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Task Force on Low-Carbon Prosperity

Recommendations

October 2009

The views expressed herein represent a collation of various viewpoints emerging from a series of discussions among the participants in the Task Force on Low-Carbon Prosperity. They do not necessarily reflect the individual institutional viewpoints of any of the Companies or Institutions who took part, or of the World Economic Forum.

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Preface

The World Economic Forum is pleased to release the recommendations of the Low-Carbon Prosperity Task Force, a business-led multistakeholder collaboration that has engaged over 80 Forum Industry Partners and experts from nearly 40 academic, non-governmental organizations and public sector institutions over the past six months.

In January, at the World Economic Forum Annual Meeting 2009 in Davos-Klosters, Switzerland, United Kingdom Prime Minister and Group of 20 Chairman Gordon Brown appealed for “business to formulate with us the economic and policy conditions that will incentivize their investment and that will bring the low-carbon economy into being.” To this end, he called on the Forum to facilitate a “new business-led mission in support of an ambitious climate agreement in Copenhagen, focused on the policies that will lead to business investment in a low-carbon recovery.”

In response, the Forum organized six multistakeholder working groups to examine how the transition to a low-carbon growth could be accelerated in key areas. These industry executives and experts collaborated in a series of workshops and virtual meetings on the Forum’s WELCOM platform. The implications of their work are profound. Their proposals constitute a potential new dimension of the emerging international architecture on climate change – a series of practical public-private collaborations to enable faster progress within the overarching framework that governments negotiate.

This report builds on two prior phases of work that Forum Members have undertaken on climate change in cooperation with governments. The first was a task force of 24 CEOs that issued initial policy suggestions to G8 leaders before their 2005 Gleneagles Summit at the invitation of Prime Minister Tony Blair. The second was a detailed set of recommendations on the design of a long-term policy framework developed as part of the Gleneagles Dialogue and endorsed by over 100 CEOs from every region and industrial sector. Transmitted in June 2008 to G8 Leaders before their summit in Hokkaido-Toyako, these CEO recommendations were the starting point for the Task Force’s work.

The World Economic Forum would like to express its gratitude to all Task Force participants and their organizations for their deep commitment and continued engagement, as well as to PricewaterhouseCoopers, which served as the project adviser to this initiative. Although the observations and proposals in this document enjoy broad support, they do not necessarily reflect the views of every individual participant. A full list of the current participants in the Task Force can be found at end of this document.

We also wish to thank Prime Minister Brown and the UK government for their inspired leadership and support. That so many of our Industry Partners and non-business constituents responded to his challenge is a testament to the growing support within the international community for an effective international strategy to address climate change.

Special thanks are also due to those in the Forum’s Environmental Initiatives team who manage the various working groups, including Brindusa Fidanza and Shruti Mehrotra, as well as Martijn Broekhof, seconded to the Forum from PricewaterhouseCoopers.

We hope that these recommendations will stimulate a wider debate among economic, environmental and foreign affairs officials about the contribution that public-private collaboration can make to the achievement of a prosperous, low-carbon future, including in developing countries.

Sincerely,



Richard Samans
Managing Director



Dominic Waughray
Senior Director, Environmental Initiatives

Executive Summary

Background

In June 2008, over 100 CEOs from every industrial sector and region of the world transmitted a set of detailed recommendations to G8 leaders for the design of a post-Kyoto Accord long-term climate framework that would be both environmentally effective and economically efficient¹. At the heart of the recommendations was a call for public-private collaboration to construct enabling mechanisms in such areas as investment, energy efficiency, technology development and common metrics to help catalyse private investment and innovation on a scale necessary to transform energy systems around the world over the next few decades. The CEOs argued that this “bottom-up” climate architecture is needed to facilitate achievement of the “top-down” national commitments and global goals that governments are seeking to establish in a new United Nations climate accord.

At the World Economic Forum Annual Meeting 2009, Prime Minister Gordon Brown of the United Kingdom asked the Forum to facilitate a business-led Low-Carbon Prosperity Task Force to build on the CEO recommendations by detailing *how* this bottom-up enabling architecture should be designed and implemented². He requested that a first report of specific proposals and policy recommendations be delivered to governments by September 2009 for economic, finance and environmental officials to have time to consider them in relation to the crucial United Nations Framework Convention on Climate Change negotiations in Copenhagen (COP15) in December 2009³.

Over 80 Forum Industry Partners from all sectors and regions have answered Prime Minister Brown’s call. Representing close to 20% of the market capitalization of all publicly-traded corporations in the world, these companies have delegated senior executives and specialists to work with counterparts from over 40 NGOs, universities, think tanks, international agencies and governments. In total, over 200 professionals worldwide are contributing to the Low-Carbon Prosperity Task Force.

Over the past six months, this extraordinary constellation of many of the world’s leading experts on low-carbon growth has developed concrete proposals in the seven areas requested by the prime minister: energy efficiency; technology development; investment; common metrics; deforestation; market mechanisms; and adaptation.

Overview of Recommendations

A successor to the Kyoto Protocol that establishes stronger national targets and international mechanisms for emissions reductions is essential in order to send clear signals to investors, managers and consumers. But, while agreement among governments in Copenhagen on the shape of a new UNFCCC climate protocol is necessary to place the world economy on a low-carbon trajectory as recommended by the scientific community, it will not be sufficient.

An unprecedented shift in private sector investment and behaviour will be required within the next 10-15 years to meet the goal of avoiding dangerous climate change⁴. Based on current trends, national policies and measures (such as cap and trade programmes or other carbon regulations) are unlikely to be ambitious enough to provoke such a major economic transformation within this short time frame.

For this reason, the new climate regime should have a very different geometry than its predecessor. In addition to top-down elements such as binding national commitments, other mechanisms and initiatives are needed to stimulate a shift in private sector behaviour more directly and rapidly.

Governments must create clarity about the successor to the Kyoto Protocol in Copenhagen but they should also build a complementary enabling architecture capable of accelerating progress within the private sector over the next five to ten years in those areas with greatest potential to lower the carbon intensity of economic growth, such as energy efficiency, technology development, low-carbon infrastructure investment and deforestation, especially in developing economies.

Adding such a bottom-up dimension to the global climate agreement would be in the political interest of all governments for three reasons:

- 1) A more direct, results-oriented push on energy efficiency, technology, investment, deforestation and adaptation is essential to add credibility to the mid-term targets set by a new United Nations accord.
- 2) Given the scale of investment required and the recent deterioration of public finances in many countries, only by building mechanisms that leverage increased public resources with much larger amounts of private sector capital will promises by developed countries to provide financial and technical assistance to developing countries be credible.
- 3) Since it will take time to agree on the details and implement a new global climate deal, it is important to press ahead with concrete actions. An official initiative to build an effective set of mechanisms that engages the private sector and speeds the pace of low-carbon technology deployment, development and related investment in economies around the world would provide the international community with an insurance policy so that political momentum on climate change is maintained, even if the climate negotiations are not fully resolved by the end of this year.

Accordingly, the Task Force recommends that UNFCCC parties agree at COP 15 to create a set of public-private initiatives in close consultation with business and other non-governmental experts. This would create a bottom-up dimension to the world's climate strategy that would complement and enable the new negotiated agreement. The process to create these initiatives should engage finance, economic, energy and environmental officials in substantive dialogue with business and other nongovernmental experts over the next two years. The Major Economies Forum offers one possible platform for organizing this public-private collaboration for the benefit of the wider United Nations process. Alternatively, a process of variable geometry could be considered in which discussions on individual proposals are pursued in the most relevant fora. The Task Force is prepared to assist if requested.

This summary section presents highlights of the concrete proposals the Task Force has developed, which could serve as a starting point for these discussions. Detailed descriptions of these recommendations are contained in the full papers of each corresponding working group, which make up the remainder of this report.

In brief, the Task Force proposes a suite of substantive, international public-private initiatives to include:⁶

Energy Efficiency

- A **global platform for intra-industry cooperation on energy efficiency** via the addition of a private sector dimension to the International Partnership for Energy Efficiency Cooperation (IPEEC) at the International Energy Agency
- As part of this, development of a set of **globally-accepted, minimum energy-efficiency standards** on a limited but critical range of energy-intensive industrial and consumer goods, as well as with respect to the retrofitting of old and construction of new buildings

Technology Development

- An international public-private portfolio of **10 large-scale integrated smart grid demonstration projects** across different regulatory regimes
- An international public-private portfolio of up to **25 carbon capture and sequestration demonstration projects** between 2013 and 2025
- A network of **regional energy research and innovation centres** modelled on the Consultative Group on International Agricultural Research (CGIAR) to help developing countries accelerate the uptake of renewable energy technologies to help implement their low-carbon growth plans
- An **international public-private dialogue to prepare the ground for an international agreement to remove environmentally harmful energy subsidies**, for formal consideration by governments during 2011
- **An informal international public-private dialogue to discuss the role of nuclear power** in the low-carbon economy and how the related policy architecture should be designed to reflect its contribution

Investment in Developing Countries

- A suite of **public-private, low-carbon infrastructure investment funds** in each developing country region, ready for business by 2013 and able to mobilize up to US\$ 75 billion per fund every three years to 2030

Common Standards and Metrics

- **A joint project of the International Accounting Standards Board (IASB) and the Climate Disclosure Standards Board (CDSB) to develop a principles-based international financial reporting standard** for corporate climate disclosure suitable for ultimate adoption by regulators
- **A global standard for the labelling of emission footprints** on consumer products, building on work currently underway in the non-governmental organization community

Avoided Deforestation and Land Use Change

- An **international public-private dialogue to “Build REDD+”** launched at COP15, hosted by key forest nations and involving international organizations, the scientific community, civil society and the private sector

Market Mechanisms

- A transparent and structured **public-private expert dialogue to help develop the rules and institutions necessary to create efficient, linked carbon markets**

Adaptation

- **A major public-private dialogue on adaptation** hosted by developing countries and involving the private sector, international organizations, bilateral aid agencies and civil society at COP15 or shortly thereafter

1 Energy Efficiency

The most effective strategy available for quickly shifting the carbon profile of major economies is to scale the application of best available technologies. Improving energy efficiency represents the largest, most cost-effective and immediately available way to mitigate GHG emissions. For example, in the International Energy Agency's (IEA) 2008 *World Energy Outlook*, energy efficiency gains account for over 50% of the abatement potential in its 450 ppm policy scenario⁷.

Project Catalyst estimates that investments in energy efficiency could provide 35% of the emission reductions required by 2020⁸. Moreover, most of these reductions could pay for themselves. Recent analysis by the McKinsey Global Institute suggests that 6.5-8 Gt of abatement could be achieved at an average internal rate of return of 17%⁹.

