Mobilizing Climate Finance

A Paper prepared at the request of G20 Finance Ministers

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Work on this paper was coordinated by the World Bank Group, in close partnership with the IMF, the OECD and the Regional Development Banks (RDBs, which include the African Development Bank, the Asian Development Bank, the European Bank for Reconstruction and Development, the European Investment Bank and the Inter-American Development Bank). The IMF led the work stream on sources of public finance. The OECD contributed the analysis of fossil fuel support, monitoring and tracking of climate finance and other inputs. The IFC and EBRD led the work stream on private leverage, and the World Bank those on leveraging multilateral flows and carbon offset markets, with inputs from other RDBs. Comments and information were kindly supplied by the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO).

Detailed contributions and background papers are listed in Appendix I.

The findings and opinions expressed herein do not necessarily reflect the views of the partnering organizations and of their member countries.

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Executive Summary

1. **This paper responds to the request of G20 Finance Ministers in exploring scaled up finance for climate change adaptation and mitigation in developing countries.** In so doing it builds upon and extends the work of last year's U.N. Secretary-General's High Level Advisory Group on Climate Change Financing (AGF). Its starting point is the commitment made in the Copenhagen Accord and Cancun Agreements on the part of developed countries to provide new and additional resources for climate change activities in developing countries. This commitment approaches $30 billion for the period 2010-12 and $100 billion per year by 2020, drawing on a wide range of resources, public and private, bilateral and multilateral, including innovative sources.

2. **While there is no precise internationally agreed definition of climate finance at present, the term broadly refers to resources that catalyze low-carbon and climate-resilient development**. It covers the costs and risks of climate action, supports an enabling environment and capacity for adaptation and mitigation, and encourages R&D and deployment of new technologies. Climate finance can be mobilized through a range of instruments from a variety of sources, international and domestic, public and private. Consistent with the focus of the Copenhagen and Cancun understandings, this paper concentrates on climate finance flows from developed to developing countries.[1]

3. **Both public and private flows are indispensable elements of climate finance**. Competitive, profit-oriented private initiatives are essential in seeking out and implementing least cost options for climate mitigation and adaptation. The dominant scale of global private capital markets and growing fiscal challenges in many developed economies also suggest that the large financial flows required for climate stabilization and adaptation will, in the long run, be mainly private in composition. Public policy and finance nonetheless play a crucial dual role: first, by establishing the incentive frameworks needed to catalyze high levels of private investment in mitigation and adaptation activities, and second, by generating public resources for needs which private flows may address only imperfectly.

4. **A starting point could be the removal of wasteful subsidies on fossil fuel use**. New OECD estimates indicate that reported fossil fuel production and consumption supports in Annex II countries amounted to about $40-60 billion per year in 2005-2010.[2] Over 250 individual producer or consumer support mechanisms for fossil fuels are identified in the inventory. Not all these mechanisms are inefficient or lead to wasteful consumption and, as such, governments may wish to retain some. Nevertheless, if reforms resulted in 20 percent of the current level of support being redirected to public climate finance, this could yield on the order of $10 billion per year. As noted in a separate G20 paper,

[1] In this paper developed countries are understood as Annex II countries, those which have pledged to provide Fast Start Finance for adaptation and mitigation activities in developing countries. They comprise the 27 EU member states, Australia, Canada, Iceland, Japan, New Zealand, Norway, Switzerland and the United States. Though it has pledged to provide Fast-Start Finance, Liechtenstein is not listed under Annex II.

[2] Note that G20 Leaders agreed in 2009 to "rationalize and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption". The OECD inventory takes stock of a very broad range of mechanisms that may effectively support fossil fuel production or use; further analysis of the impacts of the different mechanisms would be needed to determine which may be inefficient and encourage wasteful consumption.

there is also considerable scope for reforms of fossil fuel subsidies in developing and emerging economies. While such reforms are often politically not easy to implement, experience shows that well targeted safety net programs can help address distributional concerns.

5. **Comprehensive carbon pricing policies such as a carbon charge or emission trading with full auctioning of allowances are widely viewed as a promising option.** A carbon price of $25 per ton of carbon dioxide (CO_2) in Annex II economies – corresponding to the medium damage scenario in the AGF – could raise around $250 billion in 2020 while reducing their 2020 CO_2 emissions by about 10 percent compared to baseline emissions in that year. Allocating 10 percent for climate finance would meet a quarter of the $100 billion funding committed for climate change in 2020. The economic costs of a $25 price are expected to be modest – less than 0.1 percent of GDP on average – if domestically retained revenues are applied productively, for example to cut taxes that distort incentives for work or capital accumulation, or for fiscal consolidation, a major concern in many advanced economies. Comprehensive carbon pricing policies are more efficient at raising revenue than broader fiscal instruments when environmental benefits are accounted for. They are also more effective at reducing emissions, providing incentives for clean technology development and promoting international carbon markets than other mitigation instruments. A variety of options are available to address concerns about the impact on low-income families and competitiveness (e.g. adjustments to the broader tax and benefit system and reductions in other less environmentally effective taxes).

6. **Market-based instruments (MBIs) for international aviation and maritime bunker fuels have been proposed as an innovative source of climate finance.** A globally coordinated carbon charge of $25 per ton of CO_2 on these fuels could raise approaching $40 billion per year by 2020, and would reduce CO_2 emissions from each sector by perhaps 5 percent, mainly by reducing fuel demand. Charges on fuel used in international aviation and maritime transport would need to be carefully coordinated and legal obstacles, in particular those related to levying a charge on aviation fuel, would need to be resolved. The flexibility operators have in the location where they take up fuel can undermine the application of fuel charges. Treaty obligations and bilateral air service agreements could impede applying fuel charges in international aviation. New governance frameworks would be needed to determine how charges (or emission levels) are set, control use of revenues and monitor and implement compensation arrangements. The impact on developing countries of such charges would likely be modest and could be largely offset by explicit compensation schemes. Closer analysis of impacts is needed in order to design practicable compensation schemes but enough has already been done to provide confidence that solutions can be found. Compensation for developing countries is unlikely to represent more than about 40 percent of estimated global revenues, leaving $22 billion or more for climate finance and other purposes.

7. **Policy reforms, institutional development and public outlays can leverage much larger flows of private or multilateral climate finance.** These include options for buttressing carbon offset markets, other options to leverage private finance and expanded flows of climate finance from multilateral development banks (MDBs) in particular through promising new pooled financing arrangements.

8. **Carbon offset markets can play an important role in catalyzing low-carbon investment in developing countries but now face major challenges.** Offset markets through the Clean Development Mechanism have resulted in $27 billion in flows to developing countries in the past 9 years, catalyzing low carbon investments of over $100 billion. However, transaction value in the primary offset market fell sharply in 2009 and 2010, amid uncertainties about future mitigation targets and market mechanisms after

2012. Depending on the level of ambition with which countries implement national mitigation targets under the Copenhagen Accord and Cancun Agreements, offset market flows could range from $5 - 40 billion per year in 2020. A scenario targeting a two degree pathway, which would require a much higher level of ambition, could stimulate offset flows in excess of $100 billion. Other steps to strengthen offset markets include institutional reforms to increase the scope and efficiency of the market, innovative financial instruments to leverage future offset flows into upfront project financing, and steps to strengthen capacity to design eligible projects and programs in developing countries. Given that offset flows so far have largely gone to a relatively small set of middle income countries, broadening access among developing countries is an important priority.

9. **Private flows for climate mitigation related investment in developing countries have grown rapidly but remain hampered by market failures and other barriers.** Investments in clean energy (including renewable energy, energy efficiency, and energy-motivated transport investments exceeded half a trillion dollars in 2010, with over $200 billion in developing countries. This consisted of combination of public and private, domestic and foreign investment. Only a small part of this was financed by subsidized climate funds, although the modest amount of concessional funding that is currently available is demonstrating strong leverage if financial packages are carefully designed. Experience from the portfolios of MDBs, official donors and U.N. agencies suggests that private leverage factors can vary considerably according to the type of public financing that is deployed, the sector, the novelty of the technology and the level of informational and other barriers to investment. Broadly speaking, the experience of the MDBs suggests that leverage factors in the range of 3 to 6 for non-concessional lending. Leverage ratios can be significantly higher where the public finance component is the form of concessional lending, grants or equity, running at 8 to 10 or even higher. It is important that concessional resource be used with clear understanding of the extent to which they are addressing climate externalities, reducing investment risk, or addressing informational or other externalities. However, the extent to which subsidized funds can be used to leverage other flows is likely to depend as much or more on the domestic policy environment as on the financial engineering of the deal. Consistent with scenarios developed by the AGF, this report confirms that a package of public sources, MDB flows and carbon offset flows could leverage around $100-200 billion in 2020 in additional gross international climate-related private flows and an equivalent amount of domestic private resources.

10. **Although there is limited current headroom for MDBs to greatly expand climate financing on their own balance sheets, there are significant opportunities for them to mobilize resources through new pooled financing arrangements.** The Climate Investment Funds (CIFs) and Global Environment Fund (GEF) are examples of such instruments. Such instruments could provide growing opportunities for MDBs to mobilize off-balance sheet resources from multiple sources, including bilateral contributions and from non-traditional sources like private foundations and emerging sovereigns. In the longer term, MDB capital increases aimed at expanded climate finance could also be considered, potentially leveraging increased MDB climate lending by a factor of 3 to 4.

11. It is important to determine which options for increased climate financing are most promising for prioritization in the near term and which for development over the medium term. This report provides a technical analysis of the range of options available to countries, the selection and combination of which they will need to consider in the light of their national circumstances. The task is made more challenging by the present difficult economic conditions in the developed world – the most

severe in over seventy years – and by growing fiscal pressures in many developed countries. In this environment, reform of fossil fuel subsidies in developed countries is an important near-term option because of its potential to improve economic efficiency and raise revenue in addition to environmental benefits. Carbon pricing shares these advantages, by placing a price on a negative externality and improving efficiency, while also generating substantial domestic revenues for fiscal consolidation, reduction in less efficient taxes and other desirable policy objectives. Simultaneous efforts could be continued to lay the technical foundation for implementation of market based instruments for fuels used in international aviation and shipping. Progress by countries on their national targets under the Copenhagen Accord and Cancun Agreements would also be helpful to underpin a recovery in carbon offset flows, especially if combined with reforms to expand the scope and increase the efficiency of these markets. Efforts to expand pooled financing arrangements can yield substantial results in the near term when harnessed with efforts to engage with and leverage private investment. All these initiatives will benefit from improved monitoring and tracking of flows, given the relatively limited currently available data on adaptation and on private flows. Building the political consensus for implementation of these and other major policy options discussed in the report will be critical.

12. Table 1 below provides some purely illustrative scenarios for elements of international climate finance flows in 2020**.** The public sources listed here illustrate potential revenues from three carbon linked sources reviewed in more detail in Section 2.1 of this report. These can, of course, be supplemented by allocations from non-carbon linked public sources and from general budget revenues, as discussed in Section 2.2 of the report. (The coverage of public finance instruments in the report is consistent with and in some respects broader than that in the AGF report, while following a somewhat different presentation.) The potential revenues in the Table reflect various assumptions that are spelled out in the report and would vary widely according to the scenarios adopted by policy makers, including assumptions about the share allocated for climate finance flows to developing countries. The individual climate finance potentials shown here should not be added together because of possible interactions and trade-offs across sources. The breakdown between and within public and private sources will be the result of the political process.

Table 1: Illustrative Scenarios for Potential Elements of International Climate Finance Flows in 2020 *

	Revenue base ($ Bn.)	Illustrative climate finance allocations (%)	Climate finance flow ($ Bn.)
Sources of Public Finance			
Carbon Pricing ($25 per ton CO_2) in Annex II countries	250	10[(a)] --20	25--50
MBIs for int'l aviation/maritime fuels ($25 per ton CO_2)	22 [(b)]	33[(a)]--50	7--11
Fossil Fuel Subsidy Reform [(c)]	40--60	10--20	4--12
Instruments to Leverage Private and Multilateral Flows			
Carbon Offset Market Flows (various scenarios) [(d)]			20--100
Private flows leveraged by public policies and instruments [(e)]			100--200
MDB finance – pooled arrangements and/or capital[(f)]			30--40

(a) Consistent with AGF assumptions of 10 percent allocation for carbon pricing and 25-50 percent for MBIs. (b) Revenues accruing to developed countries only. (c) As discussed in Section 2.1.3, not all support mechanisms are necessarily inefficient and in need of reform. Precise revenue potential will depend on demand effects of reforms and interaction among tax expenditures, among other factors. (d) $20 billion consistent with $20-25 per ton CO_2 scenario; $100 billion with 2 degree pathway scenario, as per Section 3.1 in main text. (e) Gross foreign private flows to developing countries as per scenario in Table 3 and Section 3.2 in the main text. (f) Reflects assumption discussed in Section 3.3 in the main text that every $10 billion in additional resources could be leveraged 3-4 times in additional MDB climate flows.

*** Notes**

Table 1 outlines some purely illustrative scenarios for mobilizing international public and private climate finance flows to developing countries. The Table includes three carbon-linked public sources reviewed in more detail in Section 2.1 of the report, while Section 2.2 discusses non-carbon linked sources and general public revenues. The results reflect various assumptions that are spelled out in the report and would vary widely according to the scenarios adopted by policy makers. For simplicity the potential revenue numbers are shown as point estimates but reflect broad ranges spelled out in the text. The individual climate finance potentials shown here should not be added together because of possible interactions and trade-offs across sources. The estimate for private flows, for example, depends on specific assumptions (spelled out in the main text) about how public sources are used to leverage private flows.

Mobilizing Sources of Climate Finance[3]

1 Introduction

1. The communiqué of the meeting of G-20 Finance Ministers and Central Bank Governors in Washington DC on 14-15 April 2011 states that:

"We tasked the World Bank, working with Regional Development Banks, and the IMF, in coordination with other relevant organizations, to conduct the analysis on mobilizing sources of climate change financing, including public and private bilateral and multilateral as well as innovative sources, drawing inter alia on the AGF report consistent with the objective, provisions and principles of the UN Framework Convention on Climate Change."

2. The context for the G-20 request includes the Copenhagen Accord and Cancun Agreements reached by the Conference of the Parties to the UNFCCC.[4] These agreements established and confirmed a collective commitment by developed countries to provide new and additional resources for adaptation and mitigation activities in developing countries approaching $30 billion for the period 2010-12 (so-called Fast Start Finance) and to mobilize $100 billion per year by 2020 (from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources).[5] In Cancun governments also decided to establish the Green Climate Fund (GCF) to support climate activities in developing countries using thematic funding windows. Recommendations for the design of the GCF will be submitted to the Durban Conference of the Parties in December 2011.

3. In November 2010 the U.N. Secretary General's High Level Advisory Group on Climate Change Financing (AGF) published a report on potential sources of revenue for climate financing in conformity with the $100 billion goal (AGF, 2010). This paper and the background material underlying it draw on and aim to update and extend the work carried out by the AGF in several directions, in conformity with the mandate received: [6]

[3] Work on this paper was coordinated by the World Bank Group, in close partnership with the IMF, the OECD and the Regional Development Banks (RDBs, which include the African Development Bank, the Asian Development Bank, the European Bank for Reconstruction and Development, the European Investment Bank and the Inter-American Development Bank). The IMF led the work stream on sources of public finance. The OECD contributed the analysis of fossil fuel support, monitoring and tracking of climate finance and other inputs. The IFC and EBRD led the work stream on private leverage, and the World Bank those on leveraging multilateral flows and carbon offset markets, with inputs from other RDBs. Comments and information were kindly supplied by the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO).

[4] Reflecting the long-standing principles of non-discrimination in the governance of international aviation and maritime transport, there is no differentiation between developed and developing countries in the work undertaken by the ICAO and IMO.

[5] The Cancun Agreements recognize "that developed country Parties commit, in the context of meaningful mitigation actions and transparency on implementation, to a goal of mobilizing jointly USD 100 billion per year by 2020 to address the needs of developing countries." (Decision 1, CP16, para.98).

[6] The coverage of sources of finance in the report is consistent with and in some respects broader than that in the AGF report, while following a somewhat different presentation. Appendix 1 lists contributions and background working papers that provide more analytical and empirical detail upon which this report draws.

