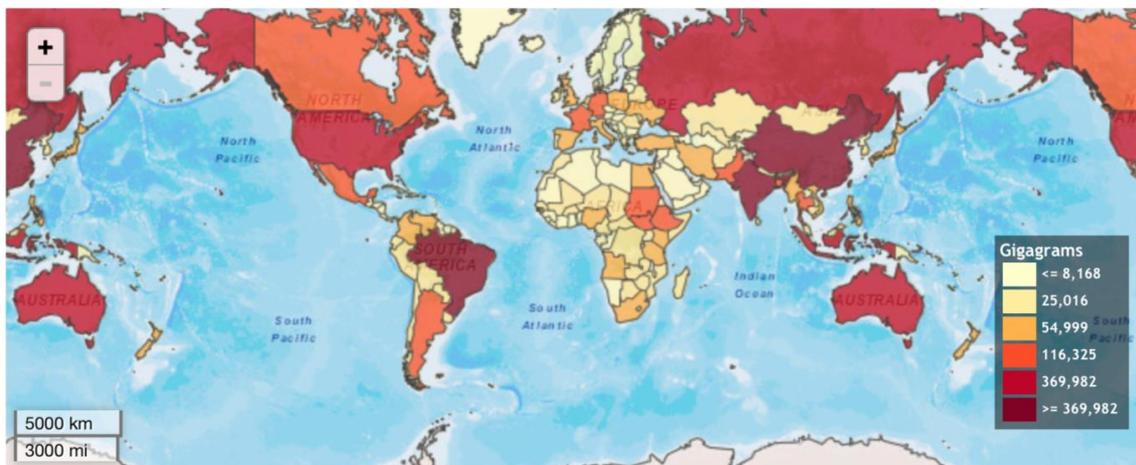


Figure 32: Emissions from agriculture by country, in kilotonnes (gigagrams) of CO₂ equivalent (average 1990–2012).

Source: FAO Stat, 2014.

119. The agriculture sector is highly vulnerable to the impacts of climate change due to the primary nature of its inputs. The IPCC suggests that the world will need to produce at least 50 per cent more food in order to meet the goal of feeding a projected 9 billion people by 2050. This must be achieved in the face of climatic volatility and change, growing constraints on water and land for crops and livestock, and declining wild capture fishery stocks.¹⁰¹ Adaptation measures in agriculture can therefore increase the resilience of food systems and strengthen food security. Furthermore, climate-smart agriculture can support the improvement of livelihoods, safeguard access to food and water, strengthen the resilience of ecosystems, and

¹⁰¹ N. Grist. "Expert Consultation: an African Agenda for Green, Low Carbon Development". Transformative adaptation in Africa's agriculture. Contribution Note for Africa Progress Panel meeting. Geneva, October 30th 2014.

reduce pressures on forests (as land-use change for agriculture is a major driver of deforestation in forest-rich LAC, African and Asian countries). Standard & Poor's has also recognized the correlation between vulnerability to climate change and national dependence on agriculture and forestry. If well-conceived and delivered, climate-smart agriculture can contribute to multiple Fund result areas.

5.2.1 Regional focus

120. Asia and sub-Saharan Africa may be particular priorities for investment in more resilient climate-smart agriculture. Many of the poorest people in these two regions depend on agriculture for their livelihoods. They are therefore highly impacted by disruptions to agricultural systems, and the risk of such disruption is high. At the same time, population, wealth, demand for meat, and therefore emissions from agriculture are all growing rapidly. The IPCC suggests losses of 18 to 22 per cent in some parts of Africa under a business as usual scenario by mid-century if remedial action is not taken.

5.2.2 Value add of the Fund

121. Despite the significant potential of climate-smart agriculture there has been relatively modest emphasis on it from existing climate funds. These investments cover altering crops and crop varieties, improving the effectiveness of crop and livestock management practices, altering the timing of cropping or water management, for example.¹⁰² The International Fund for Agriculture and Development has an Agriculture Small Holder Adaptation Programme, and seeks to incorporate climate change into its country programming. The BioCarbon Fund Initiative for Sustainable Forest Landscapes targets the agricultural drivers of deforestation, and the new GEF 6 strategy now also seeks to address food security, including through its investments in land use management and agriculture.

