Disclaimer: This paper is the result of the analysis carried out by a sub-group within the AGF. However, the paper does not purport to represent the views or the official policy of any member of the AGF.

WORK STREAM 7 PAPER: PUBLIC INTERVENTIONS TO STIMULATE PRIVATE INVESTMENT IN ADAPTATION AND MITIGATION

I. Executive Summary

In this paper, the following questions are addressed:

- What barriers inhibit private investment in mitigation and adaptation?
- What are the options for deploying public sector interventions to overcome these barriers?
- What is the potential scale of international private investment?

Four conclusions emerge from the analysis presented in the body of this paper:

1. *Potential private investment in 2020 is substantial.*

Based in part on the 2020 estimates of carbon market and public funding flows from other AGF workstreams, we estimate international private investment in mitigation ranging from $100 billion to $200 billion/year. While more difficult to quantify, private investment can also play an important role in climate-proofing developing country infrastructure and in developing climate-resilient products and methods of production.

2. *For this level of private investment to be realized, a range of existing country and project specific barriers will need to be overcome by domestic and international public interventions.*

A variety of barriers currently inhibit attractive risk/return profiles. Some mitigation and adaptation projects have higher costs or higher risks than their high carbon or non-climate proofed alternatives. Other investments, which have potentially attractive risk/return profiles, are inhibited because the necessary capital market and/or risk mitigation tools are unavailable.

One key to unlocking large private flows for mitigation and adaptation is the ability of public interventions to target the intersection of various public and private interests. Investors seek to maximize risk-adjusted returns; public providers of climate finance seek to maximize environmental outcomes with their funding (at least for mitigation), and host country policy makers seek to maximize development benefits.

3. *The existing menu of interventions is largely sufficient, but needs better packaging, strategic focus, and greater scale*.

Domestic public policies and programs, international public technical assistance and financial instruments, and carbon markets can be used to strengthen host countries' investment environments, manage country and project risks, and overcome market failures, especially the carbon externality. In order to realize the potential private flows, these interventions will need to be properly targeted, blended to form a strategic package, and scaled up. That said, there is no single public sector financing instrument

that will serve as a "silver bullet" in stimulating private investment because of the heterogeneity among (a) countries with respect to their investment environments; (b) the barriers facing mitigation, adaptation, and REDD; and (c) the financial objectives of different investor classes.

4. *The large potential for private investment to achieve climate-related objectives justifies using a substantial share of the public funding available in and before 2020 to stimulate this investment.*

From the public sector's perspective, maximizing private investment is not an end in itself but rather a means to achieve development and environmental objectives. Not all public funding will be used to stimulate private investment, but all else equal, channeling public funding through instruments that catalyze additional international private investment in a given action yields greater benefits than using the public funding directly for the same type of action. Over the period between now and 2020, public instruments will need to have the flexibility to respond to various dynamic factors such as emerging domestic climate policies in developing countries, and the expected scaling up of carbon markets.

II. Motivation

The capital investment needs for climate change related investments are significant. This paper focuses on the potential for private finance to support climate investments that provide energy services, healthy forests, climate-resilient agriculture and water systems and all the other climate-related goods and services that populations need and businesses can deliver under the right circumstances. To understand this potential, we begin with some assumptions about both the role that private investment can play and how that private investment can be catalyzed.

Private investment – In most middle income countries at least, access to private capital is not constrained due to a combination of international in-flows and domestic flows. Moreover, with some exceptions, private capital is flowing into climate-relevant sectors in these countries. Investment targets include both mitigation-related (e.g. energy production and transformation, forest and agriculture, energy-intensive end use sectors) and adaptation-related (e.g. water, health, agriculture/livestock, urban development) sectors.

A salient characteristic of private investment (in contrast to public investment) is that it must earn a return that is acceptable to the investor and better than various alternatives. Different categories of investors are heterogeneous with respect to risks and returns that they seek. For example, lenders typically focus on the ability of the borrower or project to repay its loan, whereas equity investors consider risk-adjusted returns.

Barriers - Although private capital is certainly flowing into the climate-relevant sectors, not enough is flowing into mitigation and adaptation. At present, the scale of domestic and international private investment in climate-related activities in developing countries is seriously constrained by both activity-specific and country-specific barriers that adversely affect the attractiveness of such investments, either in terms of the adequacy of returns or unmanageable risk.

Increased private flows to mitigation and adaptation activities in developing countries in 2020 will depend on the extent to which these investments become attractive relative to other opportunities. Although both international and domestic investors require attractive risk adjusted returns, their respective opportunity costs may be different. For example, because international investors look across different countries for opportunities, public interventions may need to make climate investment opportunities in developing countries at least as attractive to international investors as similar opportunities in developed countries. To the extent these interventions are effective, net in-flows to developing countries increase.

Public sector interventions – Public sector interventions to stimulate private investment in mitigation and adaptation include international (bilateral and multilateral) financial instruments and programs, including carbon markets, as well as domestic policies and programs. Some actions, which generate net benefits to the economy without including their climate benefits, are more likely to be supported autonomously by developing country policies and programs and/or require only non-concessional international support. Other actions, which result in a positive net incremental cost to the economy, may or may not require some form of (domestic or international) concessional support for their implementation. Although the menu of these interventions is diverse, experience to date suggests that they are not yet mobilized at a sufficient scale and applied across enough countries and sectors to achieve global and domestic environmental objectives. The design of public sector interventions will need to achieve environmental objectives, meet private investment criteria, and serve host country priorities

Allocation of public funding – Future allocation of international public funding for climate is likely to be subject to competing demands for: 1) direct transfers to developing countries, 2) support for specific developing country public sector actions, and 3) instruments to stimulate private investment. Even

assuming new funding sources come online between now and 2020, however, demand for public resources (especially for highly concessional instruments) will likely exceed supply. One set of allocation decisions will thus revolve around these three general purposes. An important factor to consider in this allocation is the different benefits that accrue when public funds are used to stimulate private investment.

Value of private investment – Beyond the large flows themselves, estimating the benefits from private investment to developing countries is beyond the scope of this paper. When channeled into mitigation or adaptation actions, however, private investment results in various public benefits beyond earning a return to the investor. Categories of benefits include capital being freed up due to energy cost savings, enhanced energy security from reduced fuel imports, health benefits from reduced pollution, livelihood creation, and improved agricultural and forest productivity. In addition, international private investment may contribute to increased domestic capacity for domestic innovation, technology markets, skills development, and improved international competitiveness.

There has been intense interest within the international community as to the potential future role of private investment in projects and activities that support mitigation and adaptation objectives in developing countries. Questions that have been raised include the following:

- What barriers are inhibiting the potential flows from being realized?
- What are the options for deploying public sector interventions to overcome these barriers?
- What is the potential scale of international private investment?

Accordingly, this paper explores various ways in which private sector investment can be catalyzed by public sector instruments of a concessional or non-concessional nature. It first describes the various barriers to private sector investment and then addresses the range of instruments that could potentially be employed to overcome those barriers. The discussion emphasizes the importance of packaging interventions in ways that simultaneously address the multiple barriers that frequently exist. Finally, the paper provides estimates of the potential scale of private investment and offers conclusions.

III. Barriers to Private Sector Investment

Before providing a taxonomy of the barriers to investment in this section, it may be helpful to remind ourselves of how investors consider potential opportunities. The key element to ensure private sector investment in climate change-related opportunities is to offer investors returns that are commensurate with the (perceived) risk profile of the investments. Both international investors with projects in developing countries and developing country investors will demand returns that are in line with the type of investment to be made.

Project returns can be packaged in different ways through various capital structures. The capital structure of investments consists of equity and debt, in proportions determined by the specific opportunity and market conditions. The return demanded for an investment is the weighted average cost of the investment. Debt and equity both require returns commensurate with their risk profile, with equity holders (which are exposed to most risk) demanding the highest returns. Moreover, the capital structure of investments includes different tranches of equity and debt (e.g.first loss, mezzanine, senior), each with its own associated risk profile and return expectation.

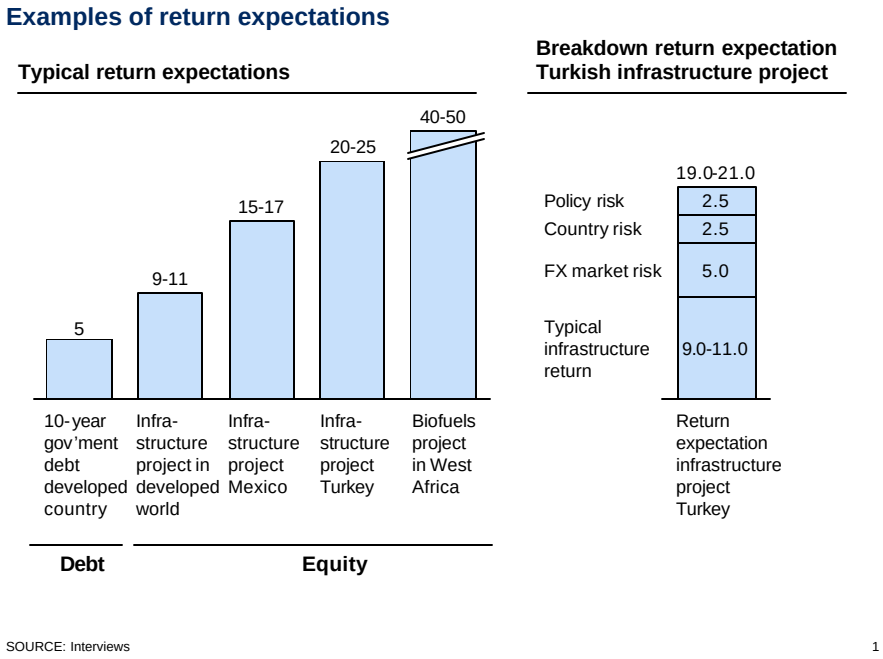
Figure 1 shows illustrative return expectations based on a number of interviews with investors as well as observed yields in the market. For example, 10-year government debt yields in developed world are around 5%. Equity returns for infrastructure projects in the developed world typically range from 9-11%. An investor in a specific infrastructure project in Mexico expected 15-17%, while an investor in an infrastructure project in Turkey demanded 20-25%, and an investor in a biofuel project in West Africa expected 40-60% return.