- More detailed analysis of the costs, incidence and impact on CO_2 emissions of various carbon pricing schemes, together with ways to improve their political feasibility, for example by scaling back other taxes (e.g. on electricity) or adjustments to the tax-benefits system;
- Further evaluation of the potential for charges on international maritime and aviation fuel use, including impact on CO_2 emissions, implications for revenues and climate finance, incidence, ways to protect developing countries from adverse effects and issues in implementation;
- Updated estimates of fossil fuel subsidies and other support in developed countries and evaluation of the revenue and other implications of their reform;
- A review of options for strengthening the effectiveness of carbon offset markets, and broadening their scope, reach and scale, including through innovative financing, together with updated scenarios of market flows to developing countries;
- Updated estimates of the scope for leveraging private climate finance using public investment and policy initiatives, drawing on the latest lessons on public policies and instruments to foster private engagement in climate-friendly investment;
- Innovative avenues to make the most of the leveraging capabilities of multilateral development banks (MDBs) to multiply climate financing in developing countries.

Definition of Climate Finance

4. At present there is no precise internationally agreed definition of climate finance. However, broadly speaking, the term refers to resources that catalyze low-carbon and climate-resilient development by covering the costs and risks of climate action, supporting an enabling environment and capacity for adaptation and mitigation, and encouraging research, development, and deployment of new technologies.[7] Climate finance can be mobilized through a range of instruments from a variety of sources, international and domestic, public and private. Consistent with the focus of the Copenhagen and Cancun understandings, this paper concentrates on climate finance flows from developed to developing countries.[8]

Rationale for Climate Finance Flows from Developed to Developing Countries

5. It is important to reiterate that the rationale for climate finance flows from developed to developing countries is both economic and ethical, as reflected in the principle of *common but differentiated responsibilities and respective capabilities* of Parties to the UNFCCC.

6. From a global efficiency perspective, climate stabilization requires mitigation to occur in both developed and developing countries. The World Bank's *World Development Report 2010: Development*

[7] A more extended discussion on the definition and measurement of climate finance is provided in Buchner, Brown and Corfee-Morlot (2011).

[8] In this paper developed countries are understood as Annex II countries, those which have pledged to provide Fast Start Finance for adaptation and mitigation activities in developing countries. They comprise the 27 EU member states, Australia, Canada, Iceland, Japan, New Zealand, Norway, Switzerland and the United States. Though it has pledged to provide Fast-Start Finance, Liechtenstein is not listed under Annex II.

and Climate Change estimates that the global least-cost mitigation pathway would require about 65 percent of efforts to occur in developing countries by 2030 (compared to a 'Business As Usual' baseline). The bulk of future emissions growth is expected to occur in developing countries, where many low cost mitigation options also arise. The bulk of climate damage and adaptation needs are also expected to occur in these countries. Developing countries are concerned that shouldering the cost of mitigation and adaptation will hinder rapid and sustained economic growth, particularly when they have historically contributed little to the current stock of greenhouse gas emissions. By separating who finances climate action from where it occurs, flows of climate finance from developed to developing countries are a key way to reconcile economic efficiency with equity in dealing with the challenge of climate change.

Public and Private Elements of Climate Finance

7. Both public and private flows are indispensable elements of climate finance. The dominant scale and scope of global private capital markets and the growing fiscal challenges in many developed economies suggest that the large financial flows required for a successful climate stabilization effort must, in the long run, be largely private in composition. With properly structured incentives, competitive and profit-oriented private initiatives will play an essential role in seeking out and implementing the least cost options for climate mitigation and adaptation.

8. Public policy and public finance nonetheless have a crucial dual role to play: first, by establishing the incentive frameworks (price signals) needed to catalyze high levels of private investment in mitigation and adaptation activities, and second, by generating public resources for specific needs that private flows may address only imperfectly.

9. As regards the incentive framework, the public sector needs to play a key role by creating an appropriate price for carbon, using fiscal instruments such as carbon taxes or tradable emission permits, which ensures that emitters' decisions properly reflect the externality associated with greenhouse gas (GHG) emissions and which guides private consumption and investment decisions towards low emission, climate-resilient options.

10. While "getting the (carbon) prices right" is a crucial policy from the perspective of reducing emissions, promoting carbon markets, and stimulating clean technology development, there is also a critical broader role for public policy and public finance because of other difficulties that aggravate the problem of the GHG externality. These include market failures affecting innovation and dissemination of new technologies (creating a role for public incentives for climate related R&D and technology deployment for mitigation and adaptation), network externalities that lead to private underinvestment in some kinds of infrastructure (e.g. pipe infrastructure to transport captured CO_2 to underground storage sites), and various informational and other problems affecting private financial markets that create an economic rationale for multilateral development banks (MDBs) and for other types of public financial flows. Grant-based financing for adaptation in low income countries is a characteristic example.[9]

[9] For a more extensive discussion of the fundamental economic rationales for the public sector role in climate finance, see Bowen (2011).

Overview of the Structure of the Paper

11. This paper discusses mobilizing additional sources of climate finance under two broad headings.

12. Section 2 - sources of public finance - considers options to help underpin a growing public-private partnership on climate finance. The section gives most attention to carbon linked fiscal instruments, especially carbon taxes and cap-and-trade systems with allowance auctions. These sources are distinctive in that they serve the double purpose noted above: they create incentives for reducing emissions, promote clean technology development and stimulate flows of climate finance through carbon markets, and they also generate potential funds for climate finance. The discussion looks at some possibilities for alleviating political concerns about carbon pricing, for example by reducing other taxes or through "feebate" variants of carbon pricing.

13. This section then looks at options for the introduction of charges (taxes or emission trading systems) for international maritime and aviation fuel use or activity [10] and for reform of fossil fuel subsidies in developed countries. The rationale for these broader pricing reforms is that they scale back current tax and subsidy provisions that undermine other emissions mitigation efforts. It should be stressed that the potentially significant revenues raised through such carbon-linked fiscal instruments can be allocated not only for climate action but also for other socially valuable public expenditures or for fiscal adjustment.

14. Finally, recognizing that climate finance need not come only from instruments related to carbon–pricing this section briefly discusses options for other sources of public financing.

15. Section 3 - instruments that leverage private and multilateral flows - considers cases where innovative and carefully designed and selected policy reforms and public outlays can potentially leverage much larger flows of private or multilateral climate finance. This includes options for buttressing the role of carbon offset markets, an important vehicle for private cross-border climate finance flows to developing countries. The section then considers options for developing other innovative instruments for leveraging private finance. It concludes by considering options for expanding flows of climate finance from multilateral development banks, using the wide range of leverage, risk mitigation and other tools available to these institutions.

16. A number of criteria are used to evaluate the various instruments that are discussed in Sections 2 and 3, including revenue potential, impact on GHG emissions, cost-effectiveness, incidence ("who really pays") and practical feasibility of implementation.

17. Section 4 concludes by discussing suggestions for strengthening systems for monitoring and tracking climate finance flows, to build trust and accountability with regard to climate finance commitments and monitor trends and progress in climate-friendly investment.

[10] International maritime transport and aviation are generally exempted from taxes routinely paid in other sectors. They are subject to charges for airport and port services and the like, which are, however, payments for services provided rather than taxes.

2 Sources of Public Finance

2.1 Carbon-linked Fiscal Instruments

2.1.1 *Carbon pricing policies*[11]

18. As noted in the AGF report, climate financing does not necessarily require new financing instruments—it could rely on mobilizing traditional revenue sources, such as taxes on income and consumption. Some new sources of public revenue merit serious attention however, most importantly carbon or energy related taxes. These are generally designed to correct for market failures by putting a price on emissions, so discouraging socially undesirable behavior and reducing social costs. Such taxes or other economic instruments should also raise public revenues, although the revenue aspect is distinct from the corrective role of such charges. Revenue could flow into national budgets while burden sharing for climate financing could be based on factors other than the base for these new financing sources. Indeed public finance economists do not generally recommend earmarking the proceeds of particular taxes for particular uses because of the risk of creating inflexible and inappropriate spending patterns. Nonetheless, allocating some of the revenue from carbon pricing as a new public source for climate finance is an option with apparent political salience and appeal.

19. Comprehensive pricing policies applied to the carbon content of fossil fuels are widely viewed as a highly promising option. They are more efficient at raising revenue than broader fiscal instruments because they correct for a huge and largely unaddressed market failure—excessive global emissions of greenhouse gases. As the carbon price is reflected in higher prices for fuels, electricity, and so on, economic agents have an incentive to exploit all possibilities for reducing energy-related CO_2 emissions across the economy. These opportunities include reducing electricity demand, promoting a shift to cleaner fuels for power generations, reducing the demand for transportation fuels, and reducing direct use of fuels by households and industry. Regulatory measures (e.g. energy efficiency standards or minimum generation shares for renewable fuels) on their own are much less effective at exploiting all emission reduction opportunities: they are a more costly way to achieve any given emissions reduction, because they do not automatically equate the incremental cost of emissions reductions across different sources.

20. Carbon pricing policies are also more environmentally effective than other domestic, climate-related, fiscal instruments. Pure taxes on electricity, for example, exploit only one way of reducing emissions, by cutting electricity demand. Within the transportation sector, vehicle ownership taxes do not encourage people to drive less and may, depending on their design, do little to increase vehicle fuel economy. A petroleum duty is more environmentally effective than vehicle ownership taxes, but in itself misses the bulk of low-cost options for cutting CO_2, for example by shifting from coal to low and zero carbon fuels.

21. Comprehensive carbon pricing also provides incentives across all sectors for the development of clean technologies—ultimately needed for global climate stabilization—by rewarding any new,

[11] This section draws on the background paper "Promising Domestic Fiscal Instruments for Climate Finance". While the section focuses mainly on carbon pricing as the most promising option, the background paper considers a wide range of other domestic carbon-related instruments in more detail.

emissions-saving technology. And, not least, by promoting international carbon markets, carbon pricing with appropriate crediting provisions can potentially leverage large private sources of climate finance for developing countries, as discussed in Section 3 below. This could be as true for carbon taxes with appropriate provisions for domestic firms to claim tax credits for financing emission reduction projects in other countries as for cap-and-trade systems with similar crediting provisions.

22. The choice between carbon taxes or cap-and-trade systems is less vital than getting right the design features of whichever instrument is chosen, and using the revenues generated productively. Important design features include achieving comprehensive coverage of fossil fuel emissions rather than pricing just one fuel, and, in the case of cap-and-trade, auctioning allowances to raise revenues and including provisions like allowance banking and borrowing to limit allowance price volatility. Productive uses of revenue include climate finance, cutting broader taxes that distort incentives for work effort or capital accumulation, or – an urgent concern in many advanced economies – for fiscal consolidation. Failing to raise revenues by giving away emissions allowances for free or by providing excessive tax exemptions, or failing to use revenues productively, substantially raises the overall cost of carbon pricing policies.

23. Roughly speaking, given the difficulties of making such long range projections, a carbon price of $25 per ton - corresponding to the medium damage scenario studied in the AGF - if applied to all CO_2 emissions in developed economies might reduce their 2020 emissions on the order of 10 percent compared to baseline emissions in that year.[12] If implemented for OECD Annex II countries through carbon taxes or a cap-and-trade system with allowance auctions, the revenue raised at this price would be around $250 billion in 2020. "Low" and "High" case scenarios with carbon prices of $15 and $50 per ton are estimated to raise revenues of around $155 billion and $450 billion respectively.[13]

24. Most of this revenue would presumably be retained for domestic purposes, for example to support fiscal consolidation or reduce other taxes. Nonetheless, allocating 10 percent of $250 billion for climate finance would meet a quarter of the funding target of $100 billion (from public and private sources combined) for 2020 established by the Copenhagen Accords. This revenue would be raised with no direct burden on developing countries, while within the developed economies the tax burden (and revenues) would be lower for greener economies (i.e., those with lower emissions intensity).

25. The overall economic costs of a $25 per ton carbon pricing policy in developed economies (such as the costs of switching to cleaner but more expensive fuels) are likely to be modest: around 0.03 percent of GDP for the average developed economy. [14] Higher energy prices caused by the pass through of carbon pricing can nonetheless have social and competitiveness effects - though they are not unusually large when set against normal volatility in energy prices. Lower income households in developed economies

[12] This price level is about a third higher than prices currently prevailing in the EU Emissions Trading Scheme (ETS). Carbon pricing is assumed to apply to the approximately 15 percent of CO_2 emissions already in the EU Emissions Trading Scheme (implicitly though allowance auctions).

[13] OECD analysis shows that if the Cancun Agreements/Copenhagen Accord pledges and actions for Annex I countries were to be implemented as a carbon tax or a cap-and-trade with fully auctioned permits, the fiscal revenues would amount to 0.6 percent of their GDP in 2020, i.e. more than US $250 billion (OECD, 2012).

[14] This assumes productive use of domestically retained revenues. If revenues are not used to improve economic efficiency (e.g., by alleviating other tax distortions) costs could easily be two or three times higher.

tend to have relatively high budget shares for electricity and fuels, and are therefore more vulnerable to higher energy prices. Energy-intensive firms competing in global markets (e.g., steel, aluminum) would suffer somewhat relative to similar activities in developing economies, exacerbating the risk of emissions 'leakage'.[15]

26. There are, however, many options for mitigating these effects, some more promising than others. Distributional concerns about the impact on low-income families can be addressed through broader fiscal adjustments, for example using some domestically retained revenues to expand earned income tax credit schemes, raising personal income tax thresholds (as proposed in Australia's carbon pricing scheme) or adjusting social contributions. For vulnerable industries, returning some revenues to these industries to help them adjust to the change in relative prices, or some free allowance of allocations, might be initially provided. But there is a risk that such compensation schemes will become permanent and come at a high economic cost, by diverting revenue from more socially productive purposes like cutting distorting taxes. Another option is to mitigate competitiveness effects through border tax adjustments applied to the embodied carbon content of imports, though carbon content (especially for final products) can be difficult to measure and border adjustments may run afoul of international trade obligations. In addition, border tax adjustments can be costly to the country implementing them and yet may have only limited benefits for the competitiveness of energy-intensive industries.

27. A more promising option for dealing with concerns about equity and competitiveness is to offset burdens from carbon pricing by scaling back pre-existing energy taxes that raise prices to consumers but have little effect on emissions. In many developed countries much of the burden of higher electricity prices on households and industry could be neutralized by reducing excise taxes on electricity.[16] Similarly, burdens on motorists from higher fuel prices can often be offset by reducing taxes on vehicle ownership. While such offsetting tax reductions dampen net revenue gains, they may enhance the likelihood of carbon pricing being adopted, while also shifting the tax structure to one that more precisely targets emissions and provides environmental benefits in a cost-effective way.

28. If broad carbon pricing is infeasible, so-called "feebates" are another possibility. Feebates impose taxes (fees) on relatively emission-intensive firms or on products with low energy efficiency, while providing subsidies (rebates) for firms with relatively low emissions intensity or for products with relatively high energy efficiency. For example, new vehicles with emissions per mile above some "pivot point" would be charged a fee in proportion to excess emissions, while vehicles with emission rates below the pivot point would receive a corresponding subsidy. Similarly, power generators would pay taxes, or receive subsidies, according to whether their average CO_2 emissions per kilo-watt hour are above or below a specified rate.[17]

[15] Leakage also results from increased use of fuels in developing countries as reduced demand from developed countries lowers world fuel prices.

[16] VAT or other taxes on general consumption are often also applied to residential electricity use, but these are appropriate to avoid distorting households' spending between electricity-using and other consumption goods.

[17] Feebates miss out on some opportunities for emissions reduction, such as encouraging people to use vehicles or air conditioners less. Nonetheless, for the economy as a whole, the majority of emissions reduction opportunities typically reflect potential improvements in energy efficiency or reductions in the emissions intensity of power generation all of which, in principle, could be addressed through feebate schemes.

29. Feebates are cost effective because all firms face the same reward for reducing emissions, regardless of whether they are above or below the relevant pivot point. But there is a tension between revenue and feasibility: raising more revenue requires setting lower pivot points which in turn implies greater impacts on energy prices, since a greater number of firms will be paying taxes rather than receiving subsidies. The revenue potential of feebates (even if simultaneously applied to power generators, vehicles, appliances, and so on) is much smaller than for comprehensive carbon pricing (implying that a larger share would need to be allocated towards climate finance goals).

2.1.2 Market-based instruments for fuels used in international aviation and shipping [18]

The potential for climate finance and environmental gain

30. Market-based instruments (MBIs) for international aviation and maritime fuels—either emissions (fuel) charges or emissions trading schemes—have been proposed as innovative sources of climate finance. These international activities are currently taxed relatively lightly from an environmental perspective: unlike domestic transportation fuels, they are subject to no excise tax that can reflect environmental damages in fuel prices. These sectors also receive favorable treatment from the broader fiscal system. For these reasons MBIs for aviation and maritime fuels are likely a more cost-effective way to raise finance for climate or other purposes than are broader fiscal instruments: increasing from zero a tax on an activity that causes environmental damage is likely to be a more efficient way to raise revenue than would be increasing a tax (on labor income, for instance) that already causes significant distortion.