To capitalize more fully on this opportunity for progress, the Task Force Working Group on Energy Efficiency proposes creation of:

- **A scalable platform to enable worldwide progress on energy efficiency within individual industry sectors.** Specifically, the May 2009 agreement among G8+5 countries to create an International Partnership for Energy Efficiency Cooperation (IPEEC) at the International Energy Agency¹⁰ should be given an explicit, new private sector dimension, providing an officially sanctioned and supported global platform for voluntary intra-industry discussions and cooperation on energy efficiency within many sectors. This initiative would be aimed at replicating many of the features of the Japanese government's successful Top Runner programme in which various industries were encouraged to make continuous progress towards best-in-class efficiency benchmarks¹¹.

Such intra-sectoral cooperation might take the form of creating common measurement and benchmarking methodologies; negotiating arrangements to share or transfer technology; recommending standards for government procurement; establishing industry-wide emission targets, standards and/or product labelling frameworks; or a combination of some or all of the above. The process would be open to companies from all countries.

- **An initiative to create a set of globally-accepted energy performance standards on a limited but critical range of energy-intensive industrial and consumer products, potentially combined with a globally coordinated early retirement programme.** Implementation of global product energy performance standards would deliver significant energy and financial savings for consumers and businesses and would benefit manufacturers by harmonizing existing national standards, reducing trade barriers and opening up new market opportunities. This initiative could build on the strong experience and learning that has been achieved from the Top Runner programme and other successful standard setting methods in the US and EU on the most energy-intensive products. In addition, product energy performance standards could be combined with national measures to promote early retirement of inefficient goods, which could further deliver a win-win effect across the world economy, simultaneously driving lower energy consumption, lower overall costs to businesses and consumers and giving manufacturing activity a boost in critical industries. This early retirement programme could be repeated over time to produce successive waves of improvement within given product categories until the potential for efficiency gains within them with best available technology was mostly exhausted.

The process would be structured as a business-government dimension of IPEEC, linking the voluntary industry discussions proposed above with the intergovernmental dialogue the IPEEC member governments have already planned to establish.

- **As part of this public-private, standard-setting process, a special sectoral initiative to set standards relating to the retrofitting of old and construction of new buildings.** The built environment is the sector with one of the highest potentials for energy efficiency reductions¹³. This initiative would seek to implement common energy performance certification and labelling methodologies; adopt and enforce binding zero net energy targets for all new and existing buildings; finance and deliver whole building efficiency retrofits to existing buildings; and drive innovation through voluntary programmes and public funding for research and development.

- **A set of regional, energy-efficiency capacity building centres to support the diffusion of best available technologies in developing countries.**

Based on positive experiences of semi-governmental agencies such as the Carbon Trust in the United Kingdom¹⁴ and foundations such as the Energy Foundation in the United States¹⁵, these centres would provide advice, support and capacity to national governments, especially in developing countries, to help formulate effective energy efficiency policies as well as offer practical advice and technical services to businesses and consumers on how to implement energy efficiency measures. These activities could form part of the set of energy innovation centres discussed in section two below, thus creating an international network of applied energy efficiency expertise.

2 Accelerating Investment in Low-carbon Technologies

The international community's ability to transform energy systems to meet future demands for growth and lower GHG emissions will ultimately depend on a burst of technological innovation over the next few decades. The potential of key low-carbon technologies is now well known – the latest microeconomic analysis suggests they can offer up to 11% of GHG abatement potential to 2030; and up to 27% by 2050¹⁶.

Technology's biggest contribution to a low-carbon future will be its ability to expand low-carbon choices and make the options ever cheaper. This requires driving technologies down the cost curve through advancements in science, engineering and mass deployment. The long-term, risky and often very costly nature of research, development and deployment of potentially revolutionary technologies requires intensified and better coordinated public and private sector efforts.

To this end, the Task Force Working Group on Accelerating Investment into Low-Carbon Technologies proposes creation of:

- **A public-private initiative to create an international portfolio of 10 large-scale integrated smart grid demonstration projects across different regulatory regimes.** There is a need for public-private partnership investment and risk sharing via a series of proof point demonstration projects to help transcend the current challenges facing the smart grid industry and to clearly illustrate the value proposition to investors and governments¹⁷. Creating a number of well designed pilot projects 2010 onward across 10 cities in the European Union, China, South Asia and the United States to represent a range of implementing environments, and sharing the learning in an open source platform will enable the smart grid industry to reduce its risk premium on capital and operating costs to a level that makes its investment case more viable.

Within the 10-city context, linkages to programmes designed to reform the utility business model and implement building standards and electrified transportation networks could also be pursued, creating a set of integrated low-carbon city demonstration projects. As the G20 chair for 2010 and leader of the smart grid technology working group of the Major Economies Forum, South Korea would be well positioned to help catalyse such an international initiative.

- **A public-private initiative to create an international portfolio of up to 25 carbon capture and sequestration (CCS) demonstration projects between 2013 and 2025.** Demand for coal has been growing faster than any other energy source and is projected to account for more than one-third of incremental global energy demand to 2030¹⁸. The development and testing of competing CCS technologies could be accelerated through a coordinated series of large-scale targeted demonstration projects over the coming decade. These demonstration projects would be jointly funded by governments and companies, with the financing of the incremental cost for CCS being supported by developing countries, multilateral development banks and available carbon financing mechanisms.

Partnership arrangements could be struck on bilateral or plurilateral basis among the United States, China, European Union, Australia, South Africa, India and other countries. Once the technical viability of various CCS approaches is better established through this global initiative, developed and developing country governments could consider whether to establish a comprehensive global strategy to deploy the best technologies at scale by introducing into the post-Kyoto framework a sector-based approach on coal-fired power plants and/or including various financing mechanisms such as an international carbon sequestration unit within the Clean Development Mechanism (CDM).

- **A network of regional energy research and innovation centres modelled on the Consultative Group on International Agricultural Research (CGIAR)¹⁹.** The Consultative Group on International Energy Research (CGIER) would facilitate applied research programmes on locally-relevant low-carbon energy solutions through open source collaboration among academics, businesses and other actors, similar to the multistakeholder GreenTech model in China²⁰.

In addition, they could develop full life-cycle views on regional technology innovation, offering regional “pull” models for technology diffusion; facilitate regional intellectual property rights mechanisms, such as patent trading platforms; stimulate research and dialogue on pathways to reductions in harmful energy subsidies; and promote efforts to bring to scale solar photovoltaic (PV) technology (especially across the US, Japan EU, India and China), distributed models of solar PV (especially across India, the Middle East/North African and sub-Saharan Africa) and advanced wind and biofuel technologies.

Funding for the centres would be drawn from a range of public, private and philanthropic sources. Their main purpose would be to support nationally appropriate mitigation action plans through the mobilization of multistakeholder networks of expertise both inside and outside the region in question.

- **An informal intergovernmental dialogue on energy subsidies.** According to recent OECD modelling, eliminating the US\$ 310 billion of annual energy subsidies to developing country consumers would reduce emissions in some countries by over 30% by 2050, and reduce global GHG emissions by about 10% by 2050 while at the same time raising economic efficiency²¹. For example, the OECD suggests that energy subsidy removal would lead to an increase in household real income by 2.5% in India and by 0.7% in China by 2050.

A platform should be created early in 2010 to enable the major energy producing and consuming economies to engage in an informal intergovernmental dialogue, informed by private sector and expert representatives, to develop a potential international agreement on energy subsidies, for formal consideration by Parties to the Conference, or the G8/G20 during 2011 or 2012.

- **An informal international public-private dialogue on the role of nuclear power in the low-carbon economy.** A platform should be created early in 2010 to enable governments and experts to discuss the role of nuclear power in the low-carbon economy and how the related policy architecture should be designed to reflect its contribution, including the establishment of international procedures frameworks and targets, such as for safety, standardization and security issues.

3 Investment in Developing Countries

Seventy-seven per cent of the energy infrastructure that will be needed by 2030 has yet to be built²². The IEA forecast that the majority of these projects will be in emerging economies, particularly India and China.²³ Cost estimates vary, but developing countries are estimated to require hundreds of billions of dollars of low-carbon energy investment in the coming 10-15 years to avoid being locked into high-carbon infrastructure for the next half-century. Carbon markets and international offset schemes like the CDM will not be able to deliver sufficient financial flows to meet these investment needs within this time frame. And, while developing economies are justifiably demanding large increases in official development assistance (ODA) from richer countries for this purpose, this is not likely to be feasible at the necessary scale, especially given current levels of public debt among OECD governments and the large funding gap for the Millennium Development Goals they are struggling to close.

Thus, mechanisms are needed to leverage the climate-related increases in ODA that developed countries do provide with larger amounts of long-dated debt and patient equity from private investors, allowing for flows from an international offset market to grow over time. By far the largest potential source of such long-term private investment is institutional investors, such as public and private pension funds, insurance companies, sovereign wealth funds, endowments and private banks. Most institutional investors invest in funds managed by private investment management firms.

This allows them to access a wide variety of investible projects in markets far from their centre of operations, exercise effective governance, achieve targeted “exit” returns and, most importantly, diversify their risk. There is growing interest among such investors in low-carbon infrastructure in developing countries²⁴, but the volume of investment by them remains low because of the considerable risks and uncertainties involved and the related fact that few large, diversified funds exist for this purpose.

The investor community has confidence in multilateral and bilateral development finance institutions and values in particular their ability to enhance the creditworthiness of transactions by participating in or providing credit enhancement to investments. Private investors sometimes require the involvement of the World Bank or regional multilateral development banks (MDBs) before they enter new markets and investment classes in a material way. Accordingly, MDBs and bilateral development finance agencies have an opportunity to play a transformational role in stimulating private energy investment in emerging and developing economies if they find a way to scale their credit support for such transactions.

A public-private investment model in which public credit enhancement and regulatory capacity building is combined with private institutional capital has the potential to unlock significant investment flows for low-carbon energy systems in developing countries, far beyond what can be financed directly from foreign aid budgets.

Accordingly, the Task Force Working Group on Accelerating Investment into Low-Carbon Technologies proposes the creation of:

- **Public-private, low-carbon infrastructure investment funds in each developing country region** (ASEAN and Pacific, China, India, Latin America, Middle East/North Africa, sub-Saharan Africa), which draw in equity from institutional end-investors such as pension and sovereign wealth funds and use a new generation of public finance (risk mitigation) mechanisms from multilateral and bilateral development finance institutions²⁵. An initial, streamlined model (MDB Low-Carbon Challenge Funds) could catalyse up to US\$ 10 billion per region per three-year cycle, ready for business by 2011.

A second, more ambitious model (Regional Low-carbon Cornerstone Funds) could catalyse US\$ 50-75 billion per region each three years and could be ready for business before the start of the second commitment period in early 2013. In this way, the increased official development assistance that developed countries provide in connection with a new agreement under the UNFCCC could be structured to mobilize the maximum possible amount of low-carbon financing for developing countries.