The differences in the expected returns for those projects are driven by the different perceived risks. In theory, a risk profile could be broken down into the base return as well as 'markups' for the various types of perceived risks. In the case of the specific Turkish investment example, relevant elements are the perceived foreign exchange risk for the Turkish lira (which does not have a liquid FX market / products), a country risk mark up, as well as perceived policy risk related to the specific investment opportunity.

Figure 1 illustrates how return expectations vary across countries and projects, and how multiple sources of risk within a project cumulatively affect an investor's return expectations. As the discussion below will show, the failure of capital markets to provide appropriately priced risk mitigation tools constitutes one type of barrier to private investment. The failure of public policies to properly internalize the external value of climate benefits and other public goods constitutes a second type.

Private sector investment in climate change-related opportunities is diverse and can cover many different types of investments – each of which can have one or multiple barriers related to the host country's or the project's characteristics. Some basic barriers linked to the domestic investment environment, such as a lack of skills or supporting legal structures, may result in an investment or opportunity not even being considered. Some barriers result in the risk-adjusted returns to the investment being unattractive such as, for example, when the climate-friendly technology is more expensive than its conventional counterpart and when carbon is unpriced. In other cases, risks are not well understood or easily managed in capital markets due to, for example, lack of information about technologies or market opportunities. This includes the upfront costs associated with entering a new market when the investor is uncertain whether and when these costs will be recouped. The practical result is that project developers cannot access the capital they need and investors lack a pipeline of attractive projects.

Figure 1



SOURCE: Interviews 1

While many of the barriers to private investment in mitigation and adaptation are similar, there are also important differences. For example, for mitigation, the private sector is unlikely to invest in low-carbon projects that are more costly than their high-carbon alternatives unless the social cost of carbon emissions is internalized through policy. For adaptation on the other hand, the risk-adjusted value of a more climate-resilient investment could be internalized without public policy if information is available to investors. . In general, the more successful the international community is in mitigating GHG emissions, the less need there is for adaptation-related investment, though a significant amount of adaptation investment will be required even in the face of aggressive mitigation action. This creates additional uncertainty about the future value of adaptation-related investment for the private sector on top of already wide-ranging estimates of the local adaptation costs per degree increase in global temperatures. The following discussion of investment barriers identifies those specific to mitigation or adaptation.

a. Challenging investment climate

Given opportunities to invest in many countries, an unattractive investment environment can be a key barrier to investment. Some aspects are specific to climate investments, such as fossil subsidies. Others are generic to any type of investment, such as foreign exchange risk.

i. Fossil energy subsidies

In many countries, fossil energy production or consumption is subsidized. Production subsidies for fossil fuels make it more difficult for non-fossil investments to be competitive. Consumption subsidies reduce the incentive to use energy efficiently. The greater the distortions in energy pricing away from market-based prices, the more difficult it is for investments in clean energy to yield attractive returns. So even if an individual demonstration project is implemented with external support, the presence of subsidies lowers the likelihood of it being replicated.

ii. Country-related risks

Many market failures and other barriers to domestic and international private investment are related to characteristics of the host country's policy/market environment. Such barriers may discourage investments in a given country or sector when similar opportunities exist in other countries or sectors with more favorable environments. *Country risk* includes a country's business conditions and investment climate like enforceability of contracts, expropriation risk, IP infringement, restrictions on foreign investment. *Foreign exchange risk* is a particular challenge in the context of mitigation, given the long-term nature of most investments (20-30 years) and the volatile currencies of many developing countries.

iii. Forest conversion incentives

Deforestation and forest degradation continue to occur in part because the domestic and global environmental benefits of forests (e.g. watershed management, carbon sequestration) are not typically rewarded by the markets. In addition to these environmental externalities, the conversion of forests is sometimes subsidized through domestic policies such as low stumpage fees or poor enforcement of sustainable management requirements. There may also be a lack of strong commitment from home governments to align policies to support alternatives to deforestation, which compete with other sources of revenue such as industrial logging, oil palm, agriculture, and cattle ranching. Finally, even when strategies to combat deforestation are present, they are often implemented on a project-by-project basis which may result in domestic leakage and ineffective use of financial support.

b. Challenging project risks

For some climate-relevant sectors, capital markets are not effective in pricing risk and/or properly priced risk mitigation instruments are unavailable from commercial providers. To the extent the market misprices these risks -- or is unwilling to price them -- it represents a barrier even when market returns should otherwise support private investment.

i. Climate change project-related risks

Technology risk occurs when a mitigation or adaptation measure uses new technologies which are often not yet well understood, resulting in investors demanding significantly higher returns than for existing technologies. Further project specific risks include construction and operating risks; however, those risks can often be mitigated directly through instruments offered by the equipment manufacturers present in developing countries.

Policy risk relates to the existence, design and predictability of relevant domestic policies, as well as changes to these policies, that affect the revenue streams and costs of projects. In developing countries, for example, power purchase agreements for renewable energy may not be easily bankable. Suboptimal policy may exist if domestic governments face constraints in terms of awareness of policy options, skills and capacity. In developed countries, policy risk is associated with investors' uncertainty over the stability of specific forms of international support.

ii. Country-level climate vulnerability

While private capital will ultimately incorporate adaptation considerations in investment decision-making, market-driven financial flows will not necessarily respond to the impacts of climate change in ways that achieve policy goals. For example, private infrastructure investors might avoid projects in countries at high risk from climate-related impacts, rather than choosing to make their projects more

climate-resistant. Global agricultural investment might migrate to regions that become more fertile in a warming world rather than invest in drought-resistant crops and production methods to continue operating in regions that become more arid.

c. Inadequate access to finance

i. Weak or incomplete domestic capital markets

A lack of deep and liquid capital markets that characterize more developed economies can lead to a mis-pricing of risk and required returns. Low income countries typically lack any formal equity and debt markets as well as effective banking systems. This poses a significant barrier to any type of investment, let alone climate change related investments. Middle income countries typically have developing or relatively well functioning banking systems and rapidly developing equity and debt markets. However, even in those countries, capital is not available for all types of investments. For example, in some cases investment capital might be available for 'corporate' investments, while no capital would be available for 'household' type of investments. Similarly some of the sources of capital, such as domestic pension funds, may be regulated in a manner that prevents their engagement in new climate relevant sectors.

A particular problem is the lack of secondary debt mechanisms. Often banks have a limited amount of capital ('credit lines') available for particular sectors. Secondary debt markets allow banks to 'sell on' their debt and be able to 'originate' new debt. However, the credit crisis has reduced the liquidity of debt markets and therefore the ability of banks to sell on their debt. As an example, a case study of the Indian National Solar Mission indicates that the local banking system has sufficient credit available for the first 1 GW wave of solar power generating capacity, but will likely struggle to make capital available in the second round.

ii. Inadequate capital for start-up costs

Economies of scope can be captured when a new product is added to an existing line, allowing the use of existing distribution, marketing and supplier channels. But in first-of-a-kind or first-in-country projects, investors face high upfront time and out-of-pocket costs associated with searching for specific opportunities, establishing technical capacity (i.e. to conduct energy audits), developing business plans, complying with local regulations and licensing requirements, and lining up upstream suppliers and downstream buyers/off-takers. These system interconnections are often better established for "business-as-usual" alternatives. Analysis has found that these sorts of transaction costs can be several times higher for first-of-a-kind low carbon investments than for conventional options

There may also be start-up challenges with respect to changing internal budgeting practices of businesses operating in developing countries. For example, even though energy efficiency investments have high internal rates of return and fast paybacks, they do impose upfront costs which need to be financed. Annual budgets of energy using businesses tend to focus on routine operating and maintenance costs, while capital budgets tend to cover large capital improvements. Energy efficiency projects can fall through the cracks. Finally, new technologies may have to compete with technologies that have a lock on markets due to declining marginal costs, for example, the central station grid model of electricity service provision.

iii. Incomplete insurance markets

Some poor countries do not have well-functioning insurance markets that allow households and businesses to hedge against big losses. For example, less than 3% of household and business losses from natural disasters in developing countries are insured. Despite the important and growing role that insurance can play to help adaptation to climate change impacts - by 2015 the number of poor people

affected by climate related disasters is predicted to increase by 50% - access and coverage in developing countries is minimal.

The barriers to successful and scaled-up climate insurance schemes, consistently identified by practitioners, help to explain the low coverage rates in developing countries. These include high set-up costs, low customer demand, other customer priorities, difficulties in scaling up, limited knowledge or culture of insurance products, limited credible distribution networks, low level of stakeholder buy-in and unsupportive regulation.

d. Insufficient risk-adjusted returns

Some mitigation and adaptation projects have a higher cost and/or higher risks than their high carbon or non-climate proofed alternatives. These mitigation and adaptation projects do not meet investors' return expectations and require external support to make risk-adjusted returns attractive.

i. Carbon externality

A fundamental constraint on private investment in those mitigation actions that have unattractive returns is the inability of investors to capture the public goods value of reducing carbon emissions. If a robust carbon market prevailed, instruments discussed in Section IV that otherwise are mobilized to internalize the carbon externality would not be needed.