122. The Fund could support mitigation and adaptation through a focus on climate-smart agriculture that will contribute to both agricultural development and food security. It can bring a wider range of instruments to facilitate actions, particularly by private and community level actors. This could include support for smallholder farmers, that will help to deliver direct benefits to communities and poor and vulnerable farmers, particularly women, and strengthen the resilience of their livelihoods. It will also be necessary to shift the practices of agribusiness and larger producers to support mitigation, wider food security benefits, and adoption of climate-smart agriculture approaches. Such programming must of course align with national priorities, with due regard for environmental and social sustainability. The environmental and social safeguard policies of the Fund will be essential in realising these opportunities appropriately.

5.3 Scaling up finance for forests and climate change in Africa, Asia and Latin America

123. The Fund has an opportunity to help maintain the progress made by efforts to reduce emissions from deforestation and degradation, which has potential to offer multiple benefits, sometimes at a comparatively low cost. Most multilateral funding for forests has focused on readiness activities. The Fund has the potential to catalyse continued and more ambitious efforts to this end.

¹⁰² S.M. Howden, J.F. Soussana, F.N. Tubiello, N. Chetri, M. Dunlop, and H. Meinke. "Adapting agriculture to climate change". Proceedings of the National Academy of Sciences of the USA, 104:19691-19696 (2007).

124. Net losses of forest cover exceed 7 million hectares per year.¹⁰³ Together, agriculture and forestry account for a quarter of global emissions. Although the division of these emissions between agriculture and forestry is approximately half, they are highly interlinked which complicates estimation. The greatest mitigation potential from forestry is through avoided deforestation. Avoided deforestation and sustainable forest management can also support adaptation, although a thorough understanding of how to maximize the resilience of both ecosystems and livelihoods through forests is still emerging. While impacts can be difficult to estimate and aggregate, resilience can be built by the contribution of standing forests to on-going provision of ecosystem services (such as the protection of soil, or flood defence or provision of non-timber forest products as safety nets) thereby contributing to the resilience of ecosystems and ecosystem services results area. It can also support employment and income generation. As an example, there are an estimated 14 million people employed in the formal forest sector.¹⁰⁴ New investment in forest management activities could lead to more jobs, as well as informal income, although the evidence regarding the extent to which this can be achieved is lacking.¹⁰⁵ As a result, REDD+ investments may contribute to the Fund's livelihood result objectives.

5.3.1 Regional focus

125. With high carbon stocks and forest area, 65 per cent of mitigation potential in the forest sector is estimated to be in the tropics. 50 per cent of this potential is achievable through avoided deforestation, as a result of the high rates of primary forest loss in many tropical forest nations.¹⁰⁶ The Global Forest Resources Assessment of the FAO suggests that the decline in forest extent has been particularly high in Latin America and Africa over the last 15 years.¹⁰⁷ It further emphasises that there are large tracts of intact tropical forest, which hold the largest mitigation potential, in Latin America (the Amazon) followed by Asia (notably Indonesia), and finally Africa.¹⁰⁸

5.3.2 Value add of the Fund

126. Existing finance for REDD+ has largely focused on mitigation, and the largest share of approved financing has supported readiness efforts to prepare for results-based finance, particularly in countries with high mitigation potential. The Fund will be unable to close the financing gap for REDD+ with its current capitalization of US\$ 10 billion across 192 countries. It will therefore need to identify targeted interventions at adequate scale. These interventions are likely to differ across both countries and regions, and must respond to country needs and circumstances, as well as evolving agreement on a REDD+ mechanism under the UNFCCC. In the light of the adoption of the logic model for REDD+ results-based payments mechanism, the Fund could explore providing results-based finance for the implementation of REDD+ strategies in a few jurisdictions that show momentum in countries where there is clear potential for mitigation, alongside ecosystem services, livelihood results and other co-benefits. The Fund's REDD+ results-based payments mechanism will be operationalized in alignment with the methodological guidance provided by the Conference of Parties (COP). It will also take relevant UNFCCC processes into account, for example technical assessments and biennial update reports on emission reductions in the context of results based payments. To this end, the Fund might explore options to deliver additional finance for countries that have already made REDD+

¹⁰³ Food and Agriculture Organization (FAO). *Global Forest Resources Assessment 2010* (Rome, 2010).