- **MDB Low-carbon Challenge Funds²⁶**. Multilateral and bilateral development finance institutions would bid out preferential access to regional packages of their public finance mechanisms. Leading global (or regional) fund management firms would tender for the bids, explaining how they would leverage the mechanisms on offer to create a new fund (or strengthen an existing one) and generate enhanced investment flows as a result. The credit support packages of development finance institutions would improve the risk/return ratio of projects within these low-carbon infrastructure funds. Based on the reputation and track record of the bidding fund manager, institutional investors could join the fund management firm's bid, offering the multilateral finance institution more confidence about its offer.

The packages of credit support could also be opened to bids from end-investors themselves, who would select their preferred fund managers to administer them. Fund managers would be paid a negotiated fee to manage the fund. The funds could work on a three-year cycle, and the right to access the public finance mechanisms could be re-tendered every five to seven years. The development finance institutions providing the public finance mechanisms would not be involved in specific investment decisions.

- **Regional Low-Carbon Cornerstone Funds²⁷**. Regional cornerstone funds for low-carbon infrastructure would be created and administered by the IADB, AfDB, AsDB, EBRD and EIB or through establishment of specialized institutions modelled on the US Overseas Private Investment Corporation. They would raise anchor equity (e.g. US\$ 5 billion) from major institutional investors as well as official and philanthropic donors and then invite leading global and regional fund management firms to establish low-carbon energy funds, clean infrastructure funds, low-carbon building funds, green-tech funds, etc. by bidding for a distribution of part (e.g. US\$ 1 billion) of the anchor equity. These firms would then galvanize their investor network to raise a further US\$ 4 billion each from the wider universe of secondary institutional investors who invest in global emerging markets.

Multilateral and bilateral development finance institutions active in the region would establish an agreement with these funds to provide preferential access to a tailored package of their risk mitigation instruments. Since most of the funds' investments would have infrastructure-style investment characteristics, they could then borrow from banks and debt capital markets to secure at least a 66% debt-to-equity ratio for their project portfolios. In this way, across the five funds, US\$ 25 billion of public and private investor equity could finance US\$ 50-75 billion of projects on a three-year investment cycle and be re-tendered every five to seven years. During the period 2013-2030, roughly six investment cycles could occur, representing a potential investment flow of up to US\$ 300-450 billion in each of the six regions.

The UN or negotiating parties are invited to ask a group of leading investors, financial experts and industry representatives to work with finance ministers and their officials to develop these ideas. Such a public-private climate finance discussion process could be launched prior to the COP15 meeting in December. It could progress over the next six to twelve months, linked to a suitable international forum. Events such as COP15 and the World Economic Forum Annual Meeting 2010 in Davos in January can provide useful early milestones for the process.

4 Common Metrics

Despite the increase in the number of company reports and shareholder requests for information in recent years, climate-related corporate disclosure in mainstream reports remains the exception rather than the rule. The information that is disclosed varies widely in format from company to company, is typically not globally consolidated and has no common public repository or repositories.

In the absence of a generally-accepted reporting framework, comparative analysis by the investment research community and the dynamics of peer and stakeholder pressure through public benchmarking have yet to fully materialize. With shareholders and managers constrained in their ability to assess relevant, carbon-related risks, financial markets are unable to fully internalize this crucial aspect of environmental sustainability in the allocation of capital.

Moreover, regulators in many jurisdictions are introducing GHG accounting rules that focus on measurement and monitoring of “direct GHGs”, i.e. those emitted directly from facilities owned and controlled by certain companies. A large multinational company operating in Australia, Canada, New Zealand, the United Kingdom, European Union and the United States, for example, is likely to be subject to up to 20 existing or imminent legislative provisions specifically aimed at regulating GHG emissions and energy use. These national differences in approach are producing variations in the quality, quantity and relevance of disclosure, and are fostering uncertainty among preparers about what they should report and how to comply with user needs.

In other words, a lack of comparable, comprehensive and reliable climate-related information from corporate emitters is a significant impediment to the transition to a low-carbon model of economic growth. Fortunately, a *de facto* standard for the preparation of corporate/entity level GHG inventories has already emerged from the cooperation of the business and environmental NGO communities in the form of the GHG Protocol²⁸. And work is already underway in these communities through the Climate Disclosure Standards Board to create a generally accepted framework for the disclosure of emission inventories, carbon-related risks and management strategies in the annual reports of corporations²⁹. The direct emissions component of this framework is based on the GHG Protocol.

Governments should direct their securities and accounting regulatory bodies to engage in these path breaking processes with the ultimate goal of creating a generally accepted set of international accounting principles that can be adopted by securities and other regulators for inclusion in policy responses to climate change that require monitoring and reporting of climate risks, opportunities, strategies and GHG emissions.

To this end, the Task Force Working Group on Universal Standards and Metrics proposes the creation of:

- **A joint project of the International Accounting Standards Board (IASB)³⁰ with the Climate Disclosure Standards Board (CDSB) to develop a principles-based international financial reporting standard for corporate climate disclosure suitable for ultimate adoption by regulators.** The output of the joint project should include:
 - A comparative review of national regulatory policy responses to GHG disclosure requirements, drawing upon initial work being conducted by the industrial, accounting, financial and environmental communities through the CDSB

- A practical and technical assessment of the complementary effect on standards of the International Assurance Engagement Standard on GHG statements being developed by the International Federation of Accountants through the International Auditing and Assurance Standards Board
 - An impact assessment identifying the types of organizations for which monitoring and reporting is likely to be material and the associated cost-benefit analysis
- **The Task Force Working Group on Universal Standards and Metrics also recommends prioritization of a global standard for the assessment and reporting of product carbon footprints to enable better transparency of emissions associated with their production and consumption.** While numerous initiatives are already underway in the World Business Council for Sustainable Development (WBCSD)/World Resources Institute (WRI) and the International Standards Organization (ISO), this process could be facilitated by one or more international organizations such as the WBCSD/WRI, ISO, OECD, UNEP or IEA/IPEEC

5 Avoided Deforestation and Land Use Change

Forest-based mitigation offers a substantial win-win abatement opportunity by 2020. Achieving half of the reductions available from terrestrial carbon, mainly through avoided deforestation, will deliver 4 to 5 Gt of abatement by 2020 – around one-quarter of the abatement required to reach a 450 ppm trajectory³¹. These efforts are cheap relative to the abatement prize: according to analysis by Project Catalyst, achieving approximately 60% of this abatement by 2020 is likely to be on the order of 15-35 billion euros with each tonne costing well below 15 euros³².

Frontloading forest-based mitigation in this fashion would buy time, as currently expensive clean technologies are demonstrated and made ready for large-scale deployment from 2020 onward. Furthermore, investment in forest-based mitigation would create alternative livelihoods and support sustainable development for forest populations, more than half of which live in extreme poverty.

It is clear that public financing will be necessary to build the foundations at the international and national levels for the large-scale implementation of REDD+ activities³³. This “readiness for REDD+” phase will require 3 billion euros over five years at minimum for capacity building alone. According to analysis by Project Catalyst, subsequent implementation at scale will cost an annual average of 8-18 billion euros per year between 2010 and 2020. Some estimates, such as the Eliasch Review, suggest more³⁴. The earlier readiness is built, the faster private finance can be deployed to take over this burden from the public sector. Depending upon the project type and geography, and on the scale of demand created for REDD+ credits through carbon markets, the private sector will be able to meet a portion of the financial flows required by 2020.

Several policies are required to attract private sector finance to REDD+ activities:

- Parties should include forest carbon in the new climate agreement through a mechanism such as REDD+ and ensure adequate stability of such regulation over the long term
- Within such an agreement, these projects must produce carbon credits of compliance grade that are tradable as offsets and fully fungible with other credits in international carbon markets
- Measurement, reporting and verification (MRV) procedures must be robust and include the use of systems that can ensure reliable calculations of the carbon value of projects

- Forest-based mitigation efforts should be made available for investment at a project level, but placed within the context of national baselines and forest nations' Nationally Appropriate Mitigation Actions (NAMA) Plans
- A risk management framework for this new asset class will be required to mitigate risks such as unforeseen reversal

The development of each of these policies will require a process of extensive dialogue between the public and private sectors. Accordingly, the Task Force Working Group on Avoided Deforestation and Land Use Change recommends the creation of:

- **An international public-private dialogue to “Build REDD+” hosted by key forest nations involving the private sector, international organizations and civil society.** Launched at or immediately after the COP15 meeting, this process would work to build the international and national architectures required for REDD+ to become an applicable national strategic planning mechanism and to be ready for private sector engagement by 1 January 2013. It would encompass the following workstreams:
 - *Enabling national policies:* to enable forest nations to develop nationally appropriate mitigation action plans or low-carbon growth strategies that incorporate policies to attract private sector finance as soon as possible after “readiness for REDD+” public measures are undertaken
 - *Designing appropriate carbon markets and credit systems:* to develop the designs for forest-based credits, including mechanisms to address the issue of permanence and a risk management framework, taking into account the lessons learned from forestry projects in the CDM and voluntary carbon markets, all ready for business by 1 January 2013
 - *Building robust monitoring, reporting and verification systems:* to develop the necessary level of sophistication of systems required for accurate REDD+ monitoring, reporting and verification, a major public-private initiative is required to develop comprehensive Earth Observation systems and field measurement and monitoring systems to be ready for use by 1 January 2013
 - *Developing public-private partnership models for REDD+:* to attract and absorb the necessary levels of private capital through carbon markets, and to attract investor capital in its own right, an international process is required to develop scalable, replicable and bankable models for REDD+ projects across the forested nations, within the next 24 months, including undertaking specific demonstration projects as early actions to validate these models

6 Market Mechanisms

A new international framework should allow national governments to employ market-based domestic policies best suited to their own national circumstances; however, it should also facilitate the linkage of explicit or implicit carbon values established at various national and regional levels. This would enhance the economic efficiency of efforts to combat climate change and stimulate low-carbon investment, especially in developing countries.

A global carbon market will need to be broad, deep and liquid to be effective. This is best achieved through ambitious and coherent national emissions reduction targets; early and effective linking of national and regional schemes; and the development and scaling up of systems for the crediting of project-based and sectoral emissions reductions.

Governments need to set a target date for linking existing and emerging emissions trading systems. They must agree on a broad set of principles to ensure that the system design does not impede subsequent linking, and that will ensure the environmental integrity of the system. The most important areas for policy harmonization are target-setting, the use of international and domestic carbon credits, rules for monitoring reporting and verification, mechanisms for avoiding excessive price fluctuations and the role of financial intermediaries.

A new framework needs to encourage greater participation in the carbon markets from unrepresented regions, and should set out the path for participating CDM countries to transition to sector- and national-level targets. Approaches beyond the existing mechanisms could, if well designed, help to deliver emissions reductions in sectors (e.g. reforestation, avoided deforestation, energy efficiency) and projects (e.g. carbon capture and storage) currently not effectively targeted by international climate policies.