The demand for carbon credits and the available carbon price in developing countries between now and 2020 is unclear. For the past several years, the CDM has offered a performance-based revenue stream for some investments. However, that window is closing and in doing so is opening a period of policy uncertainty for investors. This situation will continue until additional demand from market-based policies in developed countries emerges and/or carbon constraints in recipient countries (more likely in emerging economies) become established.

ii. Non-climate externalities

Similar to the carbon externality, residual (after enforcement of local regulations) air pollution and other non-climate mitigation impacts from fossil fuel production and conversion may impose health and other non-market costs that bias investment decisions. A study by the U.S National Academy of Science estimated that internalizing non-carbon environmental impacts of fossil power generation in the United States would add about 1-3 cents/kwh to its cost.

iii. Public goods from technology commercialization

R&D, demonstrations, and pilot projects may all generate commercially useful information, which has a public good attributes. The learning value from investments in technology commercialization projects is difficult for investors to capture, especially in countries with weaker intellectual property protections. This barrier applies to both mitigation and adaptation.

Investments in adaptation technology, such as drought and disease-resistant crops and water management systems, will occur only if it is clear that there is sufficient demand for such products to recoup the costs of R&D. While there will ultimately be a market for such products once climate change makes existing agriculture or water management practices less profitable or ecologically unfeasible, long R&D lead times and uncertainty about the nature and extent of climate change impacts in the decades ahead constrain private investment. This is especially true for crops that have only local markets and associated production practices.

iv. Agency and inter-temporal problems

Among climate change projects, energy efficiency schemes face barriers to implementation due to the fact that often the actor required to invest is not the one receiving the benefit from investment. Agency problems also affect the power sector as retail electricity service providers often have adequate information and capital but not the economic incentives to invest in demand side efficiency because of how they are commonly regulated.

Land developers may not be able to recoup their private adaptation costs -- in terms of resilience to weather damage or sea-level rise from clients. With respect to adaptation insurance, insurers may fail to reward preventative measures with lower premiums and investors often have no means to recoup investments that strengthen climate resiliency. When investments have particularly long periods of repayment, the case for outlays to can be weakened when there are competing, immediately profitable uses for limited funds.

Unlike mitigation, where the principal barrier to private investment is a global externality, much of the cost of adapting to climate change will ultimately be internalized in private investors' decision making even in the absence of policy. In many sectors, climate-resilient investments will be more profitable than climate-vulnerable investments once the impacts of future temperature increases are fully felt. Yet the return on climate-resilient investments made today may not be realized until decades down the road, beyond the time-horizon used by most investors in assessing risk-adjusted returns.

IV. Public Interventions to Catalyze Private Finance

Domestic government policy initiatives and programs, as well as international public sector financial or technical assistance can address the above barriers. Most investments face multiple barriers that all need to be addressed in order for capital to flow. In Figure 2, we have categorised the instruments by the barrier or barriers that they address.

Figure 2: Matrix of barriers and instruments

Barrier	**Interventions to Address Barrier (C = Concessional, NC = Non-Concessional)**
Inadequate returns	
Carbon externality	Domestic policy reforms (C or NC) Carbon markets (discussed in WS8) Advanced Market Commitments (C) Project investment grants and below market loans (C)
Domestic externalities	Domestic policy reforms (NC) Development policy loans or bilateral budget support (NC or C)
Country-level climate vulnerability	Insurance products (NC or C) Investment grants and concessional loans (C) Loan guarantees (NC or C) Development policy loans (NC or C)
Public goods associated with technology commercialization	Improved IP protection (NC) Prizes (C) Advanced market commitments (C) Investment grants and below market loans (C)
Agency and inter-temporal problems	Domestic policy reforms (NC) Domestic public information programs (C) Technical assistance (C) Investment grants and below market loans (C) Loan guarantees (C and NC) Development policy loans (C and NC)

	Advanced Market Commitments (C)
Energy or fossil subsidies	Domestic policy reforms (NC) Development policy loans (NC)
Risk management	
Project-related risks (e.g. technology performance)	Loan guarantees (NC) Public/private funds (NC or C)
Lack of information about investment opportunities and climate risks	Domestic public information programs (C) Technical assistance (C) Insurance products (C or NC)
Country-related risks (e.g. policy inconsistency, expropriation, forex)	Policy guarantees (NC) Risk insurance (NC) Foreign exchange products (NC)
Inadequate access to finance	
Incomplete or weak domestic capital markets	MDB or bilateral anchor investments (NC or C) Equity positions (NC) Funds (NC or C)
Start up barriers (lack of local economies of scope; inertia)	Domestic public information programs (C) Technical assistance (C)
Incomplete insurance markets	Climate risk information campaigns New insurance products (NC or C)

Some general observations are in order before presenting individual public sector interventions. In distinguishing between concessional and non-concessional instruments, we recognize that a loan or guarantee can be concessional or non-concessional depending on its fee, interest rate, tenor, or other terms. The design and deployment of instruments needs to avoid crowding out private financial instruments that would otherwise be mobilized. Analysis has found that these sorts of transaction costs can be significantly higher for first-of-a-kind low carbon investments than for conventional options.

- Concessional instruments should be considered with investor preferences in mind. Some investors prefer the upfront certainty of a lower cost of capital (such as through subsidized finance) over the expectation of improved future revenue streams (such as through carbon revenue flows or product purchase agreements), whereas others have the opposite preference. In other cases, non-concessional risk mitigation tools simply fill a gap that private capital markets are unwilling to fill.

- The channels through which these interventions might be delivered include multilateral development finance institutions (multilateral development banks including EIB and CAF, multilateral climate and carbon funds), UN agencies, bilateral agencies (development, export

credit, and technical assistance agencies), and national financial institutions (development banks and public financial institutions).

- In order for public interventions to be effective in stimulating private investment they need to be designed and implemented in a manner that is transparent, long-lasting, and consistent.

In the discussion below, we present both well-established interventions and some proposed initiatives that are not yet operational. We first present those interventions needed to make the domestic policy and market environment as conducive as possible to private investment through policy actions (e.g. elimination of fossil subsidies and domestic externalities, strengthening of domestic capital markets). These actions may be implemented either autonomously or with international support through development policy loans and technical assistance. Next, we present non-concessional instruments that can be deployed to address country-related and project-related risks. Such instruments may be sufficient by themselves to stimulate private investment in climate actions with potentially attractive returns, such as energy efficiency, or where the market is overpricing or unwilling to price various risks. Finally, we present concessional instruments that may be necessary when incremental costs are high and/or there are significant knowledge or first-mover spillovers.

a. Interventions to Strengthen Domestic Investment Environments

As a precondition to any capital mobilisation, domestic conditions need to be conducive for first-of-a-kind investments and their subsequent replication. These investment preconditions typically address key barriers including the policy/ regulatory environment, incentives for first movers and new technologies, and basic awareness and technical capacities.

Developing countries are heterogeneous with respect to these overall investment environments; in some countries this is evidenced by little private investment in country; in others, there is adequate private investment in country, but not in climate relevant sectors; and in yet others, there is adequate private investment in climate relevant sectors, but not in mitigation or adaptation activities.

In many cases, autonomous domestic government measures can assist in bringing about a conducive domestic investment environment. Particularly in lower income countries, governments may look to technical assistance, funded by international public finance, to assist them in this objective.

i. Autonomous policy measures

Autonomous policy measures are domestic policy actions that improve the regulatory landscape to overcome investment barriers both those that are generic and those specific to climate-related investments. They include (but are not limited to) the following:

Environmental regulation: This includes pollution standards and regulations (command and control as well as market based), public disclosure of information about environmental impacts, elimination of implicit subsidies for climate-risky behavior (e.g. land use controls, building standards, land use planning, protection of natural buffer zones, coordinated water management and water pricing), and (especially for forest sector investments) improved sector governance and monitoring in order to help internalize domestic externalities.

Energy regulation: Energy price reforms, elimination of fossil subsidies, building efficiency codes, end use efficiency standards (market pull), efficiency certification/labels (market push), power sector reforms that remove financial bias away from supply and demand side efficiency, and improved grid access to facilitate use of renewable resources.

Policies in sectors vulnerable to climate risks will be needed to tackle agency problems and deal with uncertainty. In heavily regulated utility sectors such as water, restrictions on passing costs onto consumers may need to be relaxed in order to allow companies to recoup adaptation investments as well as to encourage conservation.

To be effective in influencing private investment, any policy measure must be accompanied by consistent and transparent enforcement with sufficient penalties for non-compliance that affected parties have a strong incentive for compliance. Inter-governmental coordination will be needed to purchase public goods (e.g. climate resilient water and transport systems) and protect vulnerable populations in the aftermath of droughts and floods.

i. Information campaigns

Information campaigns can raise awareness and send signals on climate opportunities and risks to business and households in climate-sensitive sectors. These can be particularly effective in negative cost activities, such as demand side energy efficiency, where key barriers can be informational. This includes dedicated media campaigns, industry congresses, websites and studies.

Once climate risks are better understood, considerable domestic investment in climate change adaptation is likely to be undertaken by private sector actors as opposed to governments or civil society groups because climate impacts affect business operations through, for example, damage to physical assets, reduced asset operating life, deteriorating health and safety and productivity of the workforce, contraction of some markets, weakened supply chains and increased land, water and energy scarcity leading to the loss of company's social mandate to operate in a community. For example, in addressing such concerns food and beverage companies are increasingly working with local communities, stakeholders and local governments to design water management systems and engage in governance issues.

ii. Technical assistance to remove policy, technology and skills barriers

National governments can be supported to undertake policy measures and market reforms that strengthen the environment for private investment in mitigation and adaptation. Technical assistance can be provided multilaterally, through the MDBs or UN agencies, or bilaterally through the bilateral finance institutions or technical agencies.