31. A globally implemented carbon charge of $25 per ton of CO_2 on fuel used could raise around $12 billion from international aviation and around $25 billion from international maritime transport annually in 2020, while reducing CO_2 emissions from each industry by perhaps 5 percent, mainly by reducing fuel demand. Compensating developing countries for the economic harm they might suffer from such charges – ensuring that they bear 'no net incidence' – is widely recognized as critical to their acceptability, as discussed further below. Such compensation seems unlikely to require more than 40 percent of global revenues. This would leave about $22 billion or more for climate finance or other uses.[19]

32. A lower price of $15 per ton would imply combined annual revenues in 2020 (setting aside the same proportion for compensation) of about $14 billion. Revenues would be higher if, in addition to addressing environmental considerations, charges were also set to reflect the wider fiscal issues noted above. However, securing an initial international agreement with more ambitious pricing goals may be more challenging.

33. MBIs are widely viewed as the most economically-efficient and environmentally-effective instruments for tackling environmental challenges in these sectors. Under the auspices of the International Maritime Organization (IMO) and the International Civil Aviation Organization (ICAO), both sectors are

[18] This section draws on the background paper on "Market-based Instruments for International Aviation and Shipping as a Source of Climate Finance."

[19] Some of the revenue should also be retained by the collecting agency to provide performance incentives. The amount potentially depends on the form of scheme adopted but is likely on the order of 5 percent of revenues. Industry discussions have envisaged part of the proceeds being returned to the sectors for climate research and technical cooperation in these sectors.

taking important steps to improve the fuel economy of new planes and vessels. In maritime, notably, agreement was reached in July 2011 within IMO on the first mandatory GHG reduction regime for an international industry.[20] However, higher fuel prices resulting from MBIs would be additionally effective because, for example, they would also reduce the demand for transportation (relative to trend), promote retirement of older more polluting vehicles, and encourage use of routes and speeds that economize on fuel.

34. The principles of good design of MBIs are the same in these as in other sectors. For emissions charges this means minimizing exemptions and targeting environmental charges on fuels rather than on passenger tickets or on arrivals and departures. For emissions trading, it means auctioning allowances to provide a valuable source of public revenue, including provisions to limit price volatility and developing institutions to facilitate trading markets.

35. Failure to price emissions from either industry should not preclude pricing efforts for the other. Though commonly discussed in combination, the two sectors are not only different in important respects – for example, ships primarily carry freight while airlines primarily serve passengers – but they also compete directly only to a limited degree. Nonetheless, simultaneous application to both is clearly preferable, and could enable both a common charging regime (enhancing efficiency) and, perhaps, a single compensation scheme for developing countries.

Cooperation, incidence and compensation

36. Extensive cooperation in designing and implementing international transportation fuel charges (either taxes or auctioned permits) would be needed—especially for maritime transport—to avoid revenue erosion and competitive distortions.[21] Underlying the current tax-exempt status of international transportation fuels is a fear that unilateral taxation would harm local tourism, commerce and the competitiveness of national carriers and would raise import prices and reduce the demand for exports, as well as causing fuelling to take place in countries without similar policy measures. If governments set taxes unilaterally, they would be under pressure to set lower rates than in other countries, to protect their domestic industries and revenues. Some degree of international coordination is thus needed. In the case of international aviation, even an agreement with substantially less than universal coverage—for example one that exempted some vulnerable developing countries—could still have a significant effect on global emissions and revenue potential, given the relatively limited possibilities for carriers to simply re-fuel wherever taxes are lowest. For maritime bunker fuels, however, globally comprehensive pricing is more critical, since vessels can more easily avoid a charge by re-flagging towards countries where such charges do not apply, or by re-fueling at their ports.[22]

37. Both the ICAO and IMO are firmly committed to principles of uniform treatment for carriers and nations. A globally applied charge would be consistent with this, and could be reconciled with the

[20] Through measures added to Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL).

[21] With most ships registered in developing countries, less than 30 percent of the CO_2 emitted by international shipping is emitted in ships registered in developed countries.

[22] Container ships and other volume carriers may take fuel for an entire round-the-world voyage tanking in ports with competitive prices because these ships use fuel as ballast and replace it with water as the fuel is consumed.

UNFCCC principle of common but differentiated responsibilities and respective capabilities by a system of compensatory transfers to developing countries, or to some subset thereof—identified by clear criteria, and likely evolving over time as economic circumstances change. More generally, combining a global charge with targeted compensation provides an effective and feasible way to pursue efficiency and equity objectives.

38. Ensuring 'no net incidence' for developing countries requires careful consideration of the 'real' incidence of these charges—who it is that suffers a consequent loss of real income. This can be quite different from who bears legal responsibility for the payment of the charge. In these sectors these two groups may well be resident in different countries. It is the real incidence that matters for potential compensation, and this is sensitive to views on demand and supply responses. It will also vary across countries according to their share of trade by sea and air, the importance of tourism, and so on.

39. The first step in determining the incidence of these charges is their impact on fuel prices. Jet and maritime fuel prices might not rise by the full amount of any new charge on their use. Some portion of the real burden is likely to be passed back to refiners of oil products. If it is fairly easy for refiners to shift production from jet and maritime fuels to other products (as may be plausible, given possibilities for reconfiguring refineries over the longer term), then the amount refiners have to absorb will be relatively small; a charge of 10 cents per liter on fuels used in both sectors might then increase the price to operators by about 9.5 cents per liter.

40. Even with full pass through to fuel prices, however, the impact on final prices of aviation services and landed import prices—and on the profitability of the aviation and maritime industries—is unlikely to be large. A charge of $25 per ton of CO_2 might raise average air ticket prices by around 2-4 percent and the price of most seaborne imports by around 0.2-0.3 percent. The modest scale of these effects means that the real burden on the international aviation and shipping industries is likely to be small—and, in any case, reflects a scaling back of unusually favorable fuel tax treatment for these industries rather than the introduction of unfavorable treatment.

41. The overall burden imposed by a $25 per ton carbon pricing policy for these sectors on developing countries (and on developed too) is thus likely to be small. Further work is needed to identify possible outlying cases, but the broad picture is clearly one of very modest impacts.

42. Nonetheless, there may be a need to provide adequate assurance of no net incidence on developing countries by providing compensation. Significant challenges arise in designing such a scheme because of the jurisdictional disconnect between the points at which a charge is levied and the resulting economic impacts—especially for maritime transport. Practicable compensation schemes require some verifiable proxy for the economic impact as a key for compensation. More work is needed to identify good (reasonably accurate and acceptably verifiable) proxies, but enough has been done to give confidence that they can be found. Fuel take-up provides a good initial basis in aviation, and simple measures of trade values may have a role in relation to maritime (see below). The prior and in some respects deeper issue is to understand the extent of compensation required.[23]

[23] The background paper elaborates on possible compensation schemes.

43. Fully rebating aviation fuel charges for developing countries (or giving them free allowance allocations) would be a promising way to protect them from the adverse effects of fuel charges. Indeed this could more than compensate them: that is, they might be made better off by participating in such an international regime even prior to receiving any climate finance. This is because much of the real incidence of charges paid on jet fuel disbursed in developing countries, (especially tourist destinations, this having emerged as a particular concern), would likely be borne by passengers from other (wealthier) countries. While this compensation proposal needs further study (for example, to find a way to deal with hubs), it appears to be a reasonably practicable approach.

44. In contrast, there can be less confidence that rebating charges on maritime fuel taken up in developing countries would adequately compensate most developing countries. Unlike airlines, shipping companies cannot be expected to normally tank up when they reach their destination. Some countries—hub ports like Singapore—disperse a disproportionately large amount of maritime fuel relative to their imports, while the converse applies in importing countries that supply little or no bunker fuel, including landlocked countries.[24] Revenues from charges on international maritime fuels could instead be passed to or retained in developing countries in proportions that reflect their share in global trade.[25] While relatively straightforward to administer, further analysis is needed to validate whether this approach would provide adequate compensation, for example for countries that import goods with relatively low value per tonnage.

45. More generally, compensation could be based on relative per capita income; and could be larger for low-income countries in which higher fuel prices are a particular concern. Much detailed work remains to be done to design compensation schemes, but practicable approaches can surely be found.

Implementation

46. Implementing globally coordinated charges on international aviation and/or maritime fuels would raise significant governance issues. Even leaving aside those concerning the use to which funds are put, new frameworks would be needed to govern the use of funds raised, to determine how and when charges (or emissions levels) are set and changed, to provide appropriate verification of tax paid or permits held and to monitor and implement any compensation arrangements. While the EU experience on tax coordination indicates that agreements can be reached, it also shows how sensitive are the sovereignty issues at stake in tax setting and collection. One possibility is to link an emissions charge on international transportation to the average carbon price of the largest economy-wide emission reduction scheme, for instance, limiting the need for a separate decision process. The various detailed proposals being considered by the IMO suggest however that practical issues can be resolved, irrespective of which specific MBI instrument is chosen. There could indeed be some role for the ICAO and IMO, with their

[24] In principle, this problem can be addressed if hub ports only claim fuel tax rebates when ships unload, or if importing countries can claim rebates for fuel purchases by unloading ships associated with that trip. But this approach is administratively complex when one shipping trip has multiple country destinations.

[25] As for instance in the import-based rebate mechanism proposed by IUCN (2010) and WWF (2011). Stochniol (2011) also provides country-specific estimates of the compensation implied by this scheme based on a country's share of imports by sea and air. For instance, Ethiopia's annual rebate would be $6 million for total cost of carbon pricing of international maritime transport of $10 billion (i.e. 0.06 percent of $10 billion). The rebate and attribution keys for all countries have been submitted to the IMO in WWF (2011).

unparalleled technical expertise in these sectors, in implementing these charges, though there are other possibilities.

47. The familiarity of operators and national authorities with fuel excises suggests that implementation costs would be lower with a tax-based approach than with an ETS. Collecting fuel taxes is a staple of almost all tax administrations, and very familiar to business; implementing trading schemes is not. Ideally, taxes would be levied to minimize the number of points to control—which usually means as upstream in the production process as possible. If taxation at refinery level is not possible, the tax could be collected where fuel is disbursed from depots at airports and ports, or directly from aircraft and ship operators. Implementation would be simplest—and environmental efficiency greatest—if no distinction were made between fuels in domestic and international use. Indeed, eliminating the differentiation imposed at present could in itself be a simplification.

48. Policies might be administered nationally, through international coordination or in some combination of the two—with the appropriate institutions for monitoring and verification depending on the approach taken. For example, national governments might be responsible for implementing aviation fuel charges or trading schemes on companies distributing fuel to airlines or ships. All revenue-raising MBI proposals being considered by IMO, on the other hand, assume a global charge or ETS: operators might then be required to make electronic transfers to an international fund.[26] In such a case, flexibility might be needed to accommodate various national circumstances by, for example, allowing certain countries to opt for national collection that is linked to an international approach. On the other hand, tax collection from ships of other nations may be possible only in a regime established under an international treaty instrument. Many ships never sail in waters of or call a port in their flag State, so enforcement of shipping regulations would need to occur through international mechanisms.

49. For aviation the current fuel tax exemptions are built into multilateral agreements within the ICAO framework and bilateral air service agreements, which operate on a basis of reciprocity.[27] Amending the Chicago Convention and associated resolutions would remove these obstacles, although the EU experience on intra-union charging seems to suggest the possibility of overcoming them without doing so. An alternative approach would be to use an ETS in this sector, although the consistency of this with international aviation agreements is currently the subject of litigation. Thorough consideration of the legal challenges arising in the aviation sector is needed. For maritime fuels, there are no formal agreements prohibiting excise taxes, so there appear to be no legal obstacles to fuel charges in this sector.

50. If regional emissions trading programs develop for international transportation (e.g., in the European Union) giving away free allowances is especially problematic. Not only does this forgo revenue, it provides windfall profits for covered airlines or ships that would likely increase resistance to the introduction of fuel charges in other countries.

[26] A precedent is the International Oil Pollution Compensation Fund of the IMO.
[27] See ICAO (2000).

51. While implementation details need further study, especially in terms of governance, it is clear that feasible operational proposals for pricing international aviation and maritime emissions can be developed.[28]

2.1.3 Fossil fuel subsidy reform

52. Many governments in both developed and developing countries have in place policies that explicitly or implicitly subsidize the production or consumption of fossil fuels. Many of these mechanisms effectively subsidize the emission of carbon dioxide. Reform of these policies would not only reduce greenhouse gas emissions, it would also improve economic efficiency and free up scarce public resources – resources that could be directed to climate finance and to other public priorities.

53. The AGF report estimated a potential $3-8 billion in public finance savings from reform of those fossil fuel subsidies that developed G20 economies had identified as inefficient and leading to wasteful consumption, and which they had therefore announced plans to phase out. It assumed that all of these resources could be devoted to public climate finance. This paper draws on a new OECD inventory of various mechanisms that effectively support fossil-fuel production or consumption in 24 OECD countries. (OECD, 2011).[29] The total value of the reported individual support mechanisms for fossil fuel in OECD Annex II countries listed in the inventory, estimated in most cases using benchmarks and valuations from the respective governments, amounted to about $40-60 billion per year over the 2005-2010 period. Not all of these support mechanisms are inefficient or lead to wasteful consumption, and, as such, governments may wish to maintain some. Moreover, given interactions among support mechanisms, and the potential effect on fossil fuel demand of removing support, the exact revenues that could be raised from removing the support measures might be lower than the total amount of the individual tax expenditures. Nevertheless, assuming for illustration that as a result of reforms 10-20 percent of the current value of support was redirected to public climate finance, this would yield on the order of $4-12 billion per year.

54. Systems for fossil fuel support in developed countries are extraordinarily complex, using a diverse array of instruments. Governments support energy production in a number of ways, including by: intervening in markets in a way that affects costs or prices, transferring funds to recipients directly, assuming part of their financial risk, selectively reducing the taxes they would otherwise have to pay (tax expenditures), and by undercharging for the use of government-supplied goods or assets. Support to energy consumption is also provided through several common channels: price controls intended to regulate the cost of energy to consumers, direct financial transfers, schemes designed to provide consumers with rebates on purchases of energy products, and tax relief. Appendix Table 1 outlines the organizing framework for the different types of support mechanisms.

55. Over 250 individual producer or consumer support mechanisms for fossil fuels are identified in the inventory. The estimates were identified based on the existing Producer and Consumer Support

[28] Several MBI possibilities have been developed and closely examined under the auspices of the IMO.

[29] Note that G20 Leaders agreed in 2009 to "rationalize and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption". The OECD inventory takes stock of a very broad range of mechanisms that may effectively support fossil fuel production or use; further analysis of the impacts of the different mechanisms would be needed to determine which may be inefficient and encourage wasteful consumption.

Estimate (PSE and CSE) methodology used by the OECD to estimate government supports in other sectors, notably agriculture. Given limitations on data reported by governments and other time and resource constraints, the current estimates focus mainly on budgetary transfers and tax expenditures at the national level and a sampling of support provided by states, provinces or *Länder* in federal systems. It omits numerous other support measures that it would be desirable to quantify in the future, notably those provided through risk transfers, concessional credit, injections of funds (as equity) into state-owned enterprises, and market price support. Nevertheless, caution is required in interpreting and aggregating support amounts, particularly as the majority of support mechanisms identified in the inventory are tax expenditures, which are measured with reference to a benchmark tax treatment that is generally specific to a given country. Since support is therefore measured in relative terms within the tax system of the given country, the estimates are not comparable across countries.[30]

56. Bearing these caveats in mind, the aggregate of reported fossil fuel supports in OECD Annex II countries has, as noted, been running in the range of $40-60 billion in recent years. In 2010 a little over half of this fossil fuel support was estimated to be for petroleum, with a little under a quarter for coal and natural gas respectively. Viewed by type of support, about two thirds of total fossil fuel support in 2010 was estimated to be for consumer support, with a little over 20 percent being producer support and just over 10 percent general services support.

57. The evolution of the country estimates underlying these aggregates reflects some important policy changes. Germany's decision to phase out support for its domestic hard-coal industry by the end of 2018 is reflected in a decline in the value of this support from about EUR 5 billion in 1999 (about 0.24 percent of GDP) to about EUR 2 billion (about 0.09 percent of GDP) in 2009. In the case of the United States, the OECD inventory estimates that total producer support, including tax expenditures at the federal level and for some states, represented slightly more than $5 billion in 2009 (about 0.04 percent of GDP): the federal budget for FY2012 proposes to eliminate a number of tax preferences benefitting fossil fuels, which could increase revenues by more than $3.6 billion in 2012.