The most promising ideas that have emerged include:

- *Sectoral approaches*: where emission targets are agreed at a sector level; targets could be set at a national or international level
- *Simplified programmatic CDM*: where establishing additionality is no longer on a case-by-case basis, thereby reducing the project development costs to participants
- *Inclusion of forestry credits (REDD+)*: as forest-based mitigation becomes a vital part of a global deal on climate change, incorporating the forestry sector into carbon markets will be important to drive investments into this area

Any new mechanisms should be designed to stimulate and scale-up private sector flows of finance. For example, there should be clarity about the carbon instruments being created through each mechanism and the degree of fungibility of new instruments with existing instruments. Since the private sector is more accustomed to engaging at the project, sub-sectoral and sub-national levels where project boundaries are clear and risks are easier to quantify and manage, one of the critical challenges will be providing well-conceived incentives – commensurate with the different inherent risks – for engagement at the sectoral or national level.

While governments have the responsibility for setting emissions reduction targets in line with what the science suggests is necessary to avoid the dangerous effects of climate change, the business community has special competencies relevant to the design of carbon markets and other market mechanisms.

For this reason, the Task Force Working Group on Market Mechanisms recommends creation of:

- **A transparent and structured public-private-expert dialogue to support the development of the rules and institutions necessary to create efficient, linked carbon markets.** The Carbon Market Dialogue would explore common design criteria to enable linkage and ensure a shared level of environmental integrity across schemes; improvements to the offset market; design approaches for reducing price fluctuations without distorting markets; and use of revenues from auctioning. Launched within the next six months, the Dialogue could report its interim findings into the Conference of the Parties in 2010 and its final conclusions and recommendations, together with a future roadmap for the emergence of an international carbon market in 2011.

7 Adaptation

Adaptation to climate change is a global imperative that must be tackled as a priority in a post-Kyoto accord. The global private sector – which includes not only large multinational and national entities, but also millions of small and medium-sized enterprises, informal sector businesses, small-scale farms and fisheries – will be significantly impacted by climate related changes. There is a potential to unlock significant new and additional actions for adaptation from these private sector actors through well-designed international and national policies.

Understanding and supporting the private sector role in adaptation does not absolve developed country governments of their responsibility to fund international adaptation efforts. Rather, such understanding and support is crucial for ensuring that public funds and associated policy instruments leverage the maximum adaptation actions possible by the private sector and avoid perverse incentives that would promote maladaptation on their part.

There are several public policies required to accelerate and enable these actions, including incorporating the private sector into adaptation planning; strengthening incentives for effective adaptation by business; taking advantage of opportunities for public-private partnerships and mainstreaming for adaptation; and making international frameworks the springboard for engaging business in adaptation.

The role of the private sector in adaptation is a relatively new field that requires further analysis and study. Policy suggestions need to be discussed and developed. Specific propositions to help raise additional financing for adaptation efforts will require further exploration and development.

For this purpose, the Task Force Working Group on Adaptation recommends creation of:

- **A major public-private dialogue hosted by developing countries and involving the private sector, international organizations, bilateral aid agencies and civil society launched in COP15 or shortly thereafter.** This initiative should focus on three key areas:
 - *Development of innovative public-private financing mechanisms for adaptation:* Innovative public-private financing mechanisms for adaptation should be explored that build on the successful previous experience with similar mechanisms such as the Global Fund and Stop TB or IFFm from the health sector
 - *Further development of the national policies required to engage the private sector in adaptation:* The aforementioned national policies to catalyse private sector engagement need to be further developed; challenge funds to spur private sector innovation for adaptation and public-private partnerships for infrastructure are options that require additional development in particular, among others
 - *Specific analysis of how to engage the private sector in support of adaptation efforts in least developed countries:* As least-developed countries represent some of the most difficult areas to engage business support for adaptation, there is a need for further substantive analysis to develop the public-private partnership models that can be successful in these countries

Conclusion

National economic policies, business strategies and a post-Kyoto climate accord can and should be aligned to stimulate a new era of low-carbon prosperity over the next few decades. But to make a new paradigm of low-carbon economic growth possible, the international community will need to expand its conception of international climate change architecture.

Transforming energy systems at this scale and over this time frame will require several new public-private institutional enabling mechanisms to be built and linked to the new regime, effectively a bottom-up dimension to the world's climate strategy.

This report proposes specific ways to construct these new pieces of climate architecture. It is the Task Force's hope that, in recognizing the potential of such an approach, governments will engage in a wider discussion among themselves and with business and non-governmental communities to build a practical enabling environment. This environment should be conducive to catalysing a step change in private sector action to raise energy efficiency, develop and deploy revolutionary existing and new technologies, reduce deforestation and make sustainable investment choices at scale and speed.

The Task Force calls upon governments to launch this set of initiatives at the COP15 meeting in December 2009. The aim should be to achieve their implementation before the start of the second commitment period on 1 January 2013. For reasons of efficacy, this process should not be limited to the UNFCCC. Rather, it should have a variable geometry, encompassing the most relevant and competent international institutions.

The Task Force's companies and non-business experts are planning to deepen their investigation of these issues and proposals in the context of their ongoing activities at the World Economic Forum and elsewhere. They stand ready to contribute to and support the intergovernmental process as requested.

Endnotes

¹ The *CEO Climate Policy Recommendations to G8 Leaders* (July 2008) were facilitated by the World Economic Forum in partnership with the World Business Council on Sustainable Development as part of the G8 Gleneagles Dialogue on Climate Change, Clean Energy and Sustainable Development. <http://www.weforum.org/documents/initiatives/CEOStatement.pdf>

² The Task Force on Low-Carbon Prosperity was launched at a press conference on Tuesday 31 March in London, on the eve of the G20 April Summit. The open letter sent to the G20 and signed by the companies and experts involved in the task force can be found at <http://www.weforum.org/climate>

³ On 7-18 December 2009, the parties of the UN Framework Convention on Climate Change will meet for the 15th annual Conference of Parties in Copenhagen to negotiate a new international agreement on climate change policy, *i.e.* the successor to the Kyoto Protocol.

⁴ The 2°C limit was first suggested by the European Union in 1996 and adopted in the IPCC Third Assessment Report (2001). <http://www.ipcc.org>

⁵ For example, National Appropriate Mitigation Action (NAMA) and so called Low-Carbon Development Plans.

⁶ This report is also available on <http://www.weforum.org/climate>

⁷ *World Energy Outlook 2008*, International Energy Agency. <http://www.iea.org>

⁸ Analysis carried out by Project Catalyst, 2009. Project Catalyst is an initiative of the ClimateWorks Foundation. It was launched in May 2008 to provide analytical and policy support for the United Nations Framework Convention on Climate Change (UNFCCC) negotiations on a post-Kyoto international climate agreement. <http://www.project-catalyst.info>

⁹ *How the world should invest in energy efficiency*, July 2008, McKinsey & Company.

- ¹⁰ The International Partnership on Energy Efficiency Cooperation (IPEEC) was launched at the G8 Energy Ministers meeting, which took place in Rome, Italy, on 24-25 May 2009. IPEEC aims to promote energy efficiency worldwide by providing a high-level intergovernmental forum for discussion and information exchange. For the full declaration see http://www.enecho.meti.go.jp/topics/g8/ipeecsta_eng.pdf
- ¹¹ For a comprehensive evaluation of the Top Runner programme, see www.aidee.org/documents/018TopRunner-Japan.PDF
- ¹² The Collaborative Labeling and Standardising Program (CLASP) published a comprehensive overview of various standard setting methodologies, including the "Engineering/Economic Approach". http://www.clasponline.org/files/Chapter6_GB2ndEdition.pdf
- ¹³ McKinsey & Company estimates the reductions from buildings by 2020 at 2.4Gt (1.7 Gt residential, 0.7 Gt commercial), compared to transportation 0.9Gt, industrial 3.2Gt, and transformation 1.5Gt. Source: *How the world should invest in energy efficiency*, July 2008, McKinsey & Company.
- ¹⁴ For more information see <http://www.carbontrust.co.uk>
- ¹⁵ For more information see <http://www.ef.org/home.cfm>
- ¹⁶ *Enabling Technologies for Low-Carbon Growth*, 2009, The Climate Works Foundation.
- ¹⁷ More information on smart grids is provided in a white paper published by the World Economic Forum in partnership with Accenture. *Accelerating Smart Grid Investments*, July 2009, World Economic Forum. <http://www.weforum.org/pdf/SlimCity/SmartGrid2009.pdf>
- ¹⁸ *World Energy Outlook 2008*, International Energy Agency.
- ¹⁹ For more information on CGIAR, see <http://www.cgiar.org>
- ²⁰ For more information on The China Greentech Initiative, see <http://www.china-greentech.com>
- ²¹ *Economics of Climate Change Mitigation: Policies and Options for Global Action Beyond 2012*, 2009, OECD.
- ²² *Towards a Global Climate Agreement - Synthesis paper*, 2009, Project Catalyst. <http://www.project-catalyst.info>
- ²³ *World Energy Outlook 2008*, International Energy Agency.
- ²⁴ For example, the P8 group, which brings together senior leaders from some of the world's largest public pension funds to develop actions relating to global issues and particularly climate change. It is an initiative of the University of Cambridge Programme for Sustainability Leadership and HRH Prince of Wales supported by the Environmental Capital Group, the Nand & Jeet Khemka Foundation and the Zennstrom Foundation. The P8 Group represents over US\$ 3 trillion of investment capital.
- ²⁵ As suggested by the UNEP Finance Initiative. *Financing a Global Deal on Climate Change*, 2009, UNEP FI. <http://www.unepfi.org/fileadmin/documents/FinancingGlobalDeal.pdf>
- ²⁶ This model is introduced in a recent paper by the International Investors Group on Climate Change (IIGCC). The IIGCC is a forum for collaboration between pension funds and other institutional investors on issues related to climate change. IIGCC seeks to (i) promote better understanding of the implications of climate change among our members and other institutional investors; and (ii) Encourage companies and markets in which IIGCC members invest to address any material risks and opportunities to their businesses associated with climate change and a shift to a lower carbon economy. For more information see <http://www.iigcc.org>
- ²⁷ This model has evolved from discussions involving the Nand & Jeet Khemka Foundation and the Environmental Capital Group, with other pension funds and sovereign wealth funds, including the P8 initiative.
- ²⁸ The GHG Protocol is a decade-long partnership of the World Resources Institute and World Business Council on Sustainable Development, see <http://www.ghgprotocol.org>
- ²⁹ The Climate Disclosure Standards Board is a consortium of the Carbon Disclosure Project, CERES, The Climate Group, The Climate Registry, International Emissions Trading Association, World Economic Forum and World Resources Institute that, in cooperation with major accounting firms and associations as well as industrial and financial services firms is developing a generally accepted framework for climate change-related corporate disclosure. The first exposure draft of this framework was officially launched for comment on 25 May 2009 at the World Business Summit on Climate Change in Copenhagen, Denmark, see <http://www.cdsb-global.org>
- ³⁰ The IASB (International Accounting Standards Board) is an independent standard-setting board. The IASB cooperates with national accounting standard-setters to achieve convergence in accounting standards around the world.
- ³¹ *Towards the inclusion of forest-based mitigation in a global climate agreement*, May 2009, Project Catalyst.
- ³² *Ibid*: note that Project Catalyst analysis calculates the forest-based abatement costs in euros, which this report directly quotes. An approximate conversion for the reader could be 1 euro: US\$ 1.50.
- ³³ REDD+, or REDD-Plus, refers to Reduced Emissions from Deforestation and Forest Degradation (REDD) combined with efforts for conservation, sustainable forest management, and enhancement of forest carbon stocks through programmes such as reforestation and afforestation. The proposition here is for this full suite of forest-mitigation up to agro-forestry to be included in a Copenhagen agreement, though the various subsets (REDD, reforestation, afforestation, agro-forestry, etc.) can be dealt with through separate mechanisms as deemed appropriate.
- ³⁴ *Climate Change: Financing Global Forests*, October 2008, Eliasch Review.