Technical assistance can seek to address barriers in awareness, local skills and expertise. Such capacity building can be targeted towards both government officials, who must make informed policy choices, and local businesses, banks and investors, who need to evaluate policy environments, technology choices and financing options. Activities include providing technical experts, staff secondments, information campaigns, direct training and workshops.

Technical assistance can also involve subsidizing or meeting the cost of implementing the policies and measures identified above. Support on the domestic policy environment can include initial market studies and analyses of the most cost effective policy options in light of prevailing energy prices and tariffs. Support on technology commercialization can include energy audits, wind mapping, feasibility studies and facilitated licensing and procurement.

Low Carbon Development Plans.
Bilateral agencies, MDBs and UN agencies are assisting countries in preparing low carbon plans and strategies. UNDP is providing a range of technical assistance to developing countries to formulate low carbon, climate resilient strategies (LCCRS). This is being provided through various programs, including its 'Down to Earth' LCCRS partnership with UNEP, as well as its assistance to over 140 countries on National Communications to the UNFCCC.

International public finance spent on these upstream measures can often have a high leverage factor, with an enabled policy environment able to catalyze private sector activity across entire industrial sectors, and assistance for first mover technologies leading to replication and scale-up. This technical assistance to remove barriers in policies, technologies and skills is also a key complement, and precondition, to international support in the form of financial instruments to directly address issues of risk and return.

iii. MDB development policy loans (DPLs) and bilateral support

DPLs are being increasingly used as an integrating platform for climate change policy and programmatic initiatives. In some cases, national governments undertake the above measures with only technical assistance and capacity building grants. In other cases, DPLs strengthen policy and market conditions in the host country to make them more conducive to private investment. DPLs can be used to facilitate establishment of a long term stable, predictable, and transparent policy environment. DPLs are attractive due to their relatively low transactions cost and simplified access. Bilateral assistance agencies also provide support for policy reforms. Technical assistance in the form of secondments, training, and capacity building grants may be necessary to support domestic policy measures.

Development Policy Loans.
There have been ten DPLs with climate change components approved by the World Bank's Board over the past two years, some of which have preceded CTF investments. They include reforms and capacity building in legal systems, energy sectors, and commercial financial sectors. The World Bank's most recently approved climate DPL is for Indonesia; it is the first in a series of climate-related DPLs for Indonesia that will total $800 million. A proposed DPL focuses on strengthening resilience to climate change in Mexico's water sector. The African Development Bank is similarly assisting Egypt's climate planning through a DPL.

b. Instruments to manage country and project risks

Even with a conducive domestic environment, profitable climate investments may not occur if risk management tools are unavailable, over-priced, or if risks are assigned to entities not well-equipped to manage them. In this case, non-concessional risk mitigation instruments, including loan and policy guarantees and foreign exchange products can catalyze private investment. In many cases, these instruments are only needed for a limited time period until the domestic capital market matures.

i. Policy guarantees

Policy guarantees include guarantees offered by the host government or by bilateral or multilateral financial institutions. Sovereign guarantees are given by host governments to assure project lenders that the government will take certain actions or refrain from taking certain actions affecting the project. Although a blanket sovereign guarantee of all project risks is impossible to obtain in any project finance transaction, many of the legal and political risk categories typically encountered in an infrastructure project are well within the host government's ability to control and may therefore be fairly allocated to

such host government.

ii. Country and macro-economic risk insurance

Macro-economic risk insurance instruments are available to investors, contractors, exporters and financial institutions involved in international transactions. Political risk insurance from multilateral or bilateral agencies can cover currency inconvertibility, expropriation and political violence, and is available for investments in new ventures, expansions of existing enterprises, privatizations and acquisitions with positive developmental benefits. Where commercial risk insurance is unavailable, it can be provided by public institutions such as MIGA and OPIC. In the clean energy space, MIGA has insured hydropower projects in Lao PDR and Uganda. OPIC has provided risk insurance for several clean energy projects..

iii. Foreign exchange products

Foreign exchange risk can be hedged for some currencies. There also exist special purpose fund vehicles that provide market risk management products to investors active in emerging markets -- long-term local currency and interest rate derivatives. However, this is not always the case for many infrastructure investments with a long duration as well as for many small scale investments.

Exchange Fund.
The currency Exchange Fund (TCX) was launched in September, 2007 by development finance institutions and commercial banks from European and African countries. Its objective is to promote long-term local currency financing for borrowers in developing countries that do not have hard currency income, thereby contributing to a reduction in currency mismatches in the local market. As of 31 December 2009, TCX had hedged USD 362 million in long-term local currency loans in 25 developing country currencies and had total exposure of USD 635 million in 37 currencies.

TCX is a multilateral instrument that can be used as a model to be scaled up. TCX is structured to help its investors to hedge exchange and interest rate risks associated with long-term investing in developing country currencies. These risks are transferred to TCX by means of medium to long-term swap agreements. TCX pools market risk from multiple investors with diversified geographical business. The resulting global diversification leads to a significant risk reduction and economies of scale and scope. Through this diversification across multiple currencies, TCX can thus provide hedging products for currencies at a lower cost than what can currently be achieved otherwise. It could possibly be even more attractive with support from the IMF or developed and developing country central banks.

With respect to its financial impacts, TCX is attractive for investors active in infrastructure projects in developing countries with a long duration and/or for many small scale investments. TCX consists of a swap portfolio that is naturally long emerging market currencies and short USD. Investment in TCX is thus not concessional as it consists of medium to long-term swap agreements. The risk/return characteristics of the TCX compares well with usual market standards for mezzanine investments. Its financial performance benefits from the stabilizing effects of the portfolio diversification whilst operational efficiency is obtained through economies of scale.

iv. Loan guarantees

Loan guarantees from multilateral or bilateral institutions reduces the risk to a commercial lender that its loan will not be fully repaid. They can be important for emerging or higher risk technologies and fees for issuing guarantees can be set to cover expected losses (concessional options are discussed below). These guarantees are offered by multilateral and bilateral financial institutions to commercial banks.

Loan Guarantees.
The World Bank Group is in the process of designing risk management products that apply guarantee instruments to a range of operations, including climate smart investments that may involve higher risks. OPIC also partially guarantees U.S. commercial banks' emerging markets medium and long-term loans to businesses or correspondent banks. A framework agreement is established once OPIC underwrites a bank's credit policies and procedures. Under the agreement, credit underwriting and servicing is delegated to the bank; OPIC approves individual projects for compliance with its statutory requirements; OPIC retains discretion whether to risk share on any loan; and the framework sets the amount of risk sharing, up to 75 percent of the loan.

c. Access to finance

Investors need different types of finance at different points in the project cycle. For example, infrastructure project sponsors typically need to first raise equity beyond what they are bringing to the table, then raise debt, often from local banks. In this case, public providers of debt can only be helpful once sources of equity have been mobilized.

i. MDB and bilateral anchor investments

MDBs, bilateral development banks and export credit agencies provide non-concessional loans to the private sector for climate actions. In their private sector windows, MDBs offer project loans (A and B), corporate loans, and equity stakes in local companies. MDBs' AAA credit ratings allow them to lend on attractive terms. MDBs collectively cover all developing countries and have an in-country presence in most of them.

MDBs undertake an extensive project appraisal process that weeds out most poor quality projects. MDBs maintain a set of safeguards and other policy standards (e.g. fiduciary, procurement, environmental/social, consultation, disclosure) as well as post-Board supervision and quality assurance audits. These policies reduce the risk for commercial banks that are part of the financing package. At the same time, compliance with safeguard requirements adds to out of pocket costs. MDBs' long processing cycle impose time delays and risk of shifting goal posts, complicating the ability of private investors to assemble a financial package.

Supported by a base of sector knowledge and strategies, all of the MDBs now have explicit climate strategies that provide a framework for lending in mitigation and adaptation-relevant sectors. Financing for individual projects is normally made within the context of a country-approved development strategy, which facilitates local benefits beyond those that accrue to the project sponsor. At the same time, the fact that MDBs are largely demand-driven (especially on the private sector side) poses challenges for maximizing cost effectiveness in achieving environmental benefits across prospective countries, sectors, and projects.

MDB core lending is relatively small to other international capital flows. For example, FDI inflows to

developing countries are on the order of 10 times the scale of MDB financing. Within a given country sector, an MDB's scale of financial engagement is often small relative to the overall capacity or private investment in the sector, which can limit both the demonstration effect of projects that it finances and the interest by the host government to make policy changes that would stimulate replication of the MDB-financed project.

IFC A/B Loans
The IFC's A/B loan structure allows the B loan participants to fully benefit from IFC's status as a multilateral development institution. IFC is the sole contractual lender, acting on behalf of both itself and the B loan participants. All payments including principal, interest, and fees gain the advantage of IFC's preferred creditor status. Under this structure, IFC commits to the participants to distribute all payments pro rata among itself and the participants. As a result, IFC cannot be paid in full until all participants are paid in full. Similarly, a default to a participant would be a default to IFC. Besides providing loans, the IFC has taken minority equity positions in companies that are developing mitigation projects or products.

Some export credit agencies offer extended terms for loans to clean energy projects, which are sometimes more capital intensive than their conventional alternatives. For example, U.S. Ex-Im offers extended tenors for renewable energy, while charging an upfront fee to cover its costs for providing this service.

Risk Mitigation: Bulgaria Sustainable Energy Financing Facility
At the time of EU accession, Bulgaria was confronted with the highest energy intensity of any EU country, the necessity of restructuring and modernizing the energy sector after the decommissioning of several nuclear power plants, an over-dependence on imported energy, and rising energy prices. To confront these challenges, in 2004 the EBRD established targeted private sector credit lines to finance renewable energy production, and increase energy efficiency. These credit lines – or Sustainable Energy Financing Facilities (SEFFs) - are provided by the EBRD to local partner banks.