58. While the primary focus of this discussion is on fossil fuel subsidy reform in developed economies, it is worth noting that there is also considerable scope for such reforms in developing and emerging economies. Such reforms would have multiple benefits for developing economies, including improvements in economic efficiency and real income gains, reduced greenhouse gas emissions and increased government revenues available for development purposes. Most relevant from the perspective of climate finance, such reforms would also improve the overall policy environment and incentive structure for encouraging private climate finance flows from developed to developing countries, a point further elaborated in the discussion below on leveraging private climate finance.

59. Using the ENV-Linkages global general equilibrium model, OECD analysis projects that phasing-out fossil-fuel consumption subsidies in emerging and developing countries by 2020 could lead to about a 6 percent reduction in global greenhouse gas emissions in 2050 compared with a business-as-usual scenario. The analysis suggests that most countries or regions would record real income gains and GDP benefits from unilaterally removing their subsidies to fossil-fuel consumption, as a result of a more efficient allocation of resources across sectors. OECD analysis also suggests that elimination of fossil-

[30] These qualifications are spelled out more fully in the background paper for this report "Fossil-fuel Support".

fuel subsidies could lead in 2020 to extra government revenues equal to between 0.5 and 5 percent of GDP in various developing economies.

60. Experience shows that subsidy reforms are often difficult to accomplish given political sensitivity to distributional consequences and concerns about affected industries and workers. A number of developed and developing countries have nevertheless made some progress in reforming consumer and producer fossil fuel subsidies in recent years.[31] In implementing fossil fuel consumer subsidy reforms, governments need to consider broader distributional implications of reform and the need for well targeted safety net programs to protect the poor and vulnerable, in addition to providing transparent information about the expected impacts and incidence of the reform. To make progress on reform of fossil fuel producer support, governments may consider assistance for affected firms, for example to restructure operations, exit the industry or adopt alternative technologies. Assistance to affected workers may be part of such packages and could include initiatives for worker retraining or relocation, or the provision of incentives to diversify the regional economic base. In general, it is important that any assistance for economic restructuring or industry adjustment in response to subsidy reform be well-targeted, transparent and time-bound.

2.2 Other Revenue Sources

61. Although carbon pricing is critical to efficiently curbing CO_2 emissions, there is in principle no necessity to earmark funds from carbon pricing for climate finance: the revenue from carbon pricing could flow into national budgets instead. Conversely funding for climate finance could come from general budget resources, drawing on sources other than carbon charges. This raises the question as to what other domestic revenue sources would be appropriate in developed countries to generate additional contributions for climate finance.

62. The possibilities for funding climate finance by traditional sources are limited, in principle, only by so-called Laffer curve effects—limits, that is, on the maximum possible revenue that can be raised—and by countries' willingness to cut other spending. This makes it hard to meaningfully assess the additional revenue that could be raised from such sources, which can also be expected to reflect the significant fiscal pressures that many advanced countries face. Precisely how any additional (net) revenue might best be raised will of course also depend on countries' circumstances and preferences. Nonetheless, recent work (and experience)—much of it focused on how best to restore fiscal sustainability in the face of fiscal pressures from population aging—has pointed to ways in which additional public resources could be found in most advanced economies (IMF, 2010a). Common themes include the scope for increasing revenue without increasing rates by limiting exemptions and special treatments under the income tax and the VAT.

63. New taxes on the financial sector have also been proposed as a way to raise money for climate finance. These include most prominently a broad-based Financial Transactions Tax (FTT)—levied on the value of a wide range of financial transactions—and a Financial Activities Tax (FAT)—levied on the sum of the wages and profits of financial institutions. Both were considered and compared extensively in the

[31] Some of the country reform experiences are summarized in the background paper on fossil fuel subsidy reform accompanying this report.

IMF's 2010 report to the G20 on financial sector taxation.[32] Broadly speaking, the FTT has acquired greater political momentum, (notably with the recent proposal from the European Commission), while the FAT has acquired greater support from tax policy specialists (as a way to redress distortions arising from the exemption of most financial services from VAT). Both, nonetheless, are technically feasible—with the appropriate degree of international cooperation—and both could raise significant revenues.

3 Policies and Instruments to Leverage Private and Multilateral Flows

64. As noted in the introduction to this paper, a successful climate stabilization effort will, in the long run, draw largely on competitive, profit-oriented private investment to seek out and implement the least cost options for climate mitigation and adaptation. This is consistent as well with the dominant scale and scope of global private capital markets and the growing fiscal challenges in many developed economies. Public policy and public finance nevertheless have a crucial role in catalyzing high levels of private investment in climate friendly activity, first, by establishing the necessary incentive frameworks and, second, by making carefully selected public investments that help alleviate a range of other barriers to private investment. We begin this section with a review of some of the critical barriers that tend to hamper private investment in climate mitigation and adaptation. We then review some of the major approaches to addressing these barriers, including carbon markets (Section 3.1), other instruments to engage private finance (Section 3.2), and multilateral development bank leverage (Section 3.3).

Barriers to private climate finance

65. Although the scale and growth of climate related investment in developing countries are reaching promising levels, private investment in climate mitigation and adaptation remains limited compared to its potential and is hampered by market, institutional and policy failures or barriers that tend to depress risk-adjusted private rates of return on these activities (even though social returns may be high).

66. An important factor depressing private returns on virtually all types of climate mitigation investment is the absence of policy to internalize the global climate externality: in the absence of a robust carbon pricing regime, economic agents suffer little of the damage caused by their own carbon emissions, and, conversely, are able to internalize little of the potential social gains from mitigating such emissions. Domestic policy distortions such as fossil fuel subsidies often aggravate the problem of low private returns on low emission investment by rewarding investment in high emission activity. Private returns are also affected by the public good externality associated with knowledge and in some cases by coordination failures and so-called network externalities. The knowledge externality is in particular likely to hamper private investment in innovation and – more relevant for most developing countries – in the import, adaptation to local conditions and commercialization of new climate technologies.

67. Linked to these factors, risk perceptions for climate-related investments are often high because of uncertainties about future global and domestic climate policy frameworks, technological uncertainties, uncertainties about future climate outcomes, project risks and so on. And even where risk-adjusted private returns are estimated to be high – for example in many energy efficiency projects – actual investments are restrained by lack of awareness and information, agency problems and status quo bias.

[32] IMF (2010b). See also European Commission (2010) and, on administrative aspects of the FTT, Brondolo (2011).

68. Difficulties also arise from informational failures and other problems affecting financial markets, which can contribute to lack of access to finance (especially for long term financing), excessive volatility, contagion, sudden stops in capital flows, mispricing of risks and incomplete availability of commercial insurance and other risk management instruments. These problems are often exacerbated by the lack of or weak development of domestic capital markets in many developing countries. They are particularly relevant for investments in renewable energy that have large upfront capital costs and long payback periods.

69. Finally, both risk-adjusted returns and access to finance will be greatly influenced by the broader factors that affect all private investment, such as the domestic investment climate, institutional capacity and the enabling policy environment. Markets in many new clean technologies are still immature in developing countries. Measures to foster market development will be required to foster low-carbon investment, including awareness raising and building capacity to understand technical solutions. Such capacity building extends across the value chain, including the financial sector. The appropriate policy response varies with different barriers but, as discussed below, public policies and creative use of public finance can often leverage significant private investment.

3.1 Carbon Markets

3.1.1 Rationale for and recent trends in carbon offset markets

70. The Kyoto Protocol to the UNFCCC laid the groundwork for a global carbon market that offers a cost-effective way to reduce the greenhouse gas (GHG) emissions of industrialized countries.[33] It provides them with three ways to meet their 2008-12 mitigation commitments. They can take domestic actions to reduce emissions. They can trade emission allowances with other industrialized country signatories. Or they can purchase emission reductions ("carbon offsets") generated by low-emission projects in developing countries (the Clean Development Mechanism, CDM) or in industrialized country signatories (Joint Implementation, JI). To qualify, such projects must be certified as generating emission reductions that are genuinely additional, in that they would not have occurred without the incentive provided by participation in the offset market. There is evidence on the ground that offsets provide an effective way, at scale, to reduce the costs of mitigation. Many buyers in the CDM (&JI) market are indeed meeting a portion of their obligations at less than $15 per ton CO_2e, a marginal abatement cost lower than many alternatives, including purchase of allowances, internal abatement or national policies and measures.[34]

71. The experience of the past decade shows that carbon offset markets can play an important role in catalyzing low-carbon investment in developing countries, complementing and leveraging other financial resources. In principle carbon offset revenues provide an additional revenue stream that enhances the overall financial viability of low-emission projects. More particularly, they can help incentivize the often large up-front capital investments needed for low carbon projects (as illustrated in Figure 1), as well as

[33] The Kyoto Protocol commits industrialized countries signatories to collectively reduce their GHG emissions by at least 5.2 percent below 1990 levels on average over 2008-12 while developing countries can take no-regrets actions and participate voluntarily in the carbon market.

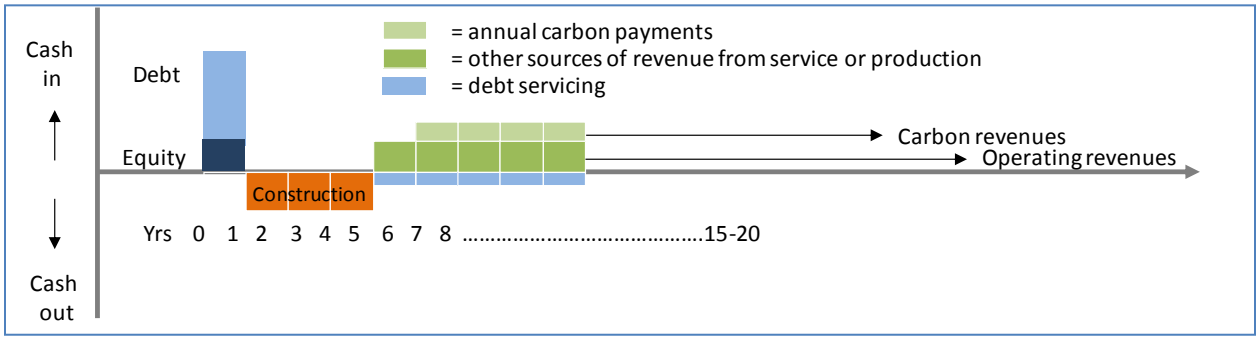
[34] For instance, the Climate Cent Foundation (Switzerland) estimates that the reduction of CO_2 emissions abroad is cheaper than in Switzerland by a factor of five (http://klimarappen.ch/en/foundation/portrait.html).

providing incentives to overcome social inertia, lack of awareness and various transaction costs that tend to hinder climate-friendly investment. The "pay-upon-performance" nature of the asset also creates positive incentives for good management and operational practices to sustain emission reductions over time.

72. The value of transactions in the primary CDM market – the largest offset market by far – totaled around $27 billion in 2002-10, which is estimated to have been associated with around $125 billion in low-emission investment. Since the bulk of transactions are forward purchase agreements with payment on delivery, actual financial flows through the CDM have actually been lower, about $5.4 billion through 2010. A 2 percent levy on issuance of CDM credits has also mobilized $150 million for the Adaptation Fund (see Box 1 below). All in, this makes of the CDM an important conduit for international climate action resources to developing countries. By contrast with other major international resource flows dedicated to mitigation, the CDM channels primarily private resources (as more than 80 percent of CDM credits are purchased by the private sector). Finally, the CDM provides opportunities to support basic development needs (e.g., access to sustainable energy services and waste management solutions, etc.) and contributes to technology transfer and diffusion.[35]

73. That said, carbon offset markets – and carbon markets as a whole – now face major challenges. The value of transactions in the primary CDM market declined sharply in 2009 and further in 2010 (Table 2), amid chronic uncertainties about future mitigation targets and market mechanisms after 2012. A number of other factors are further constraining the potential of carbon finance, including market fragmentation in the absence of a global agreement, transaction costs associated with complex mechanisms, low capacity in many countries, lack of upfront finance, weaknesses in the current 'project by project' approach and non-inclusion of some sectors with significant abatement potential (e.g., agriculture).

Figure 1: Carbon Finance Provides an Additional Revenue Stream to Low-emission Projects [36]



[35] Though considerably smaller in size, the voluntary market provides another window on the carbon market for developing countries, in particular around opportunities in agriculture, forestry and other land use (AFOLU). The voluntary market caters for the demands of individuals, companies and public entities that wish to reduce their carbon footprint in the absence of a regulatory constraint.

[36] Simplified illustration of the cash-flow of a low-emission project (e.g. a windfarm). Carbon revenues start to accrue to the project once it is operational and are linked to its performance. However, as a performance-based mechanism, carbon finance by itself can do little to address upfront financing needs. Source: World Bank (2010b).

Box 1: Levies on Carbon Offset Markets

At present a 2 percent levy on emission reductions issued to activities under the Clean Development Mechanism (CDM) is the main source of funding for the Adaptation Fund established in 2007.[37] So far about $150 million has been raised for the Fund through this means. The prospects for raising additional public climate finance from this source clearly depend on the health of carbon offset market, which, as discussed in Section 3.1 below, depend heavily on the ambitiousness of the emission mitigation targets adopted by developed countries, as well as on the extent of supplementarity limits, which are the proportion of mitigation targets that can be met by offset purchases from developing countries. In the Copenhagen-Low and Copenhagen-High case scenarios discussed in Section 3.1, for example, revenues from the 2 percent levy could run at $150-750 million per year in 2020, rising to $2 billion in a 2 degree pathway scenario.

It is worth noting that the levy entails some economic costs since it is taxing a good (climate finance) rather than a bad (emissions), although such costs are estimated to be relatively minor. Although the charge is levied on credits issued to projects in developing countries, the actual incidence of the levy will depend, as with all taxes, on the relative responsiveness to price changes as between buyers and sellers of offsets. In scenarios where demand is constrained by supplementarity limits, much of the burden of the levy is passed onto buyers in developed countries. However developing country sellers would be likely to bear more of the burden of the levy in a scenarios where such constraints are eased and buyers become more sensitive to price. In the latter scenario, rather than transferring funds from developed to developing countries, the levy would primarily transfer funds from big CDM host countries like China, Brazil and India to vulnerable countries eligible for adaptation funding (World Bank 2010a).

Table 2: Carbon Market Evolution, 2005-10 ($ billion)

	EU ETS Allowances	Other Allowances	Secondary CDM	Primary CDM	Other Offsets	Total
2005	7.9	0.1	0.2	2.6	0.3	11.1
2006	24.4	0.3	0.4	5.8	0.3	31.2
2007	49.1	0.3	5.5	7.4	0.8	63.0
2008	100.5	1.0	26.3	6.5	0.8	135.1
2009	118.5	4.3	17.5	2.7	0.7	143.7
2010	119.8	1.1	18.3	1.5	1.2	141.9

Source: World Bank (2011a). Note: Numbers may not add up due to rounding.

74. Despite the recent slowdown in market activity, a number of recent developments do show continued interest in advancing carbon market solutions in both developed and developing countries. The 2010 United Nations Climate Change Conference in Cancun adopted important improvements and reforms to enhance the efficiency of the CDM and agreed to consider the establishment of one or more market-based mechanisms to enhance the cost-effectiveness of mitigation actions by Parties. The Conference formally recognized developing countries' Nationally Appropriate Mitigation Actions (NAMAs), some of which plan the use of market mechanisms. It also recognized the contribution of forest-related activities in efforts to tackle climate change, making not only projects but also developing

[37] The CDM is so far the only flexibility mechanism to be taxed in this way under the Kyoto Protocol.

countries and sub-national regions within them eligible for incentives, subject to verification that such REDD+ activities have reduced emissions against a reference level.[38]

75. New market initiatives are also underway in both developed and developing countries, despite the uncertainties about the international regulatory environment. For developed economies, these include an upcoming cap-and-trade scheme in California and several other regional initiatives in North America, city-wide emissions trading systems in Japan, and proposed carbon trading legislation in Australia (which could become, after EU and New Zealand, the third regulation establishing a country-wide or supra-national emissions trading system in developed countries). Building on the experience and achievements of the CDM, a number of other countries are also experimenting on a voluntary basis with market approaches to cost-effectively reduce emissions, mobilize domestic and international resources for low-emission development and potentially deliver additional benefits such as increased technology transfer, energy security or competitiveness. In the developing world, a broad range of instruments are being considered in countries such as Brazil, China, Chile, Colombia, Costa Rica, Indonesia, Korea, Mexico, Turkey and Ukraine.