Partner Companies

Disclaimer

The views expressed herein represent a collation of various viewpoints emerging from a series of discussions among the participants in the Task Force on Low-Carbon Prosperity. Although the observations and proposals in this document enjoy broad support, they do not necessarily reflect the views of every individual participant nor do they necessarily reflect the individual institutional viewpoints of any of the companies or institutions that took part, or of the World Economic Forum.

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Unilever

United Overseas Bank

UPS

Vantage Point Venture Partners

Vattenfall

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1 Working Group on Energy Efficiency

Key Messages

The important role of energy efficiency in reducing GHG emissions is well understood and well documented. And so are the hurdles to improving energy efficiency. Yet, the initiatives that have been undertaken so far have not been able to initiate the transition to a more efficient economy, with more efficient products, industrial appliances, efficient buildings and an efficient power supply architecture.

To create significant movement on energy efficiency, research now has to move to action. We suggest two levels of architecture to build public-private networks on energy efficiency:

On the international level, the International Partnership on Energy Efficiency Cooperation (IPEEC) was recently launched by the G8+5 to promote energy efficiency worldwide by providing a high-level intergovernmental forum for discussion and information exchange. We propose to add an explicit, new private sector dimension to this partnership to provide an officially sanctioned and supported global platform for cross- and intra-industry cooperation on energy efficiency.

On the regional/domestic level, we propose that a global network of centres of energy efficiency excellence is created, particularly in developing countries. These centres would provide specific policy advice to national governments to help formulate effective policies as well as specific advice and services to businesses and consumers on how to implement energy efficiency measures.

The suggested public-private ecosystem for energy efficiency activity should focus on action. With these networks in place, knowledge on standards for buildings and appliances, on the development of financial products and services, and on the public-private route maps for changing utility pricing models or developing smarter grids can be shared, evolved and acted upon. Success will breed confidence as to the win-win nature of energy efficiency, and actions will spread.

To provide immediate focus, a programme for action can be linked to these two suggestions. They include:

- A public-private initiative to create an international portfolio of ten large-scale, integrated smart grid demonstration (and utility pricing reform) projects across different regulatory regimes;
- an initiative to create a set of globally accepted energy efficiency standards on a limited but critical range of energy intensive industrial and consumer goods;
- a special sectoral initiative to set regional standards relating to the retrofitting of old and the construction of new buildings.

The objective would be to have these elements in place by 1 January 2013, so that a concerted international public-private push on energy efficiency can commence in the first commitment period.

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Summary¹

- The potential for energy efficiency abatement is well-recognized and well-documented. About half of the emission reductions required by 2020 to achieve a 450 ppm CO₂ pathway can be realized via energy efficiency improvements, if the right policies and measures are put in place.
- The bulk of the abatement potential can be realized in buildings (residential, commercial and industrial) and products and appliances. Many initiatives have identified ways to unlock the potential in these areas, but these approaches have not led to a transition to the scale required.
- Despite the relatively low cost of energy efficiency in comparison to other mechanisms, the required behavioural change will not happen by itself. A step change in a range of public policy measures will be required to unlock energy efficiency's full potential. Left to its own devices, the market will take too long to get there, given the scientific imperative to reduce emissions.²
- The main hurdles that exist are a lack of financing and financing mechanisms, limited consumer and business awareness and knowledge regarding energy efficiency, high levels of lock-in through existing regulations, split incentive structures, and other market failures and inefficient behaviours.
- To unlock the potential of efficiency in the *built environment* four key policies are important. These policies may vary per region, but can build on best practices that are available. These policies are:
 - adopt and enforce binding zero net energy targets for new and existing buildings;
 - implement mandatory energy performance certification and labelling programmes;
 - enable the delivery of 'whole building' efficiency retrofits to existing buildings;
 - drive innovation through voluntary programmes and public funding for research and development (R&D).
- To unlock the potential of energy efficiency in products and appliances, we recommend agreement in principle to implement globally applicable energy performance standards. It is estimated that improved energy efficiency product standards could reduce 2030 annual global energy consumption in the residential, commercial, and industrial sectors by up to 7.5% compared with business as usual, (2.7 Gt CO_{2-eq.}). About 80% of this energy reduction, equating to a carbon abatement of 2 Gt CO_{2-eq.}, could be achieved in four key product areas: Heating, Cooling, Motors and Lighting.
- Although further work is required to establish the precise nature of solutions for individual products, policy-makers should support the creation of an expert body with an international mandate to lead the effort to establish a range of *global product energy performance standards*. The development of recommendations should be a time-bounded process lasting no longer than 3 years. The new standards could be combined with locally deployed but globally coordinated early retirement schemes that both reduce carbon and costs for industry and stimulate demand for more efficient equipment.
- It is clear that targeted investment and *new financing mechanisms* are needed. For many reasons existing financial products and approaches are not suitable for energy efficiency investments, mainly because the uncertainty of engaging in new sorts of financing products is higher than the actual level of uncertainty about investment defaults. Redesigning financing mechanisms—for example, by linking loans to property instead of owners and by rating investments according to their guaranteed efficiency performance—has great potential to unlock a much larger volume of private capital.

- Encouraging additional investment of private capital into energy efficiency and product innovation is necessary, but not sufficient. Supply-side efficiency improvements from the power sector will need to complement the investments in demand-side efficiency in buildings, products and appliances. Moreover, many of the demand-side improvements will actually be contingent upon energy efficiency improvements in the power supply.
- The current power supply system is generally based upon a centralized supply of power, transferred one-way over a nationwide grid. The developments over the last few decades in information technology (IT) and telecommunications, which have placed more pressure on existing power networks, coupled with an increasing trend toward decentralized power generation using renewable energy, as well as the underlying challenges of increasing energy demand and concerns about energy security within what is likely to be a more carbon-constrained world, all point toward a fundamental restructuring of the existing power paradigm. Today's grids, built with yesterday's technology, will simply not be able to meet tomorrow's multiple energy demands.
- One of the two key components of the transformation of the energy supply sector is the implementation of *smarter grids*. Using new techniques in IT and telecommunication, building an intelligent electricity grid in itself will reduce emissions related to energy production and grid loss. More importantly, smarter grids can act as enablers for the wider transition to a low-carbon economy. Smart grids can provide information on the performance of energy efficiency improvements to help optimize building retrofits and provide the certainty on cost savings from these improvements, which in turn will help mobilize more investments in this space.
- The second key component of a supply-side transition is the *redesign of the utility business model*. Eliminating the profit incentive from increased production for energy utilities will take away the incentive for utilities to simply produce more energy. Combined with the existence of a smarter grid, policies could be introduced that would offer incentives for utilities to invest in end-use energy efficiency. Such a reform would put energy efficiency investments on par with investments in new capacity in the eyes of utility managers, re-creating the industry's business model by making utilities potentially major investors in end-use energy efficiency measures.
- In all areas of energy efficiency there is much knowledge available. Many of the practical suggestions have been tried and tested. Some isolated examples show great promise.³ However, it seems that overall there is a lack of coordination of national, regional and local capacity to facilitate the implementation and scale up of widespread energy efficiency measures, outside of specific projects or pilot programmes.
- In order to mainstream energy efficiency activities we suggest two general directions to build the enabling environment for stronger and more coordinated action on energy efficiency. If these can be built prior to 2013, they can serve to exploit the global emissions reduction (and cost savings potential) that energy efficiency offers.
- First, we suggest building a network of domestic or regional centres of energy efficiency excellence akin to the UK Carbon Trust model or the Best Practice Network suggested by ClimateWorks. These centres would provide specific policy advice to national governments to help formulate effective policies as well as specific advice and services to businesses and consumers on how to implement energy efficiency measures.⁴
- Second, at an intergovernmental level, we suggest building on international initiatives that could provide the necessary platforms for scaling up good energy efficiency ideas. The IPEEC⁵, launched at the G8 Energy Ministers meeting in

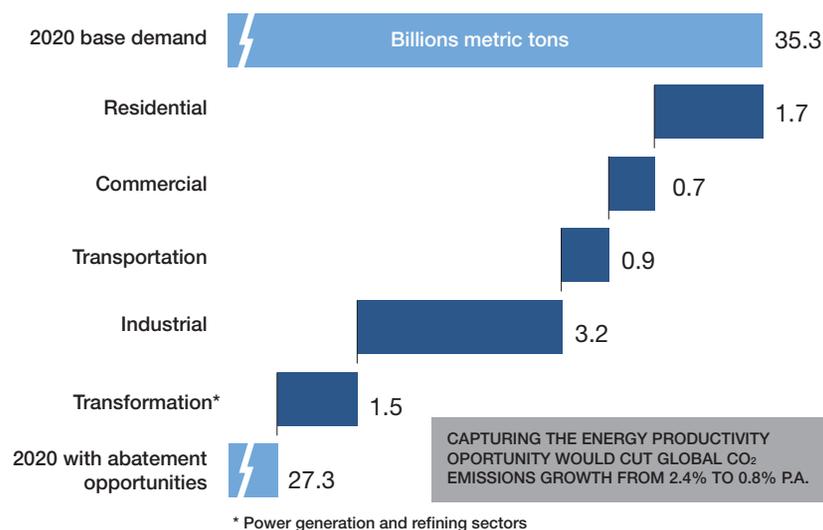
Rome, Italy, 24-25 May 2009, aims to promote energy efficiency worldwide by providing a high-level intergovernmental forum for discussion and information exchange. We suggest that this purely governmental dialogue on energy efficiency should be given an explicit, new private sector dimension, providing an officially sanctioned and supported global platform for intra-industry discussions and cooperation on energy efficiency within many sectors, including the important ones discussed above.

- To provide immediate focus, a programme for action can be linked to these two suggestions. This programme should include:
 - A public-private initiative to create an international portfolio of ten large-scale integrated smart grid demonstration (and utility pricing reform) projects across different regulatory regimes;
 - An initiative to create a set of globally accepted energy efficiency standards on a limited but critical range of energy-intensive industrial and consumer goods;
 - A special sectoral initiative to set regional standards relating to the retrofitting of old and the construction of new buildings.