¹⁰⁴ Food and Agriculture Organization (FAO). *State of the World's Forest 2011*. (Rome, 2011).

¹⁰⁵ C. Watson et al. *Integrating REDD+ in a green economy transition: Challenges and opportunities*. Background paper (London, Overseas Development Institute, 2013).

¹⁰⁶ IPCC. *Working Group III Contribution to the Fourth Assessment Report* (New York, 2007).

¹⁰⁷ Food and Agriculture Organization (FAO). *Global Forest Resources Assessment 2010* (Rome, 2010).

¹⁰⁸ IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014).

commitments in order to sustain political momentum around their implementation. Such efforts might target a particular dimension that could make a difference in the given context, for example specific deforestation drivers. New opportunities to address some of the underlying barriers to REDD+ action could exist if the Fund were to partner with a broad range of stakeholders, including emergent multi-stakeholder bodies. This could include private sector actors: both those the activities of which place pressures on forests and those that have made commitments to reducing deforestation and to sustainable forest management. Activities could help to shape new incentives for land use and land use change, or improve supply chain practices or risk assessment and due diligence in operations. The Fund can also consider opportunities to partner with sub-national government and civil society organizations within countries in order to improve understanding of land rights, associated information management systems, and the transparency, inclusiveness and accountability of relevant institutions.

5.4 Enhancing resilience in small island developing States

127. Many SIDS face an existential threat as a result of climate change, and are highly vulnerable to its impacts (see Figure 33). Projected costs of climate change may incur as much as 1 per cent of GDP in SIDS, five times as much as other regions.¹⁰⁹ Both coastal and terrestrial ecosystems are threatened by climate change. But some SIDS can avoid 90 per cent of potential damage through cost effective adaptation measures. Historically, however, SIDS have had relatively limited access to climate finance, in part as a result of their small size, and in part because of result frameworks that have prioritized the cost-effectiveness of the delivery of results at scale.