Box 2: Scenarios for Carbon Offset Market Flows to Developing Countries by 2020

Given that the outlook for offset markets depends crucially on the international mitigation framework and carbon pricing, a number of scenarios ranging from less to more ambitious levels of mitigation were reviewed to evaluate the potential for offset markets to mobilize private climate flows: [39]

- *Low scenario.* This assumes only currently enacted mitigation initiative, essentially only the targets under the EU ETS and EU non-ETS initiatives, as well as some U.S. regional initiatives, resulting in a 7 percent abatement of developed countries' GHG emission below 1990 levels. Under this scenario carbon offset prices were estimated in a $10-15 per ton range, associated with carbon offset flows of $1-2 billion per year, about the same as the 2010 level.
- *Copenhagen-Low scenario.* This assumes, in addition, expanded regional initiatives in the U.S. and Canada and the adoption of national mitigation targets in Japan, Australia and New Zealand, resulting in 9 percent abatement. Here carbon offset prices are estimated in a $15-25 range, with offset flows in a $5-9 billion range.
- *Copenhagen-High scenario.* This assumes the adoption of more ambitious mitigation targets in all major developed as well as key developing economies, contributing to 18 percent abatement below 1990 levels (which, however, would still remain substantially less than abatement levels estimated to be needed for a least-cost 2 degree emission pathway). Here, offset prices are estimated in a $25-35 range, with offset flows reaching $31-43 billion.
- *A two degree (2C) scenario.* Depending on burden-sharing, offset prices could be above $40 and offset flows could surpass $100 billion per year in 2020.

[38] REDD+ refers to all activities that reduce emissions from deforestation and forest degradation, and contribute to conservation, sustainable management of forests, and enhancement of forest carbon stocks.

[39] Details of the scenarios and the methodology employed are set out in more detail in the background paper accompanying this report "How to Keep Up Momentum in Carbon Markets?"

3.1.2 Options to scale up carbon market flows to developing countries

76. The health of the carbon market will ultimately depend upon three factors. First, there are *demand factors*, in particular the ambition of mitigation targets and the scope for market mechanisms (which drive the size of demand), as well as eligibility criteria (which influence the type of carbon assets included in the market). Second, *supply* which is notably affected by the lead time and capacity required to develop eligible projects and deliver scaled-up abatement in a broader range of opportunities. Lastly there are *market rules and institutions*, which influence transactions costs, the level of efficiency of the market and the level of capacity needed for market functioning.

77. We discuss these drivers, with options to help address current and emerging challenges to carbon markets.

78. As the scenario analysis in Box 2 emphasizes, the most important determinant of carbon offset market flows to developing countries is clearly *the level of international mitigation targets*: the more ambitious the targets the greater the scope for such flows. Developed countries can also encourage flows by *increasing supplementarity limits*, which are the proportion of mitigation targets that can be met by purchases from developing countries. Greater use of market mechanisms, taking advantage of the diversity in costs of abatement across sectors and regions, could encourage countries to scale up their mitigation efforts while lowering the cost of doing so.

79. *Improving long term policy clarity about future frameworks is an urgent priority*. Currently market activity (and associated low-emission investment) is seriously hampered by multiple uncertainties about future demand, the eligibility of various market mechanisms, project types, technology and country of origin, among others. Given the heavy toll of a potential market disruption in terms of both capacity and confidence, governments could work towards sustaining momentum in the market while new initiatives are being developed. They could, for example, dedicate a fraction of their international climate finance pledges to support testing and showcasing new approaches, such as concepts for country or sector programs, new methodologies, CDM reforms and new mechanisms. This would be a cost-efficient use of climate finance as it would target least cost-options and would be performance-based. It would also help build up a supply pipeline for a future scaled-up market, preventing supply shortages and price pressures.

80. *As regards supply, innovative steps to broaden the scope, scale and reach of carbon markets* can be considered in several directions. First, steps could be taken to include sectors bypassed under existing regimes, notably the large mitigation opportunities from REDD+ activities and agricultural soil carbon. The sequestration of carbon in soils is currently a neglected part of the climate solution, yet the carbon market could provide incentives for sustainable land management programs that deliver a triple win for society: improved yields, enhanced resilience to climate change, and global mitigation. Second, steps could be taken to scale-up the impact of carbon finance through programmatic approaches that help overcome the high costs and constraints inherent in the current project-by-project approach. This could include building on the existing CDM Programme of Activities (PoA), which has proved successful in promoting small-scale, dispersed activities such as distribution of cookstoves, efficient light-bulbs, biogas digesters and solar water heaters. It could also explore new approaches such as a city-wide approach to carbon finance, incorporating GHG mitigation concerns into urban planning, landscape approaches or policy crediting. Finally, steps could be taken to increase the participation of the poorest countries in the

carbon market, in particular by simplifying and adapting carbon finance procedures to the realities of these countries (e.g., finding solutions for the treatment of suppressed demand or of non-renewable biomass which currently hinders clean energy uptake in these regions).

81. *Encouraging innovation to turn future carbon offset flows into finance* is another option. Difficulties in securing sufficient up-front long term financing have proven a major constraint in advancing most carbon finance projects. So far, there have been few attempts by financial institutions to monetize forward carbon revenue streams as a way of providing upfront investment capital for such projects, because of factors such as underlying project risk, low familiarity with carbon finance and post-2012 uncertainty. Several institutions including MDBs[40] are developing a range of solutions such as frontloading mechanisms that turn anticipated carbon revenues into upfront finance, risk mitigation tools that enhance the confidence of financiers in the value and predictability of future carbon credits, revolving funds where accruing revenues can support a next tranche of investments, and structured finance with innovative use and combination of instruments, each addressing specific barriers and needs. Some of these existing or potential inspiring solutions are further detailed in Box 3.

Box 3: Turning Carbon into Finance

- *Risk-mitigation tools addressing delivery risks* can maximize the value of carbon credits (as buyers are willing to pay a higher price for more predictable deliveries) and unlock low-emission investment (as financiers are more confident in the value and predictability of future carbon credits). *IFC's Carbon Delivery Guarantee*, a structured financial product developed specifically for the carbon market, which assures delivery of future carbon credits from projects in developing countries to buyers in developed countries, is such an example.
- *Frontloading mechanisms* that turn anticipated carbon revenues into upfront finance. For instance, a *Guaranteed Carbon Sales Contract* would help convert the future flow of carbon offsets into an upfront payment that can help finance the low carbon project. Specifically, offset buyers would make an upfront payment in return for a shortfall agreement by the sellers which would be guaranteed by an MDB or, possibly, a pooled arrangement like the Clean Technology Fund (CTF) (the MDB or pool being protected by a counter-guarantee from the host sovereign).
- *Carbon Mezzanine Debt Facility*, which can address the need to limit senior debt and achieve greater equity participation in risky projects. Such a facility could be funded through multilateral, other public and private sources, possibly through a pooled arrangement like the CTF.
- *Instruments to address price volatility*, such as a Carbon Price Support Facility. With this kind of product a price support facility (funded by an MDB or a pooled arrangement like the CTF) would provide a minimum floor for carbon offset prices, thereby helping address the problem of price volatility and uncertainty, something that also that dampens incentives for low emission investments.

[40] MDBs are actively supporting the development of the carbon market, including through 21 carbon funds and facilities with $4.2 billion in capital, some of which are targeting segments not yet tapped by carbon finance, bringing continuity by purchasing credits beyond 2012, and providing upfront financing and risk-management products.

82. Given the possibility that the carbon market will develop in a fragmented way, through numerous regional and national initiatives, there would be a significant payoff from *greater harmonization of rules across regimes to ensure minimum fungibility of carbon assets*. This would control transaction costs and keep capacity needs manageable, which would otherwise multiply with the diverse specific requirements of each new carbon regime in a fragmented carbon world, with real risks of restricting access to the carbon market and increasing the maturity time of supply. Harmonization would also maintain liquidity and efficiency, as the gains from indirect linking through well-functioning crediting mechanisms appears to be very large, reflecting the vast low-cost abatement potential in developing countries. To ensure market integrity, greater clarity and harmonization are also needed on the framework for monitoring and accounting. A number of options are available for international GHG accounting including some that combine elements of a top-down approach based on the Kyoto Protocol and more decentralized country-led approaches.

83. Finally, there remains a considerable need for *innovation, awareness-raising and capacity building in public and private institutions in developing countries*, to increase their participation in the carbon market and build and enabling environment for low-emission development. (See Box 4 for selected on-going initiatives.)

Box 4: Innovation, Capacity and Awareness for Greater Market Readiness

Responding to growing demand from countries across Latin America, the Inter-American Development Bank is actively supporting governments, regional authorities and municipalities develop low-emission strategies, including assessment of mitigation opportunities, sources of finance and regulatory frameworks (Colombia, Mexico, and Peru). It is piloting NAMAs, for urban mobility (Brazil, Mexico and Colombia), for renewable energy and energy efficiency (Barbados), and for waste management (Peru, Colombia, Mexico and Brazil). The IDB is also engaging domestic financial institutions to raise awareness and build capacity around carbon finance, and, more broadly, low-emission opportunities, including national development banks (Brazil, Colombia, Mexico, and Peru) and local commercial banks (Argentina, Colombia, Mexico and Panama).

The Partnership for Market Readiness (PMR) provides grant-funding and technical assistance for collective innovation and piloting of market-based instruments. The Partnership brings together developed and developing countries, as well as other key experts and stakeholders, and serves as a platform for technical discussions on market instruments, to foster South-South exchange, facilitate collective innovation for pilot efforts and harness financial flows for implementation and scale up. The PMR has already provided preparation grants to 8 implementing countries, with a target of 15. The World Bank serves as the Secretariat of the Partnership.

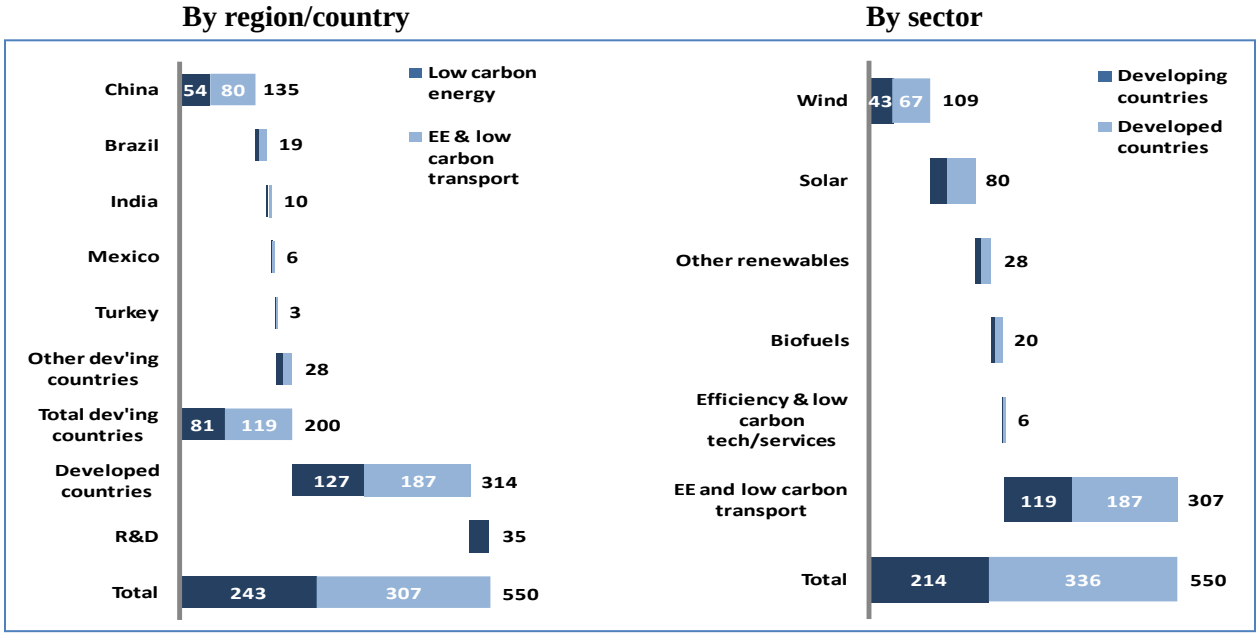
3.2 Other Instruments to Engage Private Finance

3.2.1 Current investment in climate related activity

84. While there are at present few comprehensive and consistent data on climate related investment in developing countries, particularly as regards cross-border private flows, a survey of the available evidence suggests that such investment is growing rapidly and achieving a significant scale. Analysis for

this report by McKinsey drawing on recent estimates by Bloomberg New Energy Finance (BNEF) and HSBC suggests that total investment in developing countries in low carbon energy, low carbon transport and energy efficiency (public and private, foreign and domestic) totaled around $200 billion in 2010, with about 60 percent of that occurring in just the top 5 countries – China, Brazil, India, Mexico and Turkey.[41] Developing countries now comprise well over a third of worldwide investments of this type. (Figure 2 below). However data on the private sector share in these flows is incomplete, as is that on the foreign versus domestic share. UNCTAD separately estimates that foreign direct investment (FDI) in developing economies in renewable energy, recycling and low carbon technology manufacturing amounted to $37 billion in 2009 (UNCTAD, 2010). Nevertheless, although data on private climate finance flows is still partial and often inconsistent, there is a general appreciation that large amounts of climate-related private investment have begun to flow to developing countries.

Figure 2: Sustainable Energy Investment, 2010 ($Bn.)



Source: BNEF, HSBC, staff estimates.

85. As regards the pace of growth in climate-related investment, Bloomberg estimates that investment in renewable energy in developing countries experienced a dramatic 19 fold increase in just 6 years from 2004 to 2010. Growth slowed in 2009 with the global financial crisis but rebounded in 2010 with a strong 29 percent increase, led in particular by sharply higher renewable investment in China.[42]

86. The private sector will not be immune to climate risk and impact, and will have a key role to play in investment for adaptation. An activity could be considered an adaptation investment if it reduces the risk, exposure or sensitivity of human or natural systems to climate change; increases climate resiliency; builds capacity to develop responses to climate change or addresses impacts exclusively linked to climate

[41] For further details see the background paper for this report "Climate Finance: Engaging the Private Sector".
[42] UNEP and Bloomberg New Energy Finance (2011). The estimates refer to renewable investment financed primarily by venture capital, public markets and asset financing.

variability and change. Building climate resiliency into project design, particularly for long-lived assets; incorporating climate models into hydrological surveys for dam construction; taking climate considerations into account when designing and building new infrastructure in coastal areas – these are all examples of adaptation investments that are also sound development in the face of a changing climate.

87. However, given the relatively limited experience to date, it has not yet been possible to develop a typology of or quantify flows into private sector adaptation investment, much less draw lessons on financing structures or leverage. There are estimates that climate finance flows for adaptation in developing countries may be about $5 billion per year (Buchner et al., forthcoming), with bilateral sources providing a significant share, about 80 percent (UNEP, 2010).[43] However, as with other published information on climate finance, a number of definitional caveats and issues will affect comprehensiveness and consistency. The portion of flows directed to and coming from the private sector remains unknown. Clearly, this is an area where further work is needed.

3.2.2 Public policies and instruments to leverage private climate finance

88. Public finance and policies can leverage private resources at different levels. At the retail level the term leverage in this context generally refers to the ability of a public financial commitment to mobilize some larger multiple of private capital for investment in a specific project or undertaking. At a broader level it refers to the potential for catalytic or transformational public investments or initiatives to encourage much more widespread climate-friendly changes in behavior by private firms across the whole economy – rather than only those involved in a specific climate-related project – typically by addressing economy-wide market failures or barriers to investment. The need for leverage to be also understood in this broader transformational context is clear when one compares the relatively small size of any conceivable increase in public climate finance flows from developed countries relative to total capital formation in developing countries – in the range of $6.4 trillion in 2010, projected to rise to $10.3 trillion by 2015.[44]

89. Leveraging private resources in either the wholesale or retail sense is best accomplished through some combination of policy reforms that change incentives for private investment and address key market failures, combined with public financial interventions or investments. Such public resources can come from multilateral development banks (MDBs), bilateral or domestic public sources or pooled financing arrangements. Pooled financing is a relatively new class of structured vehicle that facilitates mobilization of concessional resources from a variety of public and private sources. Examples of such pooled arrangements, which are discussed more fully in Section 3.3 on MDBs, include the Global Environment Facility and the two Climate Investment Funds (CIFs), among others. (Boxes 5 and 6 provide further information respectively on the role of bilateral aid and national development banks in climate finance.)

[43] UNEP estimates that bilateral support to adaptation amounted to almost $4 billion in 2009 from four institutions alone.

[44] IMF World Economic Outlook database, April 2011.