Background: Energy efficiency can deliver half of the required CO₂ reductions at low to net zero economic cost

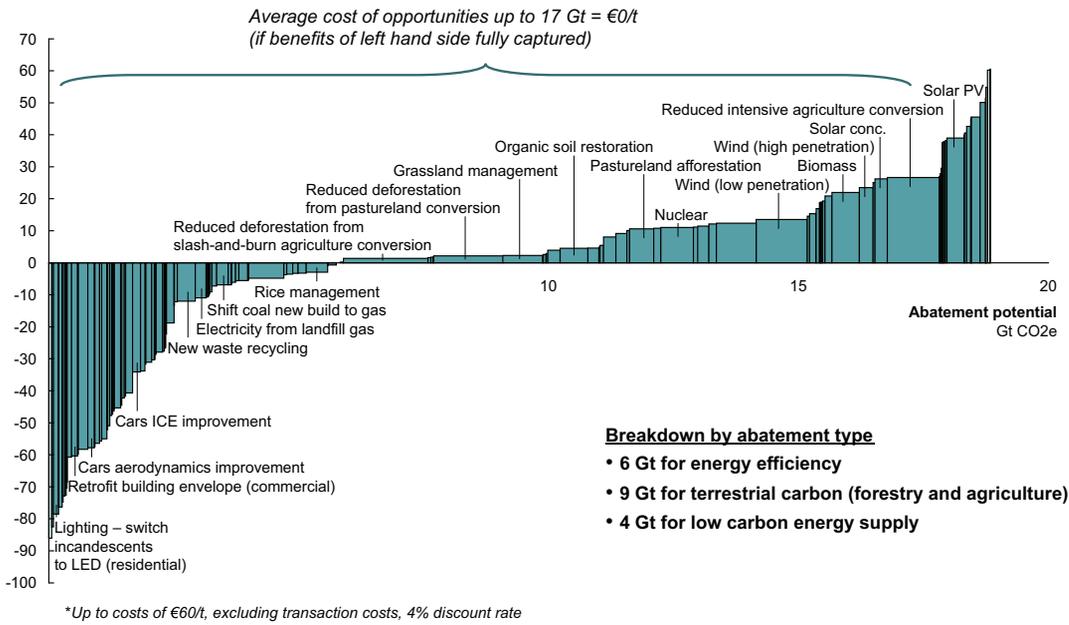
1. Investments in energy efficiency could provide 35-50% of the emission reductions required by 2020 to reach a 450 ppm pathway, representing 6.5 to 8 Gt of the total 17 Gt CO₂-eq. required.⁶ Most of these reductions can be achieved at a low cost or even at a net economic benefit. Analysis from McKinsey suggest that the 6.5 to 8 Gt of abatement envisioned can be achieved at an average internal rate of return of 17%⁷ (Figures 1.1 and 1.2).
2. Unlocking this potential would require an investment in energy efficiency of about US\$ 170 billion per year, of which approximately two-thirds—or some US\$ 97 billion—would need to be invested in developing countries (including China). By sector, the capital requirements for energy efficiency investment break down as follows: residential, US\$ 83 billion (49%); commercial, US\$ 40 billion (24%); transportation, US\$ 22 billion (13%); industrial, US\$ 25 billion (15%).

Figure 1.1: Potential CO₂ emission reductions in 2020 through enhanced energy productivity⁸



Source: MGI analysis

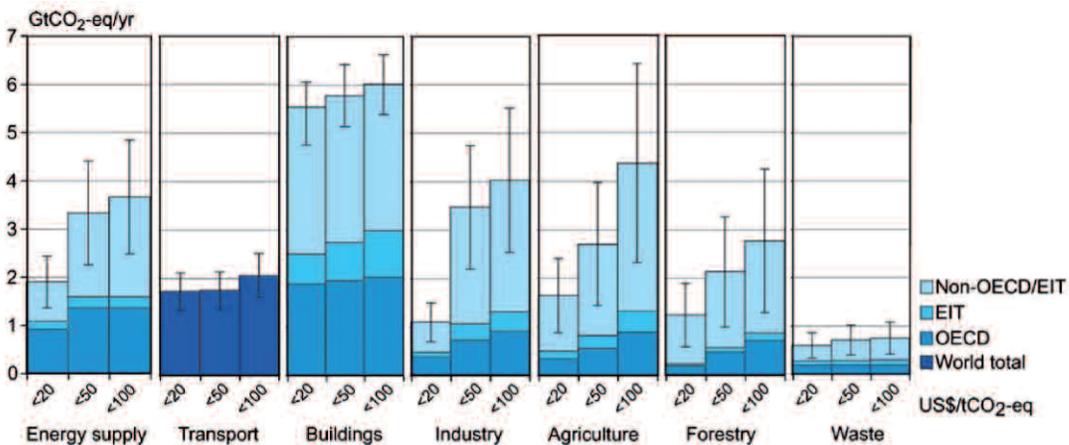
Figure 1.2: McKinsey global GHG Abatement Cost Curve, v2.0, based on Project Catalyst analysis⁹



Source: McKinsey global GHG Abatement Cost Curve v2.0, Project Catalyst analysis

- Other analyses suggest similar numbers. The IPCC, for example, estimates that by 2030, about 30% of the projected GHG emissions in the buildings sector can be avoided with net economic benefit. Other industry sectors, notably transport¹⁰ and industry, also have sizable opportunities for low-cost efficiency improvement¹¹ (Figure 1.3 below).

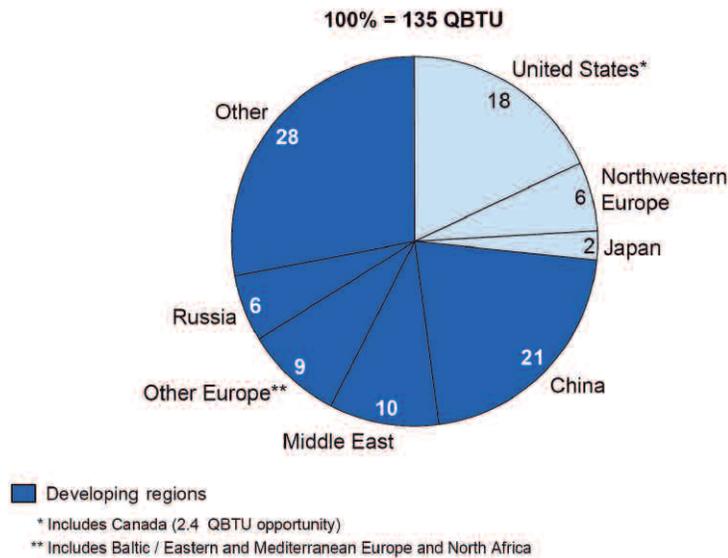
Figure 1.3: IPCC estimated sectoral economic potential for global mitigation in 2030¹²



Source: IPCC 2007c, Fig. SPM 6

- Geographically, the largest potential for energy efficiency improvements exists in China and the United States, but in other regions there is much to be gained as well (Figure 1.4 below).

Figure 1.4: Energy efficiency potential in 2020 per region¹³



Source: MGI analysis

- A range of measures have been tried and tested at the local and national levels to unlock energy efficiency potential. All these local measures have provided a range of best practices, some of which have international applicability. On a global level, however, the development of new architectures, networks or initiatives to drive forward the energy efficiency agenda has not been addressed specifically.
- Though governments have made some investments in energy efficiency through recent economic stimulus packages and are crucial drivers of the low carbon transition, the private sector must also play a key role. Most investments in new facilities are made by corporations (60%) and households (26%).¹⁴ Government is responsible for the remaining 14%. Thus, most energy efficiency costs will likely be borne by the private sector or private individuals. Financial incentives need to be created to help these actors realize energy efficiency potential, both in terms of lowered emissions and reduced energy costs over time.
- The Working Group on Energy Efficiency has identified six key dimensions of energy efficiency: buildings, product and appliance standards, finance, smart grids, reforming the utility business model, and the case for international cooperation. The group has developed a suite of practical recommendations to help unlock the potential of energy efficiency across each of these dimensions, in total enabling the transition to a low-carbon economy.

Dimension 1: Realizing the efficiency potential from buildings¹⁵

- Existing buildings offer the highest potential for energy reductions. According to recent modelling and analysis by the World Business Council on Sustainable Development, investments of US\$ 150 billion annually in improving the energy efficiency of existing structures in the US, China, Japan, Brazil, Europe and India could reduce energy use by 40%, with a five-year payback period (at energy prices comparable to US \$60 per barrel of oil). A total investment of US\$ 300 billion annually in these regions would raise the reduction potential to 52%, with a 5-10 year payback period.

9. Approaches to unlocking this potential have been widely studied and are well documented. However, they have not yet led to investment on the scale required. Annex A to this section suggests a set of integrated policy measures that could help raise the bar for retrofitting existing buildings and building new ones. These could include:
 - a. *Adopting and enforcing binding zero net energy targets for all new and existing buildings:* Targets of this type are already considered in some regions, less so in developing countries.
 - b. *Implementing a mandatory energy performance certification and labelling programme for buildings:* Governments, together with the real estate industry, should develop a common methodology for measuring energy performance and a certification and labelling system to make energy use and costs more transparent. Modelling software exists that could help appraisers identify cost-effective energy saving measures.
 - c. *Financing and delivering 'whole building' efficiency retrofits to existing structures:* Fiscal incentives could be used to finance or reduce the up-front capital costs and reduce the payback period. Regional or local semi-government agencies could facilitate these packages, for example by using one-stop shops.
 - d. *Driving innovation through voluntary programmes and public funding for research and development:* A range of public-private initiatives exist in Europe and the US focused on driving innovation in building design. Ongoing public support for these initiatives will ensure continued innovation in the sector.

Dimension 2: Realizing the efficiency potential from products and appliances¹⁶

10. Recent analysis conducted by the International Energy Agency and the Collaborative Labeling and Appliance Standards Program suggests that energy efficiency product standards could reduce 2030 annual global energy consumption in the residential, commercial, and industrial sectors by up to 6.4 terawatt-hours (TWh)—or approximately 7.5% of total demand compared with business as usual, representing a reduction in global emissions of 2.7 Gt CO_{2-eq.}. About 80% of this energy savings could be achieved in four key product categories: heating, cooling (both domestic and commercial), motors, and lighting. Delivering best in-class efficiency savings potential across these four categories could produce a global carbon abatement of 2 Gt CO_{2-eq.} by 2030.
11. Annex B to this section suggests that this potential could be unlocked by developing a set of globally applied energy efficiency product standards that apply across a limited but critical range of energy-intensive products. These standards, depending on the region and product category, could be developed as minimum standards or best-in-class standards.
12. In many countries there is substantive experience with standard-setting for various product categories. A notable example is the Japanese Top Runner programme, which has achieved significant reductions in 21 product categories. Other examples that have had some success as well are the US Energy Star Program, which achieved an estimated carbon reduction of 43 Mt CO_{2-eq.} in 2008, and the EU Energy-Using Products Directive. Whilst significant progress has been made in some geographies and product classes to establish minimum energy performance standards, there remain significant opportunities to extend these to new product categories and complete standard settings across all major geographies.
13. Standards could be further combined with a set of global schemes to ensure early retirement of existing inefficient capital. This would have a win-win effect across the economy, simultaneously driving lower energy consumption, lower overall costs to business and consumers, and giving a manufacturing boost to

critical industries, combined with more rapid discovery of even greater efficiency potential. Early retirement scheme could be repeated in discrete waves over time, which could allow for ongoing dissemination of products that incorporate the latest energy efficient technologies.