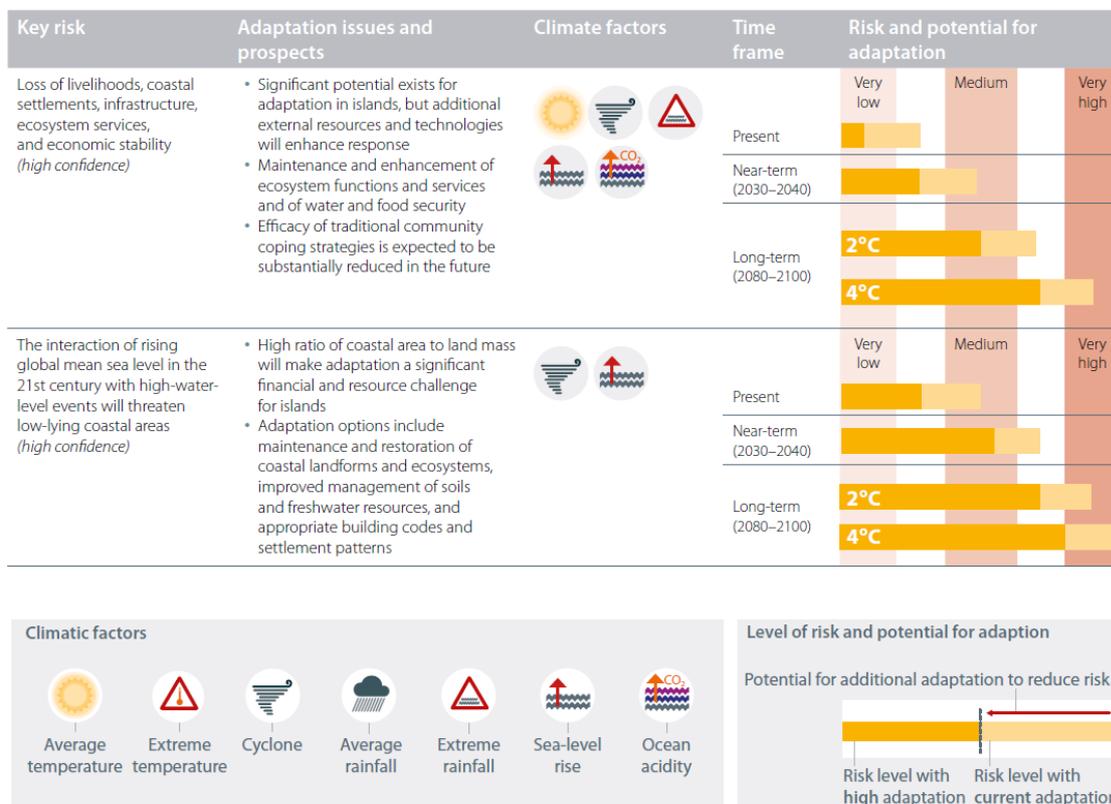


Figure 33: Adaptation potential in SIDS.

Source: E. Carabine and M. Dupar, “The IPCC’s Fifth Assessment Report: What’s in it for Small Island Developing States?” London, Climate and Development Knowledge Network, 2014

¹⁰⁹ World Bank. *Economics of adaptation to climate change - Synthesis report*. (Washington, DC, 2010).

128. There is a growing recognition of the linkages between transitioning to lower emission energy systems and strengthening resilience, as conventional energy accounts for a huge share of the budget in many SIDS, and efforts to reduce the costs of energy can increase fiscal space for adaptation.¹¹⁰ Renewable energy, energy efficiency and resilience are therefore closely intertwined agendas in many SIDS. To date, however, domestic policy and regulatory environments have not encouraged greater investment in low emission energy, and there has been a dearth of investment despite their relative cost effectiveness. Because climate change exacerbates stresses on freshwater availability there are opportunities to strengthen water management systems and infrastructure. The ecosystems (coastal, including coral reefs, as well as terrestrial, sometimes including rainforests) of SIDS are also highly vulnerable to climate change, prompting strong interest in ecosystem-based adaptation approaches.

5.4.1 Value add of the Fund

129. A review of existing climate finance investments in SIDS (particularly the Caribbean) highlights a mix of efforts to mainstream climate change into national policy including through support for climate change strategies; support for improved disaster risk reduction systems including insurance programmes, for example through support for the CARIBRISK programme; and extended coverage of early warning systems. A growing volume of finance now supports infrastructure including for coastal zone management (for example sea walls) as well as more resilient infrastructure such as roads, transport and buildings. Nevertheless there is substantial heterogeneity amongst SIDS, and many differences across the Caribbean, Pacific and Indian Ocean.

130. Many SIDS presently confront fiscal constraints following the financial crisis, which may undermine their resilience to new climate induced shocks. Unsustainable development patterns in many SIDS exacerbate climate risks. Freshwater supplies are under intense pressure, including as a result of population growth, increasing urbanisation, and tourism. In this context, there is a strong case for continuing to support efforts to incorporate climate risks and opportunities into national economic development and planning strategies, potentially in partnership with regional financial institutions. There is also scope to help countries to progress with reforms to energy policy and regulatory frameworks in order to reduce reliance on conventional energy imports, and improve the efficiency of energy provision, buildings and industries. Partnerships with regional financial institutions and centres of excellence may enable the delivery of such programmes at greater scale, and with lower transaction costs. Many such institutions have already expressed interest in accreditation as an implementing entity of the Fund.

131. There is also scope for more creative collaboration with the private sector across the region on this count. The tourism industry in many SIDS, for example, has recognized climate risks related to freshwater and energy¹¹¹ and is already adopting solar water heating, renewable energy systems and energy efficiency measures, and is investing in desalination facilities. The Fund can explore opportunities to partner with private sector actors in SIDS, including in the financial sector, to scale up such efforts.