Box 5: Bilateral Support for Action on Climate Change

OECD-DAC estimates that bilateral official development assistance (ODA) for mitigation-related activities averaged $9.4 billion per year in 2008-09.[45] Mitigation-related aid represented 7.4 percent of DAC members' total bilateral ODA, with the largest donors being Japan and Germany. These figures include contributions to specific climate funds, such as the Climate Investment Funds. In addition, countries provide support through the multilateral system; in the same period such assistance amounted to $429 million through the Montreal Protocol, the Global Environment Facility and IDA (OECD-DAC, 2011). According to UNEP, three bilateral financial institutions and the European Investment Bank together provided $13 billion for climate action in developing countries in 2009, with over two-thirds towards mitigation. However, this includes both concessional and non-concessional assistance. The four agencies covered in that study are the Agence Française de Développment (AFD), Japan's JICA (the largest contributor at $6.4 billion), Germany's KfW and the European Investment Bank (EIB). (UNEP, 2010).

Box 6: National Development Banks and Climate Finance

Data gathered by Bloomberg New Energy Finance (BNEF) indicate that national development banks accounted for $5.8 billion in clean energy financing in 2010 (BNEF, 2011). BNEF defines clean energy as renewable energy, which does not cover energy efficiency, large hydro, or finance to supply chain projects like component manufacture. Wind and bioenergy were the biggest recipient sectors. National development banks (NDBs) covered included Brazil's BNDES, Germany's KfW, France's AFD, the China Development Bank, the Indian Renewable Energy Development Agency (IREDA) and the Overseas Private Investment Corp (OPIC) of the USA. Most NDBs are focused on the country or region in which they are based. Some NDBs have an explicit mandate of working with the private sector, such as OPIC. BNDES' client base consists primarily of private companies and entrepreneurs. However, assembling a true picture of financial flows from these institutions to private climate related activity remains difficult. IREDA is said to source more than half its funds from other development banks, so the data presented above may include some double-counting. More work is needed to assemble a true picture of climate-related investment flows attributable to NDBs.

90. Resources from these various sources can be applied through a wide range of available instruments to leverage private investment, either individually or, increasingly, in combined packages of interventions.[46] Such instruments include grants, concessional and/or non-concessional lending, equity investments, often through MDB private sector windows, technical assistance and a range of loan guarantee and other risk mitigation instruments. Box 7 provides some examples of engaging the private sector through packaged interventions via the Climate Investment Funds.

[45] This figure relates to mitigation (and related capacity building) only; first data on adaptation, relating to 2010 flows, will become available at the end of 2011. In future, OECD-DAC data on climate finance will cover non-concessional support as well.

[46] UNDP (2011) discusses National Climate Funds as an instrument for developing countries to collect, coordinate and blend public, private, multilateral and bilateral sources of climate finance, as well as to coordinate and deploy these funds for country-wide climate change activities that promote national development priorities.

Box 7: Scaling-up Partnerships through Climate Investment Funds

A partnership among MDBs, recipients and contributors, with $6.5 billion in pledges, the Climate Investment Funds are providing innovative climate financing to developing countries for low-emission technology, climate resilience and forestry, pursuing a strategy that combines public sector reform and private sector action. Here are three examples from a much broader portfolio of activities in 45 countries.

Accelerating the deployment of Concentrated Solar Power (CSP) in five countries in the Middle East and North Africa: $750 million of highly concessional funding from the CIFs will catalyze a $4.8 billion package, including $1.3 billion from private sector, $2 billion from local government and $1.5 billion from the African Development Bank and the World Bank. This initiative will help deploy the largest CSP capacity in the world (around 1GW), tripling current global installed capacity and investment in CSP and achieving the scale necessary to bring down costs and promote global learning and deployment.

Deepening domestic capital markets for clean energy in Turkey: The Turkish Sustainable Energy Finance Facility incentivizes commercial banks to enter the new climate lending market using a combination of commercial-priced finance from the EBRD with concessional co-finance and substantial technical assistance support from the Clean Technology Fund (a CIF) and the EU. The facility will cover five local private banks and is expected to lead to a total of 160 projects, with abatement of 232,000 tCO_2e.

Piloting index-based agriculture insurance in Niger: This initiative aims to provide contingency funding to farmers in the event of weather and climate-related shocks, collaborating with the Global Index Insurance Facility (GIIF), the private sector and others to develop the insurance index and implementation framework. The pilot will also investigate possibility of risk transfer to the international market. This is part of a broader $100 million program (70 percent from the CIF) to help design social safety nets for extremely poor households vulnerable to climate risks. Index-based insurance schemes have been shown to increase farm income stability and provide incentives to pursue more high-risk, high return strategies. They also enhance access to rural finance through reduced default rates.

91. In the rest of this section we organize the discussion of policies and instruments to leverage private finance according to the key barriers to climate investment which they help address. As noted in the discussion of barriers at the beginning of Section 3, these include the global climate externality, knowledge externalities, problems with access to finance and high levels of risk and uncertainty. It should be noted that there is often no simple one-to-one mapping between instruments and barriers, as some instruments can be useful in addressing more than one type of problem. Additional insight can also be obtained by mapping policies and instruments not to barriers but to the main types of climate investment projects, e.g. energy efficiency, various types of renewable energy projects etc. Appendix Table 2 provides such an illustrative mapping of policies and instruments to projects organized along a stylized marginal abatement cost curve.

Leveraging private finance by tackling the climate externality

92. Interventions to address the climate externality and improve returns on climate friendly investment through some form of carbon pricing are likely to be among those actions with the highest leverage at the wholesale or economy-wide level. At the global level, under current market rules, robust

carbon pricing in developed countries provides incentives for significant private flows to developing countries through carbon offset markets. Carbon offset flows are discussed separately in Section 3.1 above, which notes how they create an additional revenue stream for and improve profitability in low carbon projects in developing countries, thereby increasing incentives for domestic and foreign private investment.

93. But there is also considerable scope for stronger carbon pricing in developing countries themselves. The most obvious opportunity relates to 'no-regret' reforms to reduce or eliminate fossil fuel subsidies, as discussed in Section 2.1.3 above. More broadly, some 22 non-Annex II developing economies have now set economy-wide mitigation targets, as indicated by information provided under the Copenhagen Accord. Advance market commitments such as feed-in tariffs to subsidize renewable energy sources are also being considered in many economies, although they are less efficient than carbon pricing and can have significant fiscal implications, depending on factors such as the size of the cost differential between renewable and fossil fuels. Interest is also increasing in regulation to improve energy efficiency, for example through economy-wide efficiency standards and codes or power sector reforms.

94. But it has to be stressed that none of these reforms are easy to accomplish or without cost. A particularly valuable use for developed country public finance is therefore through policy support (for example development policy operations) for climate policy reforms and programmatic initiatives, using some combination of development assistance in the form of concessional and non-concessional lending, grants and technical assistance.

Addressing knowledge externalities

95. Public climate finance can also achieve broad leverage at the wholesale level through investments that address other key market failures, for example the public good externality that hampers innovation and dissemination of climate technology. All new technologies contain a substantial component that is tacit and uncodifiable, that needs to be mastered through costly experimentation, particularly when the technology is being adapted for use in a new developing country environment. However, a developing country firm making such an investment in technology adaptation may find competitors quickly copying its advances at much less cost, which reduces the incentive for the firm to introduce the technology in the first place. Lack of information and status quo bias are also a particular source of problems in promoting investment in energy efficiency, a sector which otherwise promises not only high social but also private returns.

96. Here carefully designed and scaled public investments in demonstration projects to pilot and debug new technologies and institutions can have a major impact in promoting learning and the diffusion of new ideas. Such investments also generate valuable new project and sector information and reduce policy risks by establishing safeguards and other standards. Careful monitoring and evaluation of lessons from learning investments are low-cost public goods that can accelerate the flow of private finance and new technologies. Experience with such projects shows that a blend of grant, concessional, non-concessional and carbon-offset financing can be used to provide an effective mixture of financial incentives and technical assistance that encourages private firms to invest in new clean energy technologies, stimulating learning-by-doing and knowledge diffusion for the economy at large.

97. Some examples include the *China Renewable Energy Development Project* (supported by an IBRD loan and a Global Environment Facility grant) to encourage manufacturing of small scale solar home systems, the EBRD's *Sustainable Energy Initiative*, which supports both energy efficiency and renewable energy projects with a strong emphasis on transfer of skills and learning, and the China *Energy Conservation Project* which helped pilot hitherto unknown Energy Service Companies (ESCOs) to provide both finance and technical know-how for energy efficiency. Another example of implementing a mix of information, regulatory and market-based policy instruments to catalyze private action is the South African Wind Energy Programme (SAWEP), implemented by UNDP with GEF funding. This initiative has assisted in creating a sector-wide market-enabled environment for large-scale wind energy investment.

Access to finance and risk mitigation issues

98. Development lenders are also gaining experience in how to address problems of lack of access and missing insurance markets in climate finance. Public lenders provide an important element of stability through their ability to undertake large-scale, long-duration, non-concessional lending for climate action, especially during periods of high volatility and sudden stop in global capital markets, such as the recent global financial crisis. In addition they are able to provide core or anchor financing that, creatively blended with concessional finance, grants, risk mitigation and learning, can also leverage increased climate lending by domestic commercial banks and other private lenders. Export credits are also being used creatively by countries to stimulate private investment in developing countries in low carbon development, with more favorable terms and conditions reflecting the higher initial investment costs and expected useful lives of such projects.[47]

99. In China, commercial bank lending for energy efficiency was being hindered by apparent lack of collateral for such lending. The *China Utility-Based Energy Efficiency (CHUEE)* project has helped banks structure efficiency loans as project finance with collateral, also providing an IFC first loss guarantee and technical assistance for capacity building in local banks, supported by GEF concessional funding. As local banks have gained experience the amount of loss coverage from international sources has been reduced while bank lending has risen substantially.

100. The *India Solar Power Guarantee Facility* ($150 million) approved by ADB's board in 2011 aims to reduce the overall cost of financing and lengthen loan tenors for solar projects. The Facility covers up to 50 percent of the payment default risk on commercial bank loans of up to 15 years to private sector developers of small solar power projects. The UK Government will provide a $10 million untied grant to ADB to subsidize the guarantee fee rate and help buy down the risks/costs of financing. The Islamic Development Bank has identified renewable energy and energy efficiency as priorities for its interventions in Turkey's energy sector, including through strategic partnerships with local financial intermediaries.

[47] Export credit agencies (ECAs) typically provide loans or guarantees to facilitate exports. In recent years the majority of medium and long-term official export credit flows from OECD governments to developing countries have been to transport and energy sectors (37 and 26 percent respectively), followed by energy projects (11 percent, including 1 percent estimated for renewable energy and energy efficiency in the power sector). OECD statistics on export credits in 2010 as cited in Buchner, Brown and Corfee-Morlot, 2011.

101. Subordinated or mezzanine debt— financing with a lower payment priority than senior loans— can be a useful way for the public lender to take on more of the risk, strengthen a project's equity profile and encourage additional commercial lenders to provide senior debt financing. This approach was used by IFC to support one of the first wind projects in Mexico. Over time, public support can be decreased and eventually phased out as commercial lenders gain experience and confidence about the viability of these investments.

102. A variety of other risk sharing instruments can further help address the risk-return tradeoff, including tools such as policy and loan guarantees, insurance products and hedging instruments. Increasing access to risk-sharing instruments is an important strand of comprehensive adaptation strategies, given the likelihood of more frequent extreme events as a result of climate change. There have already been some promising applications of innovative mechanisms such as index-linked insurance and weather derivatives – for example, the Caribbean Catastrophe Risk Insurance Facility, which combines index insurance with risk pooling. At the local level, analysis suggests that microfinance can be a promising instrument for adaptation. For example, in Bangladesh, analysis found that 70 percent of existing microfinance portfolios were related to climate change adaptation (Agrawala and Carraro, 2010). In the longer-term these instruments have the potential to be self-sustaining, but there is a need for public funding to pilot new methods and initiate new projects. It is also well understood that such instruments are only one component of a comprehensive adaptation strategy.[48]

103. Green bonds could be another innovative instrument where asset-backed corporate bonds are used to refinance operational cash-flow from low-carbon infrastructure projects. These types of structures could help access large pools of institutional capital, reduce the average cost of capital, and provide a low-cost exit for construction phase capital and bank debt. The bonds would allow institutional investors (pension and insurance funds) to match stable long-term returns from operational infrastructure with their liabilities. (Della Croce, Kaminker and Stewart, 2011).

3.2.3 Potential for leveraging private climate finance

104. As noted, the potential for leveraging private climate finance can be assessed at 'wholesale' or 'retail' levels, the former looking to economy-wide changes in climate-friendly private investment as a result of broad changes in incentives, the latter more narrowly at private capital mobilized in specific projects. While wholesale leverage will undoubtedly be of the greatest significance in the long run, arriving at reasonable estimates of such broad potential changes is a difficult challenge, especially given that private investment behavior in general is among the less well understood aspects of economics. We leave this challenge for future work, and, following the AGF, concentrate on leverage at the retail level, using leverage ratios that are derived from the lending experience of the MDBs.

105. Experience from the lending portfolios of MDBs and other donors suggests that private leverage factors can vary considerably according to the type of public financing that is deployed, the sector, the novelty of the technology and the level of informational and other barriers to investment. Broadly speaking, the experience of the MDBs suggests that leverage factors in the range of 3 to 6 for non-

[48] The World Bank Group finances on average $2-3 billion per year in disaster risk reduction and recovery, resources that could potentially be leveraged for adaptation related investments through improved screening and targeting of investments.

concessional lending, although they can be significantly higher in projects such as for power sector energy efficiency, with well-established private players and relatively few technological surprises. Leverage ratios can be significantly higher where the public finance component is the form of concessional lending, grants or equity, running at 8 to 10 or even higher.

106. The AGF Report developed scenarios in which public climate finance from developed countries, MDB finance and carbon offset flows could leverage in the range of $100 – 200 billion of gross private climate finance flows from developed to developing countries in 2020.[49] These findings are broadly consistent with the analysis of instruments and options discussed in this report. Table 3 summarizes the AGF approach and also provides a transparent way for readers to vary any of the assumptions and develop alternative scenarios. The AGF discussion considered scenarios where developed country public sources and MDB finance could together provide additional annual flows of $35-60 billion to leverage private finance in 2020, a range also within the combined scope of the various public finance and MDB instruments and approaches discussed respectively in Section 2 above and Section 3.3 below. The AGF also considered complementary annual carbon offset market flows of $30-50 billion in 2020, similar to the Copenhagen High scenario discussed in Box 2 and Section 3.1 above.

Table 3: AGF Scenario for Additional Private Climate Finance in 2020*

	$ bn.
1. Developed country public and MDB finance	35-60
2. Plus carbon offset flows	30-50
	65-110
3. Times private leverage factor	x 3
	195-330
4. Plus "negative cost" investments	50
5. Total additional private flows	245-380
6. Times assumed foreign ratio	x ½
7. Additional international private **	123-190

* AGF Working Stream Paper 7 (2010), pp. 30-31. ** Rounded to $100-200 billion in the AGF discussion.

107. The AGF method applies a conservative private leverage factor of 3 to the total of $65-$110 billion of additional MDB, other public and carbon offset flows noted in Table 3, yielding additional leveraged private flows of $195-330 billion. The AGF also estimated that there could be around $50 billion of so-called "negative cost investments" (e.g. in energy efficiency) identified using the McKinsey Marginal Abatement Cost Curve (MACC). Adding in such investments yields an estimate for 2020 of total additional gross private flows (both foreign and domestic) of $245-380 billion. Assuming with the AGF that half of this total comes from international sources yields an estimate of around $120-190 billion for north-south private financing flows, which, given the inherent uncertainties surrounding the embedded assumptions, the AGF rounds to a range of $100-200 billion. This would represent a significant share of the overall capital investment requirement in developing countries that has been estimated as consistent with a 2C pathway.

108. These estimates might be substantial under-estimates in that they do not attempt to capture all of the broader changes in private investment behavior that would result from policy efforts to tackle economy-wide market failures and improve the economy-wide structure of incentives. On the other hand these scenarios do rely on assumptions of significant additional flows of public finance from developed

[49] AGF Workstream 7 Paper: Public Interventions to Stimulate Private Investment in Adaptation and Mitigation.

countries, which may prove a challenge given the very difficult economic and fiscal conditions confronting these economies.