14. The standard-setting process would require international coordination via an expert body with an international mandate (potentially via the IPEEC) and would need to allow for a careful stakeholder consultation process. Where standards are already in place, this partnership could provide a clearinghouse of existing standards (see Dimension 6 below).

Dimension 3: New ways of financing energy efficiency investments¹⁷

15. To date, private financing for energy efficiency has not taken off to the scale required, mainly due to the perceived high uncertainty and risks of these investments. Annex C to this section suggests that if the correct mechanisms and institutions can be put in place, sufficient confidence can be built in the value and certainty of future streams of energy savings. While the focus of these suggestions is on building retrofits, these financing mechanisms could also be applied to financing in other sectors, such as industrial retrofit.
16. The concept behind the suggested mechanisms is quite simple. If one can ensure that the energy savings derived from a certain retrofit investment can serve as a guarantee for the financing, the risk associated with the financing comes down. In some cases it will be possible take these investments off-balance sheet, thus freeing up even more private capital to be invested.
17. A number of key barriers that curb private capital flows into energy efficiency include the misalignment between tenor length and payback period, the lack of certainty and confidence in performance guarantees, the complexity of end-user investments, the level of aggregation and high transaction costs, and the narrow financial assessment of energy efficient investments. Possible solutions to these barriers could include:
 - a. *Tenor length*: The payback periods on energy efficiency investments often exceed the period the property owner stays in the property. Linking the investment to the property, instead of the owner, tackles this problem.
 - b. *Certainty and confidence in performance guarantees*: There is a lack of awareness within rating agencies, institutional investors, etc., on how to ensure guaranteed energy savings on efficiency investments. Building awareness and capacity to collect data and apply it in financial modelling would help to increase the size and volume of energy efficiency investments.
 - c. *Complexity of end-user investments*: End users (property owners) considering an energy efficiency investment face a fragmented set of local and regional policies, incentives, solutions and official stakeholders. Developing one-stop solutions and coordinated energy efficiency actions would help lower investment barriers.
 - d. *Aggregation and transaction costs*: Energy efficiency retrofits involve large numbers of different upgrades, together forming a 'project' investment. Providing finance solutions for these 'bundled' investments could help reduce transaction costs.
 - e. *Broader than financial assessment*: Energy efficiency should be considered in the context of additional benefits beyond cost saving, such as the potential for stimulating innovation, improved asset values, improved health, and serving as a behavioural change agent (others may copy once they see the results of the early mover on energy efficiency). Innovation centres that can help actors identify the multiple benefits of their energy efficiency plans and build out integrated approaches to implementing them, could reinforce the financial business case.

18. These solutions so far have been tested on only a limited scale within the US and UK regulatory frameworks. We believe these mechanisms have good potential to be scaled up and distributed on a wider scale.

Dimension 4: Smarter grids as an enabler of a low-carbon economy¹⁸

19. Globally, the power sector is responsible for approximately 24% of global carbon emissions, projected to rise to approximately 14.26 Gt by 2020. Annex D to this section suggests that the potential for information and communications technology (ICT) to reduce these emissions using smart grid technologies could be about 2.03 GT, or roughly 4% of worldwide emissions in 2020. This is a significant abatement prize.
20. Moreover, one should consider smart grid technology as an enabler in the wider transition to a low-carbon economy. For example, smarter grids can *inter alia* enable more efficient and reliable energy delivery; provide the ability to integrate more renewable energy into existing networks; provide the ability to manage increasing numbers of electric vehicles; enable customers to manage their energy use directly; provide information on energy savings (for improved financing mechanisms); and stimulate an array of new business models in the energy sector.
21. In recent years, the technology of smart grids and smart metering has developed quickly and is now well proven. However, the systems process of applying these technologies is still maturing. At the moment there are only a handful of fully integrated smart grid pilots in place—the most advanced being in the U.S. city of Boulder, CO. Nevertheless, the data coming from these few pilot examples is promising.
22. As smart grids do not provide a one-size-fits-all solution and are heavily contingent on the existing electricity infrastructure, the regulatory framework, and the energy mix, a series of larger-scale demonstration projects in various different contexts are needed to further develop the application of the technologies.
23. The suggestion is to identify and build local smart grids in cities and regions in order to create a wider, national grid responsive to renewable energy sources like solar and wind power, while optimizing other sources of power from traditional fossil fuels and nuclear power. Specifically, policy-makers should:
 - a. identify a number of key cities or areas where smart grid pilots can be set up, tested and further demonstrated;
 - b. encourage the creation of regional public-private partnerships to design, set up and implement risk-sharing frameworks to implement smart grid technology;
 - c. mandate that these partnerships help in collecting and disseminating information, sharing best practices, policies and standards to optimize the scale up of smarter grids.

Dimension 5: Rethinking the energy utility model¹⁸

24. Traditionally, a utility recovers operational costs through a rate mechanism based on the volume of its electricity or gas sales. Under this approach, increasing sales improves profitability. The utility is given an incentive to produce more energy, rather deliver the same energy more efficiently. Annex E to this section suggests that through policy reform, a different business model could be encouraged.
25. Eliminating the profit incentive to increase production will take away the incentive for utilities to simply produce more energy. Combined with the existence of a smarter grid, policies could be introduced that offer incentives

for utilities to invest in end-use energy efficiency. Such a reform would put energy efficiency investments on par with investments in new capacity in the eyes of utility managers, re-creating the industry business model to make utilities potentially major investors in end-use energy efficiency.

26. Annex E to this section suggests a dual approach to reforming the utility business model:
 - a. *Eliminate incentives to profit from increased sales*: A more efficiency-friendly business model would recover the fixed cost of operation based on a per-customer formula, which is periodically reviewed and adjusted to ensure the revenue requirement is met.
 - b. *Provide incentives to profit from investing in the energy efficiency of homes and businesses*: In order to stimulate significant investment in the energy efficiency of homes and businesses, the costs of these programmes should be included as part of the utilities' cost of service.
27. There is some experience with reform of this kind in several US states. This experience shows that once the savings targets are met, energy efficiency programmes can create a net benefit. A 2006-to-2008 case study in California suggests a net benefit of US\$ 2.7 billion from a US\$ 2.2 billion investment in energy efficiency. This created US\$ 300 million in shareholder earnings and US\$ 2.4 billion in ratepayer savings.
28. Globally, there are many different utility market structures—ranging from vertical monopolies to deregulated markets (most notably in Europe, where the traditional vertically integrated utility has been broken up into competitive generation, power acquisition, and retail sales units, and monopoly transmission companies). Business model reforms to promote energy-efficient delivery would clearly need to vary considerably from place to place to accommodate these different structures. There is no bespoke solution.²⁰
29. Governments or regulatory decision-makers therefore need to assess to what extent utility business incentives are in alignment with the ability to fully deploy energy efficiency solutions, both to address climate change and to meet other energy-related policy goals, such as cost reduction. International partnerships such as the IPEEC could help to develop and share best practices on regulatory reform.

Dimension 6: Architectures to improve impact²¹

30. To make changes in energy efficiency actually happen, there is a need to develop high-impact networks and coordination platforms at the international level, and increase dedicated capacity at both the national and regional levels for bespoke domestic implementation of energy efficiency strategies and policies. Below we suggest two initiatives—one an international platform for strategy and policy sharing; the other a network of domestic centres of excellence to offer bespoke, practical advice, capacity and support.
31. Our first suggestion is to *create a private sector dimension for IPEEC*. The most effective strategy available for shifting the carbon profile of major economies quickly is to scale the application of best available technologies. The formal UNFCCC negotiations are addressing this matter only indirectly (via top-down, overall national emissions commitments). A more direct, bottom-up approach is also warranted that would create a scalable platform enabling worldwide cooperation on energy efficiency within individual industry sectors.

32. Governments should agree to create an international process replicating many of the features of Japan's successful Top Runner programme, in which various industries were encouraged to voluntarily set and make continuous progress toward best-in-class efficiency benchmarks. This could be done by building on the May 2009 agreement among G8+5 countries to create an IPEEC at the International Energy Agency. This purely governmental dialogue on energy efficiency should be given an explicit, new private sector dimension, providing an officially sanctioned and supported global platform for intra-industry discussions and cooperation on energy efficiency within many sectors, including the important ones discussed above.
33. The nature and depth of intra-industry cooperation in such an exercise no doubt would vary from sector to sector. It might involve the creation of common measurement and benchmarking methodologies, or the negotiation of arrangements to share or transfer technology, or the recommendation of standards for government procurement, or the establishment of industry-wide emission targets, standards and/or product labelling frameworks, or a combination of some or all of the above.
34. The overall effect of this initiative would be to expand the geometry of potential climate progress by enabling action on energy efficiency in key industrial sectors on a worldwide basis, notwithstanding the varying nature of formal national commitments by governments in a UN agreement. Governments should view it as complementary to and enabling the goals of the UN Framework Convention. They should help to catalyse and support this proposed public-private piece of climate architecture by encouraging major companies within their countries to participate in dialogues within their sectors, and by providing hosting and technical staff support at the IEA. Indeed, they should view the addition of a private sector dimension to IPEEC as a way to strengthen the quality of the partnership's intergovernmental dialogue.
35. We also recommend the *creation of a network of centres of energy efficiency excellence*. Creating a network of national, regional and local centres of excellence in developing countries for the implementation of energy efficiency would help governments and businesses in those nations mobilize for action on energy efficiency.²² Centres of excellence, most notably the Carbon Trust in the UK, have proven to be successful policy instruments in some countries for realizing the full extent of energy efficiency potential. Could indigenous versions of the Carbon Trust model be established in Brazil, China, India, Mexico, Russia and South Africa, with regional hubs in the Middle East and South Asia? We believe this could and should be done.
36. A network of such centres would serve three objectives. First, they would provide policy advice to national governments, helping them formulate the optimum regulatory mix to achieve energy efficiency. Second, they would provide advice and services to business and consumers on implementing energy efficiency measures. Third, they could share experiences and engage in partnerships with each other. These centres would be complementary to a range of other international policy initiatives, including the IPEEC platform mentioned above, carbon pricing, and the setting of minimum universal efficiency standards for buildings, appliances and energy-intensive goods.
37. Linked to the proposition from the Investor Working Group in section 2 of this report, we could envisage these centres of energy efficiency excellence forming part of—and being financed by—the Consultative Group on International Energy Research. As with the CGIER, the objective should be to create this network in five or six developing countries within the next five years.