The SEFF model has demonstrated its ability to create a market for energy efficiency and renewable energy financing. The first and most successful SEFF is the Bulgarian Industrial Energy Efficiency Renewable Energy Credit Line, which supports investments in small scale energy efficiency and renewable energy projects by either reducing the energy demand or by replacing the lost capacity with green energy supply. The initial amount of €50 million was approved by the EBRD in January 2004 and loans were subsequently signed with six participating banks. In June 2006, the Bank approved an extension of the credit line. In total, nine Bulgarian banks signed up for the facility. The credit line is complemented by grant funding of €35.2 million, which is dedicated to project preparation and incentives to overcome barriers that both sub-borrowers and banks face in pursuing sustainable energy investments.

As of 31 December 2009, the credit line shows strong results. Participating banks have signed loans amounting to €90.5 million, to finance 135 projects worth €171 million. The completion of these projects is estimated to lead to significant energy savings and CO_2 emissions reductions (over 900,000 MWh/year of electricity saved and close to 600,000 tons CO_2-equivalent/year respectively). The estimated power generation equivalent replaced, based on the same portfolio, is 140 MWe. Energy efficiency sub-loans have ranged in size from €46,000 to €2 million with an average sub-loan of €510,000. Eligible packages of measures were identified and have included investments in machinery upgrading and/or replacement, co-generation of heat and power, thermal insulation of production halls in various industries such as pulp and paper, sugar mills, chemical plants, bakeries, heavy machines and metal processing. Renewable energy sub-loans range in size from €64,000 to €2.5 million with an average size to date of €809,000. The scope of investments has included hydro-power, wind farms, heat-pumps, biomass, biogas and solar heat projects.

ii. Insurance products

In recent years, the international community has developed schemes to address the lack of insurance products that offer climate coverage for developing countries. The success of such schemes depends on perceived stakeholder ownership, trusted distribution networks, a willingness of insurance markets to underwrite the risk, and host government commitment to address regulatory issues.

Weather Index.
One insurance model is the "Weather Index Insurance for Agriculture", which is aimed at alleviating negative economic impacts of extreme weather on farming economies by compensating part of the damage cause to agricultural products. Under such schemes, insurance claims are paid according to the number of days when the temperature falls either above or below certain agreed levels. Actual damage to crops need not be measured and verified, allowing rapid payout and low transactions costs. The model is being piloted by JBIC in Thailand.

iii. Technical assistance

MDBs, multilateral and bilateral agencies all provide technical assistance to developing countries with the aim of addressing financial access barriers. Technical assistance aims to assist the private sector to become informed about the full range of financing sources, to understand and identify which sources are best suited, and then to navigate a particular financing source's criteria and procedures. This support can be particularly when there is a public finance component, and a need to combine and sequence different sources of public and private financing. Typical support includes specialist expertise, training and awareness-raising.

One emerging area of support is assisting governments in devising streamlined and harmonized structures to coordinate public financing, to ensure an effective linkage with national priorities and to create synergies between climate and development finance.

Technical assistance can also seek to address the supply of financing, building a better understanding among the investor community, both internationally and domestically, of the opportunities and risks of climate investments. This increased awareness, together with increased overall deal flow, can provide the critical mass to attract institutional investors to a new sector.

Climate Finance Platforms.
The World Bank Group and UNDP have recently jointly launched the *Climate Finance Options Platform*, an online resource platform which provides a comprehensive, regularly updated list of sources of climate finance. The platform, targeted at policy makers and project leaders in developing countries, includes a South-South community of practice, and is also developing and testing indicators for monitoring and reporting climate finance flows.

In Brazil, UNDP is assisting businesses to combine and sequence a number of different sources of public finance to take a comprehensive approach to the life-cycle management of refrigerators. In particular these activities address Ozone Depleting Substances (ODS), which are used as refrigerants and typically have a very high global warming potential.

In December 2009, the UNDP-administrated Cambodia Climate Change Alliance Trust Fund was established, with the objective of empowering Cambodia's National Climate Change Committee (NCCC) to coordinate funds along national priorities and monitor implementation of climate activities. The trust fund creates a harmonized engagement point for donors and aims to strengthen the emerging community of practice in government, private sector and civil society, enabling them to access the most up to date information on financing, priorities, resources and knowledge sharing services.

d. Revenue support and concessional instruments

These instruments are deployed when risk-adjusted returns are not attractive, normally due to market failures. Carbon markets (discussed in WS8) are the most promising vehicle for addressing the carbon emission externalities, but such markets may still be incomplete in 2020. The overall price structures of conventional and low carbon alternatives must reflect their true social costs in order to promote investments that are consistent with the rational use of economic resources from society's perspective. In the absence of a carbon signal, some developing countries have adopted tax or other incentives policies to

promote renewable energy. Further, other market failures related to technology and first-mover spillovers are beyond the remedy of carbon pricing.

i. Carbon Markets

Carbon market offset programs operating in developing countries would obviate the need for several of the public sector instruments discussed in this paper. Although carbon markets are the subject of Workstream 8, we mention them here because they are an important domestic policy tool for creating a price signal for private investment. Initial estimates from Workstream 8 suggest a volume of carbon offset flows ranging from $8 billion/year to $150 billion/year depending on different GHG scenarios and assumptions, with a mid-range of $30-$50 billion/year.

Project-based carbon crediting initially emerges from domestic carbon caps in developed countries in which some portion of the cap can be met through an international offset program. Over time, some emerging economies may enact policies that move in the direction of a domestic carbon signal as well, such as by establishing a carbon tax, a sectoral offset program, or a cap on a specific sector. In the long run, signals to private investment will be strongest if carbon market covers entire economies.

The carbon market is the most direct and efficient way to send signal to private sector. The public sector interventions discussed below that indirectly internalize the carbon externality are generally less desirable from an efficiency perspective in terms of allocation an economy's resources, including posing the risk of picking technological winners.

ii. Advanced Market Commitments (AMCs)

AMCs constitute a category of initiatives that make an investment more attractive by ensuring investors upfront of a minimum market demand and/or price for a product or service that meets certain specifications. AMCs are most applicable to relatively homogeneous products that are at an advanced stage of development. The ex ante assurance can be provided through a range of policy instruments, including results-based, short-term market incentives that sufficiently raise internal rates of return on viable projects to enable them to access local credit or equity markets – where, at least initially, developers face very high interest rates or return expectations. Over time, an AMC can be gradually withdrawn or reduced as market and technology awareness increases, allowing private-sector developers to pursue the already-viable opportunities in the market.

Such temporary demand side interventions can aim to increase and improve certainty of prices such as via a feed in tariff that guarantees the cost differential of renewable energies versus higher carbon alternatives. In the adaptation space, AMCs include purchase guarantees for initial development and production of drought-resistant crops or water management technology. AMCs can also ensure the amount and certainty of sales via standards or government procurement programs. More sophisticated schemes include both features in terms of offering a fixed price for a certain quantity or committing a quantity only if the price or cost is lower than a certain threshold. In order to avoid large rents, the approach and mechanism need to be adjusted from case to case.

Feed in Tariffs.
Feed In Tariffs are a prime category of AMCs for renewable energy. A FiT provides income support for technologies that are not yet economically competitive.. Often such support is structured as a $/KWh payment guaranteed for the lifetime of a project. The enhanced income streams are intended to improve the investor returns with the aim to attract significant amounts of private sector capital (from both domestic and international sources) to build those projects. By offering declining payment for subsequent 'vintages' or generations of project, it can stimulate technological innovation and serve as a bridge to grid parity for renewable energies.

Although many countries have adopted feed-in tariff policies, their designs and effectiveness vary widely.

- The FiT that Spain has put in place more than 10 years ago led to a boom and bust situation in 2008/9 which necessitated major adjustment of the mechanism. It is thus seen as an example how the regulatory framework of a Fit should rather not be set up.

- India has launched an ambitious "National Solar Mission" to drive increases in solar power. As part of this strategy, India has developed an innovative FiT to stimulate private sector demand which can be seen as a rather good example of how to set it up in the developing world.

- The GET FiT program developed by Deutsche Bank would lead to international feed in tariffs that would support both renewable energy scale-up and energy access in the developing world through the creation of new international public-private partnerships (see Appendix for case study)

The costs of FiT programs might be paid by domestic ratepayers or taxpayers, by international support through public instruments, or by some sort of carbon market crediting scheme.

By financing the incremental cost of a renewable energy vs. a high carbon alternative, the FiT should enhance returns and thus attract a large amount of private finance. Preliminary theoretical estimates for the leverage factor of a FiT are available based on the McKinsey Global Abatement (Investor) Cost Curve. On this basis, it is expected that $1 of (annual) incremental cost financing for solar power could leverage about $8 of (upfront) investment capital. To what extent this cost is paid for by the international community depends on how the mechanism is structured.

iii. Investment grants

Bilateral or multilateral investment grants are often used to address market distortions such as the carbon externality. Concessional finance, which is much more constrained than non-concessional instruments, is drawn primarily from multi-donor trust fund resources such as the CTF, GEF, PPCR, and SREP, and from bilateral assistance agencies. The current scale of concessional finance available for the private sector from these sources is constrained by the capital base of relevant trust funds contributed by donor countries. Because concessional resources are limited, they are often used to leverage significantly larger non-concessional finance including MDB non-concessional loans, sponsor equity, export credits, etc., as discussed below under "Packages of interventions". Although such blending is more often used for inducing private investment in renewable energy, it is sometimes also needed to overcome market entry barriers to investment in energy efficiency.

iv. Technical assistance

Relatively small amounts of grant-based technical assistance can assist the private sector in overcoming market-entry and start-up barriers. For energy efficiency, technical capacity to undertake energy audits, identify energy efficiency opportunities and provide solutions is necessary. Without such technical capacity, energy efficiency opportunities will go unfulfilled. Energy efficiency lending programs need to be accompanied by technical assistance, at least in the initial stages, and in some cases the actual lending may not even be required. Technical assistance, for example to build partnerships with local, regional and global vendors, consultants, Energy Service Companies (ESCOs), equipment suppliers and project developers, is essential for creating the healthy pipelines that public and private financiers need to scale up.