3.3 Multilateral Development Bank Leverage

109. In an important respect multilateral development banks (MDBs) are themselves an institutional device to help mobilize private savings for development purposes. Specifically, MDBs are able to fund – leverage – investments several times their shareholder capital because of their ability to borrow in private capital markets. Like all banks, MDBs provide economic services such as risk sharing or asset transformation services which allow them to serve as financial intermediaries between savers on the one hand and opportunities for productive investment on the other. But MDBs also have specific features which allow them to address various problems that otherwise hinder private capital flows to developing countries. In particular, the multilateral shareholding structure and preferred creditor status of MDBs serves as a commitment device to better deal with the problem of a lack of institutions for contract enforcement in international lending to sovereign governments. These features also give MDBs a comparative advantage in collection and dissemination of information about the investment environment in developing countries, something that the private sector may under-provide because of the public good nature of such knowledge. Finally, MDBs also serve as mechanisms for reallocating subsidies – that is, resources that they derive from their preferred creditor status and access to a subsidized shareholder capital base, which they are able to use for development objectives, for example through concessional lending. [50]

110. Such features should also help MDBs address some of the problems that tend to inhibit private investment in low carbon and climate resilient development outlined in Section 3.2 above. Annual MDB investment in mitigation activities in developing countries was about $19 billion in 2010.[51] In this section we first examine the potential for MDBs to leverage shareholder capital as a source for additional climate financing, looking both at the available headroom under the existing capital structure of the MDBs, and also, in the longer term, through possible new climate-related MDB capital increases.[52] Second, we examine the potential for expanding pooled financing arrangements that allow MDBs to mobilize and channel a variety of concessional flows through structured vehicles for climate investment.

3.3.1 Leveraging shareholder capital

111. At the operational level the extent to which MDBs can leverage shareholder capital is determined by their capital adequacy policies, which vary across MDBs to some extent, and also according to the risk profile of the borrower, concentration levels, asset type and other relevant factors. Broadly speaking, however, a useful rule of thumb for the current mix of non-concessional loans on MDB balance sheets is that minimum capital adequacy ratios (expressed as the required on-balance-sheet equity for backing

[50] For further discussion of these points see for example Buiter and Fries (2002), Hagen (2009) and Rodrik (1995).
[51] Background paper for this report on "Climate Finance: Engaging the Private Sector".
[52] A similar proposal is made in an IMF Staff Position Note for a Green Fund that would use an initial capital injection from developed countries in the form of reserve assets to leverage resources from private and official investors by issuing low-cost "green bonds" in global capital markets. (Bredenkamp and Patillo, 2010).

loans) range between 25 and 33 percent.[53] This is broadly consistent with the assumption in the AGF report that every $1 billion of paid in capital leverages $3-4 billion of lending. MDBs can also more effectively target lending to strengthen climate resilience in developing countries by improving the climate-screening of their overall development portfolios.

Use of existing headroom

112. The AGF report itself did not venture an estimate of how much additional climate financing MDBs could in theory leverage from any available headroom in their existing paid-in capital, noting that there were different perspectives on whether such an increase should count as new and additional. It is true that before the recent global financial crisis some MDBs had a certain amount of headroom within their capital structure that could have been used for additional climate finance. This headroom disappeared as the MDBs undertook levels of crisis-related lending that stretched their balance sheets, raising the prospect of a sharp contraction in post-crisis lending capacity. To avoid this scenario shareholders agreed to an MDB capital replenishment calibrated in most cases to the relatively modest aim of meeting existing post-crisis lending needs, rather than creating room for newly identified needs such as climate finance. While additional climate financing could in theory be achieved by increasing the share of climate finance within the existing headroom constraints, there may not in general be a sufficient mandate from the recent capital replenishments to justify an extraordinary use of MDB capital for climate purposes, as the AGF report notes. This is particularly so in light of developing country concerns about crowding out of more traditional areas such as infrastructure, health care and education. In some cases, however, for example the Inter-American Development Bank (IDB), the recent capital increase did include specific climate-related lending targets.[54]

MDB capital increase: technical aspects

113. Given that the latest capital replenishment agreements were concluded just recently and the related capital increases have a number of years remaining to be fully subscribed, extended discussion of a future capital increase for MDBs is premature today. Nonetheless some initial technical analysis may be warranted given the special issues that would arise with a capital increase specially targeted at climate, the long run nature of the climate issue and the likelihood that views may evolve over time, particularly as 2020 approaches. The background paper "*The Scope for MDB Leverage and Innovation in Climate Finance*" provides more details of this analysis.

114. Assuming that the riskiness and pricing of climate financing loans would be comparable to the current mix of loans on MDB balance sheets, and assuming a 25-33 percent capital requirement, every $10 billion of additional paid-in capital could be initially leveraged to support $30-40 billion of additional loans. In addition the repayments from these loans would support further lending of $3-4 billion per year over the longer term, assuming an average loan maturity of about 10 years. Finally, the income from non-

[53] Loans and guarantees create broadly similar credit exposures and hence are treated alike for capital adequacy purposes. As a result, increased usage of guarantees would not enable MDBs to achieve higher leverage on their shareholder capital. However, guarantees remain an attractive means of achieving more private sector leverage, a subject dealt with in more detail in Section 3.2 above.

[54] The IDB's Ninth General Capital Increase approved in 2010 includes a target to increase lending for climate change, sustainable energy and environmental sustainability to 25 percent by 2015.

concessional climate lending could be used to further supplement the leverage achieved by a capital increase. More specifically, most of such net income would arise from the savings to MDBs from not having to pay charges or dividends on their shareholder capital. Assuming a 5 percent interest rate on loans, every $10 billion of new paid-in capital would generate annual income of $500 million, which could also be dedicated to climate investment. If all income was retained to support climate lending, then shareholder capital and lending would both grow at 5 percent per year. After ten years, retained earnings would total an additional amount exceeding $5 billion, leveraging additional loans over $15-20 billion. Alternatively net income could be used to increase the concessionality in climate loan pricing, or in providing grant financing.

115. A key challenge would be how to accommodate a capital increase which aims to increase the flow of climate finance from developed to developing countries within the capital structure of the MDBs. A capital contribution restricted to developed countries (referred to as 'Part I' countries in some MDBs) would normally result in the voting power of these countries increasing relative to that of developing (Part II) countries, a change contrary to the spirit of recent 'Voice and Representation' reforms.

116. There are a number of possible approaches to this problem. One would be for both developed and developing members to subscribe to a general capital increase that would leave the shareholding structure unchanged, but with only the former subscription including a paid-in portion while the latter would be entirely callable. This is legally perhaps the soundest approach, although an analysis of MDB charters would be needed to ascertain if it works for all. An alternative approach would be a selective capital increase with only Part I countries subscribing for non-voting shares. Some Part I members may not be willing or able to forgo such voting rights, however, and further analysis would also be needed to ascertain the legality of this approach under existing MDB charters. Finally, Part I countries could donate money to MDBs, increasing their reserves and allowing leverage. However members would not be entitled to recover donations upon a withdrawal from membership or dissolution of the MDB, reducing the desirability of this option for potential donors.

117. A somewhat separate issue is that a climate finance focused capital increase would tend to increase the lending capacity of the non-concessional arms of MDBs, the bulk of whose operations are directed to creditworthy middle income countries, creating a potential mismatch with the objectives of shareholders, who may wish to focus on concessional financing for low income countries. Other solutions may be more appropriate to fund climate finance in low income countries, for example the options discussed in the next section.

3.3.2 Pooling flows to support targeted concessional lending

118. Given the limited scope for mobilizing additional financing by leveraging their capital in the near-term, MDBs can explore other alternatives for "pooled" financing arrangements which allow them to mobilize and channel concessional flows through structured vehicles for climate finance.

119. These pooled arrangements offer a number of advantages. They allow MDBs to mobilize off-balance- sheet resources from multiple sources, including traditional sovereign donors as well as non-traditional sources such as private foundations and emerging sovereigns. They allow new ways for donors to contribute (beyond traditional grants), for example through long-term concessional loans.

Pooled arrangements can be structured in ways that accommodate the different risk-return appetites of donors, while also allowing great flexibility in providing instruments tailored to the needs of a wide variety of recipients. Large pooled arrangements also offer significant economies of scale and administrative efficiencies. MDBs could also better align disaster risk reduction and reconstruction financing and climate-financing, including under a variety of pooled arrangements.

120. A number of types of pooled financing arrangements have evolved in recent years, providing ideas for expansion in coming years as well as opportunities for cross-sectoral learning.

Climate-specific financial intermediary funds

121. There are now six multi-donor financial intermediary funds (FIFs) that focus on climate, with more than $10 billion in cumulative pledges and contributions and approved outlays for projects of $6.7 billion.[55] The World Bank acts as a trustee to these FIFs, and the Bank, other MDBs and UN agencies are among the implementing agencies used to channel resources to recipients. Examples of innovations in fund-raising developed by these FIFs include:

- *Bilateral donor contributions in the form of concessional loans,* for example concessional loans to the Clean Technology Fund under the Clean Investment Funds (CIFs) totaling €703 million by France and Germany;

- *Funding through monetization of offsets,* for example financing of the Adaptation Fund through a levy on Certified Emission Reductions (CERS) issued under the Clean Development Mechanism;

- *Funding from private foundations.* A small but growing share of the contributions of private foundations has targeted climate change: U.S. foundations (which comprise about three-quarters of global foundation giving) gave about $338 million for international climate change purposes in 2007, of which about 39 percent was donated through global programs such as the CIFs and about one-quarter funded policy work.[56] Foundation giving for climate change has focused in particular on helping low-income populations, both by improving resilience to climate change and by supporting mitigation efforts, in sectors such as sustainable forestry and agriculture. Many of these efforts, such as the Global Alliance for Clean Cookstoves, have used a partnership model where participants contribute in a range of ways, both financially and in-kind. MDBs have worked with these foundations both by managing global programs and by supporting partnerships financially and through knowledge-sharing and convening of stakeholders.

122. These funds have expanded the pool of resources dedicated to climate finance by enabling a range of donors to contribute in both traditional and non-traditional ways, thereby facilitating additional

[55] These comprise the Global Environment Facility (GEF), the two UNFCCC GEF-managed special funds (Special Climate Change Fund, or SCCF, and Least Developed Countries Fund, or LDCF), the two Climate Investment Funds (Clean Technology Fund, or CTF, and Strategic Climate Fund, or SCF), and the Adaptation Fund established under the Kyoto Protocol. All but the Climate Investment Funds operate as financial mechanisms under the UNFCCC, and, in the case of the GEF, other conventions. See World Bank (2011b).

[56] The U.S. Overseas Private Investment Corporation (OPIC) has also committed over $500 million to date to support private equity funds investing in international clean energy projects.

co-financing of climate investment by MDBs. Lower all-in financing costs resulting from the blending of concessional terms with standard MDB terms improve the viability of low-carbon investments.

Targeted investment vehicles

123. Targeted investment vehicles enable donors and investors to focus resources on specific sectors, often by providing complementary tranches that each have different risk and return profiles. Tranching in this way helps mobilize funding from investors whose investment parameters would not otherwise enable them to invest in emerging-market clean-energy projects. An example of this approach is the *Global Climate Partnership Fund (GCPF)* developed by the IFC as a debt investment vehicle (proposed for up to US$500 million) that will provide financing mainly for on-lending through financial institutions for renewable energy and energy efficiency projects by small and medium-sized enterprises and households in developing countries. The Fund will issue a range of senior, mezzanine and junior shares and notes that aim to accommodate the investment parameters of a wide range of investors.[57]

Learning opportunities: Pooled financing arrangements in the health sector

124. Pooled financing arrangements that have proven valuable in addressing financing challenges for communicable diseases could provide useful lessons for climate finance. (See Appendix 2 for further information on these examples of pooled financing arrangements.)

- One example is the pilot Advance Market Commitment (AMC), a "market pull mechanism" that incentivizes private sector pharmaceutical companies to deliver vaccines to developing-country markets by guaranteeing a minimum level of demand and a stable product price for a set period of time. The AMC brings together resources from traditional donors with a foundation (the Bill & Melinda Gates Foundation) and an emerging BRIC country (Russia). Drawdowns under long-term, legally binding donor commitments are structured to accommodate the disbursement schedule of the AMC. Pull mechanisms can have wider applicability in areas such as climate change mitigation by similarly removing obstacles to private sector investment. For example, they could be replicated in the renewable energy sector to provide long-term, legally-binding donor commitments to support payment of feed-in tariffs.

- Another example is the International Finance Facility for Immunization (IFFIm), which "front-loads" financing needed for immunization programs in the poorest countries. Using legally binding, long term, future donor commitments to issue bonds, IFFIm makes more money available *now* for vaccine purchase and delivery. The applicability of this structure to the climate finance arena merits further analysis, particularly in areas where large upfront capital investments are needed.

[57] The Fund is intended to have four tranches: (i) junior C shares, (ii) mezzanine B shares, (iii) senior A shares, and (iv) senior notes. KfW, IFC and one other development finance institution are expected to invest up to US$75 million each in A and B shares. Germany and Denmark have invested €22.5 million and €5 million, respectively, for C shares.

Key considerations and challenges

125. A number of issues will need to be carefully considered in expanding the use of pooled financing arrangements. First, proposals for new financial arrangements need to be reviewed in the context of the broader international financial architecture, with an eye on whether they mobilize additional resources and complement existing arrangements or present potential competition and fragmentation of aid delivery. Second, pooled arrangements have not yet been able to attract large sums from non-traditional donors – the challenge here is to provide compelling value propositions that clearly demonstrate value for money. Finally, one size does not fit all. Mechanisms such as IFFIm could be structured to address climate finance needs only if there is a compelling case for front-loading, and if donors are able to make the long-term, legally-binding commitments required under such schemes.

4 Monitoring and Tracking Climate Finance Flows [58]

126. The Copenhagen Accord and Cancun Agreements formalize a collective commitment by developed countries to provide new and additional funding for action on climate change in developing countries both in the short- and longer-term "*from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources".* This collective financial commitment requires a system to measure, report and verify (MRV) the relevant financial flows across a variety of sources. Such a system should help assess – individually and collectively - whether or not commitments are being met, and to facilitate the implementation of these commitments by identifying where progress could be made. Ideally, such a system should ensure transparency and accountability. This in turn would require comprehensive, accurate and comparable information such that aggregation across sources of information is possible.

127. There is considerable agreement, however, that the existing effort to track climate finance lacks transparency, comparability and comprehensiveness. One problem is that, despite a number of provisions in the UNFCCC outlining key principles, there is no internationally agreed definition of what counts as "climate finance." There is therefore no agreed basis for measurement or methodology for tracking. Measuring adaptation finance is particularly challenging given its intricate linkages with development. There is also currently no formal definition of private climate finance and no dedicated systems to track private climate finance. This is compounded by confidentiality issues. Matters are somewhat better for public climate finance flows, where working definitions already exist, for example related to the Creditor Reporting System of the OECD DAC which has clearly defined Policy Markers for Climate Change Mitigation and Adaptation (the so-called "Rio Markers" – see also Box 5). These can be built upon using ongoing work in the aid community, for example to also monitor in-country flows of public climate finance.

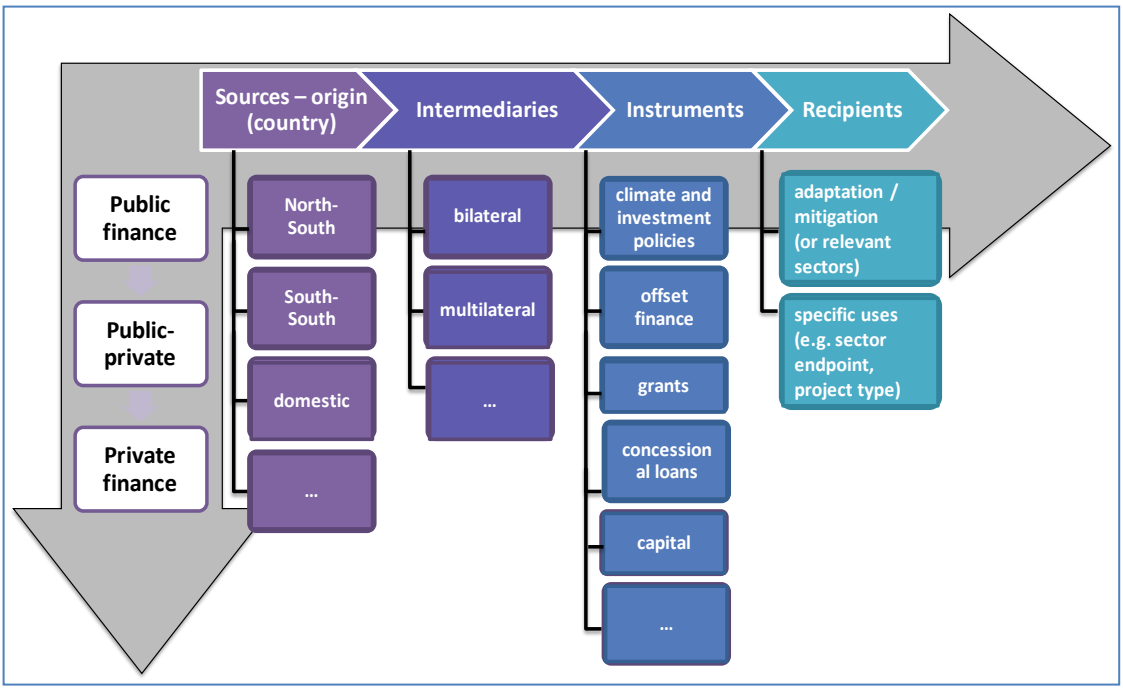
128. The Cancun Agreements recognize the shortcomings of current reporting of climate finance under the UNFCCC and have called for significant improvements on this issue, both regarding the frequency and coverage of reporting. They call for strengthening national communications, increasing the frequency of reporting via biennial reports to be reported by developed and developing countries, and the creation of

[58] This discussion draws on Buchner, Brown and Corfee-Morlot (2011).

a registry to record developing countries' mitigation action seeking international support and associated funding needs. All these items include some elements of climate finance reporting. Importantly, the Agreements call for strengthened reporting on climate support both from developing countries as recipients and from developed country donors.