5.5 Transforming energy generation and access in Asia and Africa

132. Reducing emissions associated with energy generation, as well as energy use, is central to climate change mitigation. As noted, energy is a cross-cutting input into most segments of the economy. The Fund will need to address two complementary but distinct challenges: first to

¹¹⁰ IPCC. *Working Group III Contribution to the Fifth Assessment Report* (New York, 2014), and UNFCCC (2008).

¹¹¹ IPCC. *Working Group II Contribution to the Fifth Assessment Report* (New York, 2014).

shift investment toward increases in large scale deployment of low-carbon electricity to avoid continued dependence on fossil fuels such as coal, and second to support the extension of access to sustainable energy services for poor and underserved communities. There is a huge opportunity to partner with public and private investors and implementers in taking on both challenges.

133. As key economies including India, South Africa, Kenya, and others make new commitments to scale up the deployment of low emission energy, the Fund has an opportunity to provide finance that helps deliver further cost reductions, or to access and tap into other sources of finance. The Fund will need to adopt distinct strategies to support large-scale deployment, scaled-up finance, and cost reductions. There is a glaring lack of finance to support innovation, including technology research and improvement, as well as innovative financing models. This has been flagged as a significant challenge to realizing the prospects of transitioning to a low emission energy future,^{112,113} and is linked to the high costs of access to finance more generally. More detailed analysis of cost trends by region and opportunities for finance to make a difference may enable a more targeted approach. Engagement with cities may also help create new markets and opportunities for the deployment of low emission energy sources.

5.5.1 Regional focus

134. Demand for energy continues to grow rapidly in both Asia and Africa. In Asia in particular, with its high reliance on coal to meet these needs, there is a need to help countries transition to lower emission solutions. In Africa, where overarching access to energy remains relatively low, demand for energy for industrial and productive processes such as manufacturing, as well as for lighting, cooling and cooking (including in households) is growing. In both regions, large numbers of people (68 per cent of Africa's population for example, and hundreds of millions of people in Asia) live without access to energy.

5.5.2 Value add of the Fund

135. Financing the deployment of renewable energy has been a priority for many existing climate funds, which have directed the majority of their finance to this purpose. There is also growing private sector investment in low emission approaches to energy generation and use, though in developing countries investment in conventional energy continues to be much larger. But the scale and scope of these efforts remains inadequate. Major recognized barriers to wider scale deployment of renewable energy include the overarching policy, regulatory and enabling environment and the extent to which they incentivize low-emission versus business-as-usual approaches, as well as wider difficulties in raising finance for infrastructure.

136. The Fund can take an integrated approach to addressing policy, regulatory, and institutional issues alongside financing wind and solar technologies that are increasingly cost-competitive but still confront barriers to deployment. In this context, there can be a role for the Fund to finance the deployment of supporting technologies that enable the incorporation of these technologies into the energy system such as storage and smarter grid technology. The Fund should also support programmes aimed at supporting further innovations and breakthroughs in key technologies, such as concentrating solar thermal power, which can provide base-load power, but the costs of which are falling much more slowly than wind or solar PV power.

¹¹² Barbara Buchner and others, *The Global Landscape of Climate Finance, Climate Policy Initiative (CPI) Report* (San Francisco, CPI, 2014).

¹¹³ Global Commission on the Economy and Climate, *Better Growth, Better Climate: The New Climate Economy Report* (Washington, DC, 2014).

137. There is also potential for the Fund to make a contribution to upscaling the financing to enable access to cleaner cook stoves and lighting for households and communities, particularly in Asia and Africa, through innovative business and financing models for the poor. In order to achieve its goals of increasing access to clean cooking technologies and lighting, the Fund might partner with specialized entities that have a track record in incubating new businesses and deployment models and bundling small and micro-programmes together in order to channel targeted and catalytic funding to key businesses and enterprises that can make material contributions to this goal.