Technical assistance can also be used to build private sector capacity for climate resilience. Private actors need skills, knowledge and information – and sometimes prompting – to do what is in their long-term self-interest. Along with raising investor awareness, there is a need to improve the understanding of financial institutions about emerging business opportunities, to change the perception that adaptation is difficult to support with commercial finance. Farmers will need information and advice on the likely effects of climate change in their region, new practices and varieties which they may wish to adopt, and, vitally, long term weather forecasting. With sufficient awareness and buy-in from investors, opportunities arise to test out new products and approaches, as well as new ways of delivering finance to new markets, including via micro-finance schemes.

Project Development Facility.
One response to the market entry and start-up barriers mentioned earlier is the Seed Capital Assistance Facility, a joint initiative of UNEP, ADB and AfDB. The GEF funded Facility helps VC and private equity fund managers to include portfolios of seed transactions within their overall investment holding. For each seed investment that fund managers make in first-time clean energy projects, the Facility cost-shares a portion of the project development and transaction costs. In essence the SCAF is a form of project development facility that relies on private investors to select projects.

e. Packages of interventions

The individual interventions discussed above can be used to build more comprehensive strategies to stimulate private investment achieve economies of scale and scope, and take account of dynamic factors. Sometimes packages of interventions are developed in which barriers are addressed simultaneously, whereas in other cases, barriers may be addressed sequentially. Multiple interventions are sometimes blended or packaged together to more effectively address multiple barriers to private investment. At the same time, complexity can be a deterrent to private investment, so clarity and simplicity in the packaging of instruments are important.

The instruments to be blended depend on project characteristics and investor needs. Depending on these factors, packages might include domestic policies, concessional instruments such as carbon finance or grants, and non-concessional instruments. For example, for energy efficiency and other individually small clean energy initiatives, aggregation of projects may be needed to achieve economies of scale and scope. For renewables, carbon crediting can be combined with domestic policy instruments such as feed in tariffs.

Instrument selection also depends on the stage of a technology's commercial maturity. The instruments used to incentivise particular technologies will evolve over time. At an early stage of development, capital

incentives (supply-side) are generally most effective. At later stages of deployment and diffusion, production-based incentives tend to work best. The deployment of instruments will therefore need to be dynamic over time.

i. Grants combined with non-concessional instruments

Targeted international support can overcome start up challenges by combining concessional financing with measures such as project pre-preparation, market studies, and other forms of technical assistance. For example, the Clean Technology Fund (CTF) has provided highly concessional finance that has been combined into an overall package with MDB loans and technical assistance to stimulate private investment. The Clean Technology Fund (CTF) is a multibillion dollar multilateral fund that aims to reduce global emissions growth and combat climate change by helping to close the price and risk gap in developing countries between dirtier conventional technologies and commercially available cleaner alternatives. The twelve country and one regional investment plans thus far endorsed aim to use $4.6 billion in CTF funding to mobilize over $44 billion in total planned investments -- a leverage rate of nearly ten times. The CTF operates through both the public and private windows of the multilateral development banks (MDBs).

The pricing and terms of the CTF funds offered to private sector clients are tailored to address barriers identified for each case. MDBs will seek to provide the minimum concessionality needed to catalyze projects and programs within a sector. However, the MDBs have flexibility to structure the project in such a way that the CTF funds can clearly address barriers. This includes enabling the CTF to create new products as needed. Examples of CTF instruments include concessional interest rate loans and loans with performance incentives; subordinated debt and mezzanine finance; guarantees and insurance products; risk-sharing products; and equity investments.

CTF wind projects.
The CTF has negotiated deals to co-finance two wind power projects in the Oaxaca region of Mexico with the International Finance Corporation and Inter-American Development Bank. Both projects are using small amounts of CTF financing ($15 million and $30 million respectively) to leverage additional public and private financial flows into wind power investments. In both cases, the CTF is deploying its resources as subordinated debt to senior lenders. By providing subordinated debt to these projects, the CTF has helped improve their debt service coverage ratios for senior lenders and thus lowered the perceived risk that otherwise would have prevented the projects from securing the necessary financing. As risks emerge during the course of the project, the CTF tranche will serve as a cushion to other debt providers.

In the EDF La Ventosa 67.5 MW greenfield wind project, the total project, the financial structure is as follows: Total Project Costs are $189 million, CTF financing is $15 million, development bank financing is $124 million, and sponsor equity is $50 million. The leverage ratio (CTF/Private Finance) is approximately 1: 3.3..

The EURUS wind project has a different financial structure with total project costs of $604.5 million, CTF financing of $30 million, development bank financing of $283 million, private sector financing of $62 million, and sponsor equity shareholder loans of $229.5 million. In this case, the leverage ratio (CTF/Private Sector) is considerably higher -- approximately 1:10 – than for La Ventosa due to project size, perceived risks, and requirements of senior lenders. Financing has closed for this project.

ii. Strengthening Domestic Financial Markets

Some efforts to strengthen domestic capital markets involve multiple interventions. The IFC and EBRD have implemented several programs that finance clean energy through local financial intermediaries using a combination of technical assistance and risk mitigation instruments.

Energy Efficiency Financing.
The China Utility Energy Efficiency Program (CHUEE) is one of IFC's most successful programs in enabling the rapid scale up of sustainable energy investments. The program started in 2006 and was designed to stimulate sustainable energy investments in China through guarantees directed to SE portfolios, and advisory services directed to FIs and market players such as utilities, equipment vendors and energy service companies. Both types of interventions relied on support from donors in the form of risk capital and GEF grants.

The program has exceeded its original loan volume target and met initial GHG reduction targets, while improving access to financing for Chinese SMEs and promoting new lending practices more favorable to EE projects than conventional, asset based lending. Program utilization has been rapid when compared to the experience of similar programs. As of June 2009, the program's participating banks provided loans totaling to 3.5 billion Chinese yuan (US$512 million). These loans financed 99 sustainable energy projects, such as heat and gas recovery, power generation, and introduction of efficient production systems. The steel, chemical, and cement industries are the largest beneficiaries. The GHG emissions avoided from these investments are estimated at 14 million tons of CO2 per year.

The CHUEE program also supported a network of market players such as ESCOs, equipment vendors and utilities, and the network enhanced the members' chances of obtaining bank financing by 31%. Independent of membership in the network, advisory services also increased the probability of obtaining financing by 27%. In addition to scale, the CHUEE leverage of donor funds is over 100 times where about US$4 million of donor grants and risk capital have realized more than US$500 million in investments through local FIs.

iii. Public/private funds

To address the lack of access to capital for low carbon infrastructure projects, new sources of private capital may be mobilized from institutional investors (e.g. pension funds, insurance companies, sovereign wealth funds). At least some institutional investors' risk-reward criteria can be made consistent with the financial performance of low carbon projects by the establishment of public/private funds. These funds can achieve this objective by committing public equity at the fund level to demonstrate the public sector's willingness to share the risk with private investors and by providing risk mitigation instruments at the project level. Complementing these features are information services to reduce perceived risks that are based on lack of institutional investors' lack of knowledge about low carbon opportunities. Funds can be structured to co-invest in a range of opportunities covering equity investment funds, debt funds that would invest in projects directly, and debt funds that would buy secondary debt (financing local financial institutions).

Public Private Partnerships.
The Global Energy Efficiency and Renewable Energy Fund (GEEREF) was proposed in 2006 by the European Commission and is a public-private equity fund designed to maximise the leverage of public funds. GEEREF invests in energy efficiency and renewable energy projects through providing risk capital to private equity funds with a regional focus. The regional private equity funds themselves are specialized in providing equity finance to small and medium-sized project developers and enterprises (SME) of renewable energy and energy efficiency projects and technologies. These funds focus on project requiring up to €10 million equity investments while at the same time filling a substantial gap in the markets. Main goal of the GEEREF is to achieve high leverage of public funds by offering preferential returns to those funds and at the same time a high degree of financial stability. €108 million have been committed to the GEEREF over the period until 2011 by the EU commission, Germany, and Norway; while €22.5 million had been deposited until end of 2009. GEEREF plans to initiate fundraising for the second closing in 2010 to bring the total funds under management to above €200 million. It is targeted to mobilize at least €300 million up to €1 billion (leverage factor of more than 10 expected).

Another program, FIDEME, was launched by the French environment agency ADEME and the French commercial bank Natixis and is a €45 million public-private debt (mezzanine) fund aimed at addressing the debt-equity gap that was preventing the start-up of renewable energies in France. One third of the capital (€15 million) was provided by ADEME as a subordinated tranche within the public-private fund. The fund then provided subordinated financing to projects helping sponsors to fill the debt-equity gap and in so doing attract senior lenders. This double leverage structure allowed ADEME to mobilize over 20 times the public funding contribution it provided. Since inception, FIDEME has financed 30 renewable projects for a total capacity of over 300 MW and ~€330 million mobilized, accounting for one third of France's wind farm capacity up to 2006.

Another initiative, at a less advance stage but promising, is the Clean Pool, a public-private-partnership model being discussed by the ADB, IFC, DFID and members of the private investment community. This model is intended to alter the risk/reward balance through public sector interventions. It is proposed to have the following structural elements:

- Public and private investors would jointly shape the investment strategy
- A fund of funds would investment in multiple primate private equity funds operated by specialist managers
- A co-investment platform through which public and private investors could directly finance large scal projects; the presence of public investors could enhance regulatory certainty.
- Provision of public support instruments to improve the risk-return profile of low carbon projects for private investors.