129. Recent work by the OECD/IEA Secretariats (Buchner, Brown and Corfee-Morlot, 2011) proposes a useful multidimensional conceptual framework (Figure 3) to organize thinking about the kinds of information that could be tracked in a comprehensive MRV system for climate finance and to provide a basis for discussion. Development of a comprehensive framework would clearly be a step-by-step process, on the basis of dialogue to achieve consensus on key definitions, methods and approaches, allowing reporting countries, relevant inter-governmental organizations and other stake-holders to build capacity to provide higher quality and more complete information over time. Among the steps that can be prioritized for action:

Figure 3: The Dimensions of Climate Finance



Source: Buchner, Brown and Corfee-Morlot (2011).

- Adopt clear definitions of climate finance spanning both public and private sources and prioritize work to improve standardized tracking of international climate finance flows from both a donor and a recipient perspective.
- Explore various avenues of tracking climate finance within a more comprehensive MRV system, drawing the lessons from existing information systems.
- Improve reporting of public climate finance flows from both a donor and a recipient perspective building on existing information systems, ongoing efforts to improve these (e.g. inter alia,

UNFCCC national communications, DAC CRS) and new reporting tools established under the Cancun Agreements (i.e. biennial reports, registries).

- Extend reporting to include a basic reporting of private climate finance. A minimum level of information could be ensured by requesting public finance sources to report on leveraging ratios and by streamlining the reporting on finance flowing through carbon markets.

126. In support of collective action to develop a comprehensive system to MRV climate change finance, the World Bank is in the process of introducing a system that will measure the share of investments that provide adaptation and mitigation co-benefits in each new project in its portfolio, down to the project sub-component level. This is considered a promising start and a step towards building on the Rio markers currently in use by OECD DAC countries. The World Bank is cooperating closely with other MDBs and the OECD DAC secretariat with a view to harmonising the methodologies across these systems so that climate finance data will be comparable across the multilateral banks and bilateral donors. The tracking system will be operationalized for the World Bank's portfolio in fiscal year 2012.

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Appendix 1. List of contributions and background papers

Milan Brahmbhatt and Jane Ebinger of the World Bank were, respectively, principal author and team coordinator for this synthesis report on "Mobilizing Climate Finance". Andrew Steer, the World Bank's Special Envoy for Climate Change, and Otaviano Canuto, Vice President of the World Bank's Poverty Reduction and Economic Management Network, provided overall guidance and oversight for the work. Michael Keen (IMF) led the work stream on sources of public finance. Helen Mountford led OECD contributions on the analysis of fossil fuel support, monitoring and tracking of climate finance and other inputs. The work stream on private leverage was led by Shilpa Patel and Josue Tanaka, at the IFC and EBRD respectively. Philippe Ambrosi, Priya Basu and Lisa Finneran of the World Bank led the work streams on carbon markets and leveraging multilateral flows. Jane Hupe and Eivind Vagslid coordinated comments and information on behalf of the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) respectively. RDB input to the synthesis paper was coordinated by Martin Poulsen at AfDB, Samuel Tumiwa at ADB, Josue Tanaka at EBRD, Matthias Zoellner at EIB and Walter Vergara at IDB. Valuable comments were also provided by the UN and the UNDP.

Contributions to the preparation of the synthesis report and background materials were also provided by: Philippe Benoit, Veronique Bishop, Ari Huhtala, Masami Kojima, Aditi Maheshwari, Susan McAdams, Alan Miller, Klaus Opperman, Lasse Ringius, Chandra Shekhar Sinha, Jon Strand, Trichur Sundararaman, Stacy Swann, Maria Vagliasindi, Vikram Widge (World Bank Group); Ian Parry and Ruud de Mooij (IMF); Julia Benn, Jan Corfee-Morlot, Robertus Dellink, Valerie Gaveau, James Greene, Christopher Kaminker, Tamara Levine, Virginie Marchal, Remy Paris, Andrew Prag, Jehan Sauvage, Cristina Tebar-Less, Marie-Christine Tremblay (OECD); Monojeet Pal, Obi Okoye (AfDB); Robert Schoellhammer, Lu Xuedu (ADB); Claudio Alatorre, Maria Netto (IDB); Tetsuya Tanaka, Theodore Thrasher (ICAO); Jo Espinoza-Ferrey, Leigh Mazany (IMO). Andre Stochniol (IMERS) provided helpful comments and information. Team support was provided by Elif Kiratli and Alexandra Sears (World Bank).

Detailed background papers prepared for the report are listed below:

IMF (2011). *Promising Domestic Fiscal Instruments for Climate Finance,* International Monetary Fund.

IMF and World Bank (2011). *Market-based Instruments for International Aviation and Shipping as a Source of Climate Finance*, International Monetary Fund/ World Bank.

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[59] OECD Secretariat providing inputs to this background paper include: Jan Corfee-Morlot, Robertus Dellink, Andrew Prag

[60] With inputs by Josue Tanaka, EBRD.

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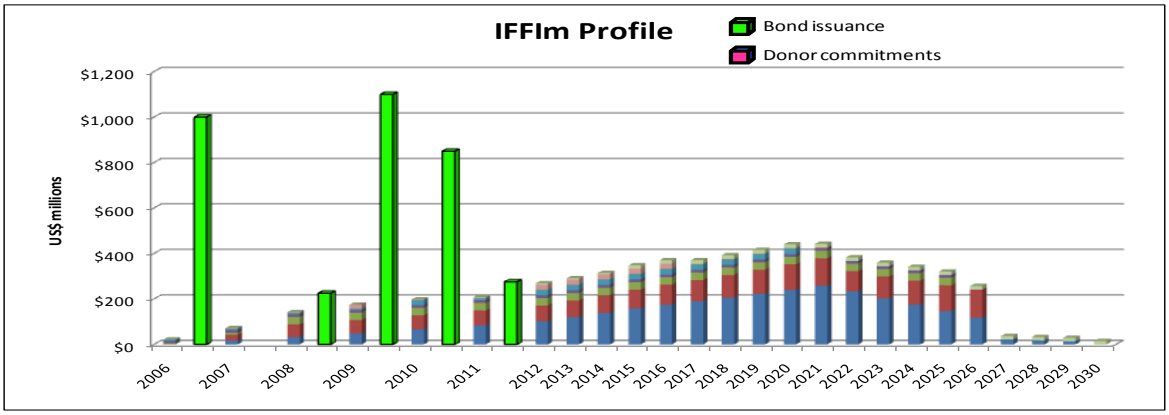
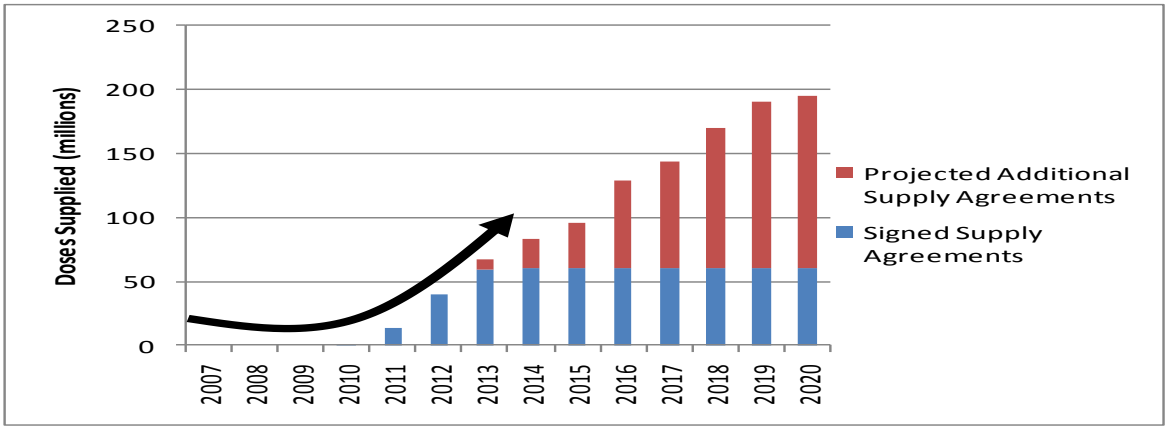
Appendix 2. Learning opportunities for innovative climate financing: IFFIm and AMCs

Pooled financing arrangements, such as the International Finance Facility for Immunization **(**IFFIm) and Advance Market Commitments (AMCs), have proven valuable in addressing financing challenges for communicable diseases. They could provide useful lessons for climate finance.

IFFIm: Using long term, legally binding, future donor commitments to issue bonds, IFFIm makes more money available *now* for vaccine purchase and delivery. IFFIm was able to front load $1 billion of future donor commitments in the first year of operations, which would have taken nearly 7 years to raise otherwise. It followed that success with an additional $2.4 billion in the next 4 years that would not have been available for a further decade. The early investment of this $3.4 billion into vaccinating children will have a tremendous leveraging effect for recipient countries. Frontloading of funds to achieve a climate objective provides similar leveraging benefits as the cost of addressing climate change impacts will grow the longer the problem is unchecked. The applicability of this model to the climate finance arena merits further analysis, particularly in areas where large upfront capital investments are needed.



The Pilot AMC: offers long-term, results-based payment contracts to private sector manufacturers to produce and deliver pneumococcal vaccines to markets that they had considered too risky. From a nonexistent market to a current contracted market of 60 million doses of per year (and rising), the AMC has been successful in pooling $1.5 billion of traditional donor funds to engage significant investment of private sector funds. "Pull" mechanisms such as these can have wider applicability in areas such as climate change mitigation by similarly removing obstacles to private sector investment, notably, the lack of sufficient bankable revenue streams to enable sponsors of low-carbon investments to secure sufficient loan funding. For example, a pull mechanism could be constructed to support renewable energy feed-in tariffs (FiTs) in developing countries for a set period of time. Participation in such a mechanism could be in exchange for the right to emission reduction credits, which in the current market do not provide a bankable source of revenue.

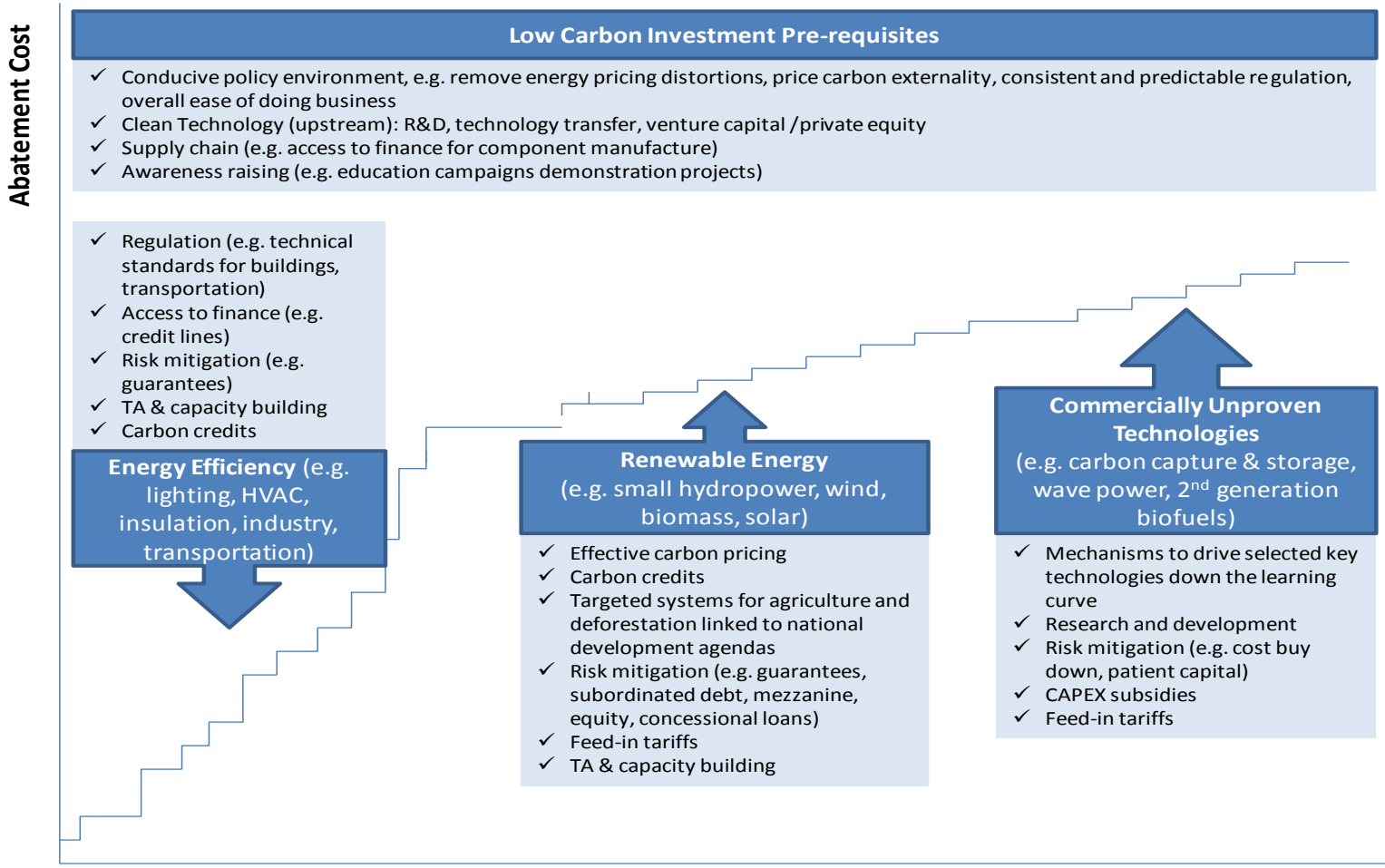

Doses Supplied (millions)
250
200
150
100
50
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Projected Additional Supply Agreements
Signed Supply Agreements

Appendix Table 1: Matrix of fossil fuel support measures, with examples

Transfer Mechanism (how a transfer is created)	Statutory or Formal Incidence (to whom and what a transfer is first given)									
	Production							Direct consumption	
	Output returns	Enterprise income	Cost of intermediate inputs	Costs of Production Factors				Unit cost of consumption	Household or enterprise income
				Labour	Land	Capital	Knowledge		
Direct transfer of funds	Output bounty or defficiency payment	Operating grant	Input-price subsidy	Wage subsidy	Capital grant linked to acquisition of land	Capital grant linked to capital	Government R&D	Unit subsidy	Government-subsidized life-line electricity rate
Tax revenue foregone	Production tax credit	Reduced rate of income tax	Reduction in excise tax on input	Reduction in social charges (payroll taxes)	Property-tax reduction or exemption	Investment tax credit	Tax credit for private R&D	VAT or excise-tax concession on fuel	Tax deduction related to energy purchases that exceed given share of income
Other government revenue foregone	Reduced resource-rent tax		Under-pricing of a good, government service or access to a natural resource		Under-pricing of access to government land; reduced royalty payment		Government transfer of intellectual property right	Under-pricing of access to a natural resource harvested by final consumer	
Transfer of risk to government	Government buffer stock	Third-party liability limit for producers	Provision of security (e.g., military protection of supply lines)	Assumption of occupational health and accident liabilities	Credit guarantee linked to acquisition of land	Credit guarantee linked to capital		Price-triggered subsidy	Means-tested cold-weather grant
Induced transfers	Import tariff or export subsidy	Monopoly concession	Monopsony concession; export restriction	Wage control	Land-use control	Credit control (sector-specific)	Deviations from standard IPR rules	Regulated price; cross subsidy	Mandated life-line electricity rate

Source: OECD secretariat background paper for this report on fossil-fuel support.

Appendix Table 2: Stylized Marginal Abatement Cost Curve,
Financial instruments and support mechanisms to facilitate energy sector investments



Source: Adapted from Pathways to a Low-Carbon Economy, Version 2 of the Global Greenhouse Gas Abatement Cost Curve, McKinsey & Company, 2009

Source: Background paper for this report on "Climate Finance: Engaging the Private Sector".