V. Potential Scale of Private Investment

This section assesses the potential scale of private capital investment in mitigation-related activities and presents a qualitative discussion of the potential sources of private capital investment in adaptation-related activities. These estimates do not distinguish between domestic and international financial flows.

a. Mitigation

To estimate the scale of private investment in mitigation in 2020, we first establish an upper bound based on identified opportunities in developing countries along a range of carbon prices. Within this envelope, we estimated private investment flows by applying a leveraging factor to public funds and carbon market revenues expected to be available in 2020.

We used the McKinsey GHG abatement cost curve to estimate the investment capital potential along different ranges of the marginal cost curve. Figure 4 shows an abatement cost curve in the developing world in 2020 based on the McKinsey Global Cost Curve V2. The model yields abatement measures and their associated incremental costs as compared against business as usual development based on external pre-crisis forecasts for the developing world. Importantly, the baseline also includes the current status of domestic policies including, in some cases, fossil subsidies. Incremental costs include annualized incremental capital expenditures and operating costs, using a functional life repayment period and 10% discount rate. We note that the position of the curve is sensitive to these factors. For example, actual private sector discount rates in developing countries are likely to be higher than 10%.

Using this framework, Figure 4 shows measures with a cumulative abatement potential of almost 14 Gt (excluding purely behavioral measures) in 2020. This is beyond the 9.5 GT required to meet a 2 degree scenario. Individual measures range from having negative incremental costs to positive costs of over $100/ton. Investment opportunities for measures with negative costs total about $54 billion/year. For measures with positive costs, the potential annual investment opportunities are of the order of $600 billion for all identified measures.

Abatement measures along different ranges of the curve tend to be clustered by sector. Negative cost measures are primarily energy efficiency improvements in buildings, transport, and industry. Measures with positive costs less than $15/ton are mostly improvements in forestry and agriculture practices. Measures with costs greater than $15/ton include power and industry technologies such as renewable energy and CCS.

The three ranges along the curve can be generally associated with the different public sector interventions described earlier in this paper.

Negative cost measures

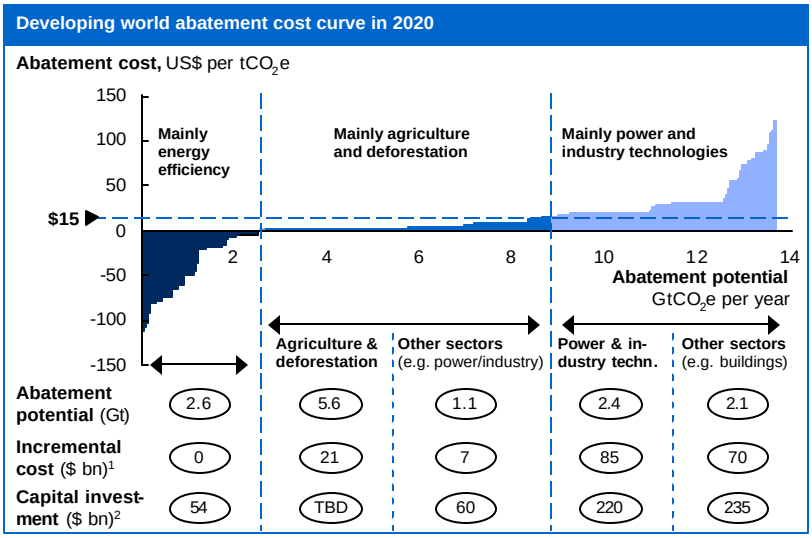
The estimated $54 billion in potential abatement opportunities with negative costs will not automatically be realized as they may still face high upfront capital and transaction costs, an adverse domestic investment environment, opportunity costs, and first mover risks. Moreover, energy subsidies and other domestic market or policy failures may distort these investment decisions.

International public interventions and financial instruments can overcome barriers to private investment in negative cost mitigation actions such as energy efficiency. Development policy loans and other instruments can reduce domestic policy and market barriers to private investment. Technical assistance can provide different types of support to project developers (e.g. renewable resource assessments) who

are otherwise unable to attract private finance for early stage pre-project development. Thus, negative cost measures are expected to require relatively modest amounts of concessional support and larger flows of scalable non-concessional support.

Figure 4

Measures with cost up to $15 per ton CO_2e have an abatement potential of 9.3 Gt and require $28bn incremental cost financing in 2020



1 Annual incremental cost between 2016 and 2020 excluding transaction cost
2 Annual total capital investment between 2016 and 2020

SOURCE: McKinsey Global Abatement Cost Curve v2.0, team analysis

4

Measure with positive costs between $0/ton and $15/ton

Those measures with positive incremental cost up to $15 per ton offer potential annual investment opportunities of almost $70 billion, with associated incremental costs of about $ 28 billion. Agriculture and forestry measures include the largest part of the abatement potential of those measures (about 5.6 Gt). On the other hand, agriculture and forestry measures typically exhibit rather low annual capital investment. These opportunities tend to be concentrated in SubSaharan Africa, the Amazon region, and East Asia outside of China.

The main goal of public instruments for forestry and agriculture measures is not to leverage investment capital, but rather to cause the annual stream of cash flows to exceed the opportunity costs of cutting down trees. Autonomous policy measures in developing countries, such as strict enforcement of existing forest sector laws and regulations, need to be linked with (and ideally precede) domestic incentives, carbon finance (REDD credits) or public instruments to finance incremental costs. MDB policy loans can assist developing countries in strengthening their capacity to manage forest resources in a sustainable manner. Private capital leverage factors are modest for agriculture and forestry measures as both require relatively low capital investment.

Measures with costs between $15/ton and $130/ton

Measures with large incremental cost (more than $15 per ton CO2e) offer potential investment opportunities of about $ 450 billion, though in practice this full potential is unlikely to be realized without significant carbon prices or equivalent policy measures. About half of the annual investment

opportunities are offered in power and industry sectors (about $220 billion). These opportunities tend to be concentrated in emerging economies such as China, India, South Africa, Brazil, and Mexico.

The instruments needed to mobilize private investment for these measures often include a combination of enhanced cash flows, risk mitigation, and direct financing. In order to attract private investment and eventually become economically competitive, some technologies need instruments that enhance cash flows to overcome the carbon externality, as well as measures to overcome the public goods associated with technology commercialization. This is the case for renewable energies as solar or industrial technologies like carbon capture and storage (CCS), while other renewable energies like hydro or even wind power are already close to being competitive. In addition to carbon finance, candidate instruments include investment grants that leverage domestic investment, and feed in tariffs, whose costs may be covered by domestic ratepayers or taxpayers, or with international support. Because of the additional risk associated with new technologies, loan guarantees may be used to mitigation project risks. MDB loans may also be used to lower risks to commercial lenders for projects involving large scale upfront capital investments.

Private investment mitigation actions can be facilitated by a range of public instruments. The amount of private sector investment leveraged by different financing instruments at the disposal of donors and IFIs varies considerably according to the barrier being addressed, the geographical location, the instrument used and project specific characteristics. The following experiences point to a wide range in leverage ratios:

- Non concessional debt: Past experience has shown that the leverage factor is typically in the 2-5x range for non- concessional or partly concessional debt, meaning that annual spending of $1 will generate private capital investment of $2-$5. Debt financing of projects with private sponsors by EBRD, under its Sustainable Energy Initiative results in a leverage of 1:1.8, ie €1.8 of additional private sector investment generated for every €1 of EBRD funds invested.

- Debt financed via grant (concessional) funds can leverage between 1: 8 and 1:10. Grant funds, if invested via MDBs to co-finance projects together with the private sector, can raise significant leverage because they can take a high risk without demanding the corresponding returns.

- Equity and guarantees financed via grants: According to data from IFC's Financial Mechanisms for Sustainability, equity and guarantees financed via grant funds can lead to a leverage of 1:20.

- Equity investments by MDBs in projects with private sponsors can leverage about 1:8 to 1:10 times debt and equity.

- Donor financed climate funds (part concessional): Experience of the multi- donor Climate Investment Funds shows that every dollar of spending results in around $3 of private sector investment for sovereign guaranteed projects and $8.5 of private sector investment for private sector sponsored projects.

- The carbon offset mechanism results in significant capital investment leverage. The World Bank Development Report 2009 estimates that "in addition each dollar of carbon revenue leverages on average $4.60 in investment and possibly up to $9.00 for some renewable energy projects. It is estimated that some $95 billion in clean energy investment benefited from the CDM over 2002–08."[1]

[1] World Bank – World Development Report 2010 – page 262

- Forestry: While there are a wide range of drivers of deforestation and thus different initiatives that fall within REDD+, the evidence base on REDD+ and private sector leverage is thin. The available evidence indicates a ball park leverage ratio of 1:5. IFC's investment in forestry has accelerated significantly in recent years with $1.2bn of direct investment over the past 4 years in projects with a total capital value of $6.3bn (1:5 leverage). This includes the support of financially sound businesses practicing sustainable forest management in tropical forests.

Thus, an "average" private finance leverage ratio in 2020 is likely to depend on the country, project, instrument and overall context. For simplicity purposes, we take 3x as a relatively conservative average of this leverage ratio range.

Recognizing that leveraged private investment is not an end in itself, but rather a means to achieving environmental objectives, it appears that a large share of the potential flows mentioned above could be mobilized through public interventions. Based on analyses in relevant public sector working papers being prepared in the context of the AGF, $35-60 billion could become available from multilateral development banks and/or public sources in 2020 for leveraging private investment. This would only be a portion of total multilateral development bank and public source finance, as some will be directed activities that do *not* leverage private finance. Based on Workstream 8, $30-$50 billion could become available in the form of carbon offset market flows (based on a mid-range Copenhagen Accord scenario). We assume these fully leverage private finance.

From the above, we can estimate the international private investment flows as follows: Based on the McKinsey MACC, there is $54 billion in negative cost mitigation measures that can be stimulated via largely scalable non-concessional public instruments. We assume a 3x leverage factor for positive cost mitigation measures that can be stimulated via multilateral development bank, public instruments, and carbon market flows. With this leverage factor, carbon market revenues of $30-$50 billion/year yield $90-$150 billion in private investment, and multilateral development bank and/or public flows of $35-60 billion/year yield $105-$180 billion in private investment. These generate a total (positive and negative cost measures) private investment flow of $249 billion ($50+ $90+$105) to $380 billion ($50 +$150+$180) per year. Assuming up to 50% of the above total comes from domestic developing country sources, flows from developed countries would be $124 billion to $190 billion per year. Recognizing the uncertainty surrounding the embedded assumptions, we round to $100-$200 billion per year in international private investment in mitigation. These flows represent net incoming investment in developing countries that would likely be otherwise directed to developed countries, which offer less risky environments, in the absence of international public support.

In addition to climate benefits, private investment in mitigation can result in other developing country benefits. Although estimating the value of these benefits is beyond the scope of this paper, it is worth recognizing that they are significant. First, increased investment in mitigation results in domestic capital being freed up due to energy cost savings, enhanced energy security and conserved foreign exchange due to reduced fuel imports, rural electrification, health benefits from reduced pollution, livelihood creation, and improved agricultural and forest productivity. For example, a recent study on the benefits of private investment, commissioned by DfID, shows that between 7 and 36 jobs are created per MW of new capacity in the manufacturing and installation of solar photovoltaic power plants and between 2.6 and 37.5 jobs are created per MW of new capacity in manufacturing and installation of wind power plants.

Second, international investment often contributes to increased domestic capacity for domestic innovation, technology markets, skills development, and consolidation of local financial and credit

markets and consequently enhanced international competitiveness. There is, however, no widely accepted method to estimate all of these diverse benefits.

b. Adaptation

Adaptation includes a more heterogeneous set of activities than mitigation, ranging from coastal protection, to changes in agricultural practices and technologies, to weather-proofing real-estate and infrastructure, to increase expenditures on human health. Private capital can play a significant role in each of these areas, though the type and source of capital will vary. Unlike mitigation investments, where the benefits are generally global public goods that do not accrue to the investor and require some public intervention to leverage private capital, adaptation investments can benefit the investor and attract private capital on their own.

Below, we provide an overview of a range of private capital sources and sectors relevant to adaptation. Given the wide variation in adaptation cost estimates, and the lack of analysis of potential public and private sector roles, we do not attempt to quantify potential private capital flows. Rather, we illustrate the current scale of flows, both globally and in Non-Annex I countries, along-side (where available) estimates of potential uses and needs.

Domestic Investment

Accounting for 30 percent of total global fixed asset investment, private capital from developing countries spent in developing countries totalled $4 trillion in 2008. This will likely be the most significant source of private capital for adaptation-related infrastructure, agriculture, water and coastal zone investments, but will need supporting domestic policy to be effectively mobilized.

Foreign Direct Investment

Globally, foreign direct investment (FDI), totalled $1.7 trillion in 2008, 29% of which flowed into non-Annex I countries. FDI will generally be attracted to similar activities as domestic investment and will respond similarly to adaptation policy. But additional policy tools are available to mobilize FDI, including country-risk insurance, foreign exchange products, loan guarantees and MDB anchor investments.

Insurance

Insurance products can play a unique and essential role in helping both individual investors address climate-risk and vulnerable countries hedge against some of the worst impacts of climate change. Currently, insurance market penetration in developing countries is limited, with non-Annex I countries accounting for only 15% of global premiums in 2008. Between 2000 and 2009, the global insurance industry paid out $37 billion per year on average for catastrophic events, of which 13% went to non-Annex I countries.

Private Sector R&D

Whether for developing drought and disease-resistant crops or new water management technologies, R&D will be critical in adapting to climate change. Of the $1,148 billion spent on research and development globally in 2008, only $339 billion is funded by governments. Policies tools such as Advanced Market Commitments applied to crops, for example, could attract private R&D dollars to adaptation-related projects.

Philanthropic Giving

Development assistance provided by individuals, NGOs and private foundations is growing in size relative to official development assistance and can play an important role in improving climate-resilience in non-Annex I countries. For example, philanthropic giving can compliment public investment in the agricultural and health sectors and in helping vulnerable countries anticipate and respond to extreme weather events.

Private Health Spending

Climate change will have a range of impacts on human health. At 2 degrees of warming, the World Bank estimates the cost of these impacts will range from $1.6 to $2 billion per year while the UNFCCC estimates costs of $5 billion per year. Private capital, which accounts for more than half of health care spending in non-Annex I countries, will play an important role in addressing these costs.

The above sector-specific estimates are clearly not additive, but are intended as a qualitative indication of the magnitude of potential private investment.

VI. Conclusions

Summarizing the analysis in preceding sections of this paper, we find that:

1. Potential private investment in 2020 is substantial.

2. For this level of private investment to be realized, a range of existing country and project specific barriers will need to be overcome by domestic and international public interventions.

3. The existing menu of interventions is largely sufficient, but needs better packaging, strategic focus, and greater scale.

4. The large potential for private investment to achieve environmental objectives justifies using a substantial share of the public funding available in and before 2020 to stimulate this investment.

a. Potential private investment in 2020 is substantial.

Potential private investment opportunities in developing countries are on the order of hundreds of billions per year. Relative to a baseline business-as-usual scenario, investment in mitigation is on the order of $50 billion/year for negative cost measures, which need largely non-concessional support to stimulate such investments. Under reasonable assumptions about public and carbon market funding, leverage ratios, and the share of the total private investment from domestic sources, we estimate about $100-$200 billion/year in international private investment in mitigation.

To the extent carbon markets come in to stimulate mitigation, much of the public funding raised through various sources could be directed to stimulating adaptation investments. While more difficult to quantify, private investment can play an important role in climate-proofing developing country infrastructure and will play an essential role in developing climate-resilient products and methods of production.

b. For this level of private investment to be realized, a range of existing country and project specific barriers will need to be overcome by domestic and international public interventions.

Identifying the intersection of interests among potential investors, international providers of public sector interventions, and host country policy makers is key to unlocking large private investment flows for mitigation and adaptation. To over-simplify, investors seek to maximize risk-adjusted returns; public providers of climate finance seek to maximize environmental outcomes with their funding (at least for mitigation), and host country policy makers seek to maximize development benefits.

Each of these actors has critical roles to play:

- In order for investors to become interested in a mitigation or adaptation activity, host country policy makers may need to strengthen domestic capital markets, address sector-specific policy or market barriers that both inhibit private investment and that reduce the effectiveness of international support for investment. Some domestic policy reforms are broadly necessary to attract any private investment in climate-relevant sectors, regardless of whether the investment is for mitigation, adaptation or REDD+ or simply “business as usual”.

- Developed countries need to support the above host country reforms, enact their own domestic carbon caps that allow for international offsets, and provide public finance in a manner that cost effectively stimulates investment. For their part, the bilateral or multilateral agencies providing

public finance need to customize their own mix of instruments provided in order to provide needed technical assistance, meet financing needs of specific projects, and organize co-finance with other institutions that offer complementary instruments.

- Domestic and international investors must be open to mitigation and adaptation related opportunities that meet their respective investment criteria and are consistent with host countries' low carbon and climate resilient plans.

c. The existing menu of interventions is largely sufficient, but needs better packaging, strategic focus, and greater scale.

The existing menu includes domestic policies and programs, risk mitigation instruments, carbon markets, and international finance both concessional and non-concessional, including technical assistance. In order to stimulate private investment in the direction and at the scale needed to address the climate challenge, new approaches may be needed for deploying them. Greater attention to strategic focus means exploiting country and sector-specific carbon "wedges", and providing stronger guidance to multilateral agencies by their respective boards. Better packaging might mean new forms of partnerships among domestic policy-makers, institutional channels for international finance, and the private sector, while minimizing complexity and transaction costs associated with public-private-partnerships. Scaling up might mean engaging those investor classes that control large capital flows, but are not currently directed to climate activities. It might also mean shifting from retail to wholesale approaches in delivering finance such as by engaging host country financial intermediaries, bundling individually small projects for financing, or sector-wide strategies.

That said, there is no single public sector financing instrument that will serve as a "silver bullet" in stimulating private investment because:

- Countries are heterogeneous with respect to the status of the conditions for private investment.

- Mitigation, REDD, and adaptation actions are heterogeneous with respect to the barriers that investors face.

- Different categories of investors are heterogeneous with respect to their investment objectives.

d. The large potential for private investment to achieve environmental objectives justifies using a substantial share of the public funding available in and before 2020 to stimulate this investment.

The environmental benefits as well as other domestic co-benefits from channeling public funding through instruments that catalyze greater flows of private investment are likely to be greater than if the same level of funding was channeled directly to developing countries without such leveraging. The climate policy world's focus on incremental costs and who should pay them is unlikely to be as effective in meeting the environmental challenge as a focus on how to best stimulate the most environmental benefits through private investment.

Over the period between now and 2020, the selection and design of public instruments to leverage private finance will need to have the flexibility to complement emerging domestic climate policies in developing countries, the expected scaling up of carbon markets, the cost trajectories of different climate technologies, evolving projections of climate impacts, and other dynamic factors. For example, the

growth of carbon markets should moderate the need for concessional public sector instruments to address the public goods value of mitigation.