Next steps

To provide immediate focus to the outlined items above, a programme for action is suggested, which includes:

38. On the international level, add an explicit, new private sector dimension to the IPEEC. This partnership would provide an officially sanctioned and supported global platform for cross- and intra-industry cooperation on energy efficiency.
39. On the regional/domestic level, set up a global network of centres of energy efficiency excellence, particularly in developing countries. These centres would provide specific policy advice to national governments to help formulate effective policies as well as specific advice and services to businesses and consumers on how to implement energy efficiency measures.
40. An initiative to create a set of globally accepted, minimum-efficiency standards on a limited but critical range of energy-intensive industrial and consumer goods. Combined with national measures to promote early retirement of inefficient goods, this initiative could have a win-win effect across the world economy, simultaneously reducing energy consumption, lowering overall costs to businesses and consumers, and giving a boost to critical manufacturing industries. This process would be structured as a business-government dimension of the IPEEC, linking voluntary industry discussions with the intergovernmental dialogue that IPEEC member governments already plan to establish. It would also use the national/regional centres of energy efficiency proposed above as drivers for creating bespoke domestic implementation programmes for the standard-setting process across government and industry.
41. The public-private standard-setting process should include a special sectoral initiative to set standards relating to the retrofitting of old and construction of new buildings. The built environment is the sector with the highest potential for energy efficiency improvement. This initiative would seek to implement common energy performance certification and labelling methodologies; adopt and enforce binding zero net energy targets for all new and existing buildings; finance and deliver “whole building” retrofits to existing buildings; and drive innovation through voluntary programmes and public R&D funding.
42. A public-private initiative to create an international portfolio of 10 large-scale integrated smart grid demonstration projects across different regulatory regimes. Creating a number of well-designed pilot projects and sharing the resulting lessons would enable the utility sector to lower its risk premium on capital and reduce operating costs to a level that makes the investment case more viable. Such a process should:
 - a. Identify 10 key cities or areas where smart grid pilots can be set up, tested and further demonstrated
 - b. Create 10 regional public-private partnerships to design, develop and implement risk-sharing frameworks to implement smart grid technology
 - c. Mandate that these partnerships help collect and disseminate information, sharing best practices, policies and standards to optimize the scale-up of smarter grids
 - d. Simultaneously work on policy reform to take away the perverse profit incentive and create incentives for utilities to invest in end-use energy efficiency

Endnotes

- 1 This contribution was prepared by the Working Group on Energy Efficiency of the Task Force on Low-Carbon Prosperity and is based on conversations among Working Group members in a number of virtual meetings. The preliminary recommendations were further discussed in the Energy Efficiency Workshop held at the offices of Booz & Company in London, 19 August 2009.
- 2 McKinsey estimates a ten-fold increase in carbon productivity is required. This corresponds with a productivity growth that would be three times as fast as the industrial revolution. See *The carbon productivity challenge: Curbing climate change and sustaining economic growth*. June, 2008. New York: McKinsey & Company.
- 3 One example is the Federal Energy Management Program (FEMP), which has helped to reduce the average energy intensity in federal buildings by roughly 25% since 1985; by contrast, the average energy intensity in US commercial buildings has remained more or less at the same level.
- 4 Linked to the proposition from the Investor Working Group on accelerating low-carbon technologies, we suggest these centres of energy efficiency excellence should also be networked both to each other and to the proposed Consultative Group on International Energy Research. See the recommendations on accelerating low-carbon technology.
- 5 The International Partnership on Energy Efficiency Cooperation (IPEEC) was launched at the G8 Energy Ministers meeting in Rome, Italy, 24-25 May 2009. For the full declaration, see http://www.enecho.meti.go.jp/topics/g8/ipeecsta_eng.pdf.
- 6 Analysis from Project Catalyst, 2009.
- 7 *How the world should invest in energy efficiency*. July, 2008. New York: McKinsey & Company.
- 8 Source: *The carbon productivity challenge*, supra.
- 9 Source: *Towards a Global Climate Agreement - Synthesis paper*, 2009, Project Catalyst. <http://www.project-catalyst.info>
- 10 Although no specific recommendations were made for the transportation sector in this chapter, the working group recognizes there are major energy efficiency gains possible in this sector. The transportation sector would probably require a specific set of policy measures, which could be along the lines of the product and appliance standard-setting process suggested here. For example, transportation was identified as one of the key sectors under the Japanese Top Runner Program, with a target of 23.5% efficiency improvement by 2015, compared to 2004 levels.
- 11 *Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. 2007. Geneva: IPCC.
- 12 Source: *Energy efficiency: how far does it get us in controlling climate change?*, 2009, D. Ürges-Vorsatz & B. Metz, Energy Efficiency.
- 13 Source: *How the world should invest in energy efficiency*, July, 2008. New York: McKinsey & Company.
- 14 Analysis by Margaree Consultants, 2009. See http://www.theclimategroup.org/news_and_events/erik_haites_on_climate_finance
- 15 More details on this section are available in Annex A. See <http://www.weforum.org/documents/gov/Environment/Taskforce/Buildings.pdf>.
- 16 More details on this section are available in Annex B. See http://www.weforum.org/documents/gov/Environment/Taskforce/Product_Standards.pdf.
- 17 More details on this section are available in Annex C. See http://www.weforum.org/documents/gov/Environment/Taskforce/Energy_Efficiency_Finance.pdf.
- 18 More details on this section are available in Annex D. See http://www.weforum.org/documents/gov/Environment/Taskforce/Smart_Grids.pdf.
- 19 More details on this section are available in Annex E. See http://www.weforum.org/documents/gov/Environment/Taskforce/Utility_Business_Model.pdf.
- 20 In addition to creating incentives for the utility sector and introducing smarter grid and metering systems, targeted policies will be required to create incentives for end users. The range of policies that address the end user is wide. Although this contribution does not address changing end-user behaviour, this should be part of any reform package. One promising suggestion to smooth the consumer use of energy during peak periods is time-of-day pricing.
- 21 Annex F: Building a scalable public-private platform to encourage industry uptake of efficient technologies on a worldwide basis. See http://www.weforum.org/documents/gov/Environment/Taskforce/PPP_Efficiency.pdf.
- 22 Some of these centres are already in place or are emerging at the moment. Examples include the REEEP (<http://www.reeep.org>), focusing both a renewable and energy efficiency remit; the ICCT (<http://www.theicct.org>), focusing on for vehicle emissions; the ITDP (<http://www.itdp.org>), focusing on clean transportation; CLASP (<http://www.clasponline.org>), focusing on labelling and standards for appliances; and RAP (<http://www.raponline.org>), focusing on utility reform.

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2 Working Group on Accelerating Investment: Low-Carbon Technologies

Key Messages

Creating Low Carbon Technology Demand in Developing Countries

Low-carbon technology investment globally was about US\$ 155 billion in 2008. Recent estimates suggest it could reach over US\$ 500 billion a year to 2030 if the incremental costs of moving to a low-carbon energy system are met.

The main low-carbon technologies are well known. Some are not yet market ready; others are not yet deployed to scale. This means low-carbon technologies carry an incremental cost versus current energy technologies.

If the world economy transitions to a low-carbon system, the investment opportunities for low-carbon technologies will be large and will grow over time as widespread deployment reduces costs. In time they will become more competitive than fossil fuels.

Governments can take some specific actions over the next six to twelve months to accelerate investor interest in low-carbon technology:

- At the international level, parties to the Framework can agree to a second commitment period, including strong emission reduction targets from developed countries and clarity on what major developing countries will do to limit the growth of their emissions.
- The major energy producing and consuming economies can engage in an intergovernmental dialogue on how to remove energy subsidies.
- At the national level, governments can agree to develop Nationally Appropriate Mitigation Actions (NAMAs) and/or Low Carbon Growth Plans, to provide policy frameworks for accelerating investment in low-carbon technologies domestically.

If governments do signal clear long-term policy intent for low-carbon growth, there are a series of specific actions which the business and expert community can reciprocate in order to accelerate investment in low-carbon technologies, especially in developing economies. These actions include:

- Working with national governments (as part of their NAMAs or Low Carbon Growth Plans) to help develop policy frameworks that enable the acceleration of wind, solar and biofuels projects as part of the domestic energy mix;
- Developing and linking together virtual networks and physical centers of innovation activity in the low-carbon technology space around the world, and especially in developing countries (akin to creating a Consultative Group on International Energy Research modeled on the existing highly effective network of agricultural research centers);
- Undertaking a public-private initiative to create an international portfolio of up to 25 carbon capture and sequestration (CCS) demonstration projects by 2025 linked to major coal plants across the major coal-using nations including China, India and South Africa;
- Embarking on an informal, international public-private conversation on nuclear power, to establish international procedures frameworks and targets, including for safety, standardization and security issues, that can enable nuclear power, especially third- and fourth-generation nuclear, to play a useful and transparent role in the clean energy future.

Disclaimer

The views expressed in this section represent a collation of various viewpoints emerging from a series of discussions among the participants in the Working Group on Accelerating Investment in Low-carbon Technology. Although the observations and proposals in this section enjoy broad support, they do not necessarily reflect the views of every individual participant nor do they necessarily reflect the individual institutional viewpoints of any of the companies or institutions that took part, or of the World Economic Forum.

Summary

- The potential of key low-carbon technologies is now well-known – latest microeconomic analysis suggests they can offer up to 11% of GHG abatement potential to 2030; and up to 27% by 2050¹.
- Different low-carbon technologies are at different stages of market readiness. This means they require different policies to help accelerate their investment. Historic investment in R&D in the energy sector has been low, compared to other sectors of the economy. A step change in investment in research, development and deployment as well as investment in market-ready low-carbon technologies is therefore required.
- Governments can take some specific actions over the next six to twelve months to help accelerate global investment in low-carbon technologies:
 - Parties in the negotiations can agree to a second commitment period, including strong emission reduction targets from developed countries and clarity on what major developing countries will do to limit the growth of their emissions.
 - The major energy producing and consuming countries can agree to negotiate an international agreement on energy subsidies.
 - Parties can agree to have each develop national strategies such as NAMAs or Low Carbon Growth Plans in time for the second commitment period.
- The UNFCCC negotiations provide the space to agree to a second commitment period and to agree to NAMAs. Irrespective of whether parties can agree on NAMAs, members of the Major Economies Forum can agree to develop more comprehensive Low Carbon Growth Plans.
- In response to these actions from governments at the international level, businesses and expert organisations can work together with key international organizations and national or regional authorities to develop a collaborative network of public-private low-carbon technology innovation arrangements, platforms and centres around the world. This will help to develop the human resources and information flows that can stimulate a regional/national “pull” model for technology diffusion in time for the start of the second commitment period on 1 January 2013. Inspired by the Consultative Group on International Agricultural Research (its public-private funding structure, its networked applied research agenda, and its impact on food security through the deployment of enhanced crop science technology especially in developing countries) we term this new network of innovation the Consultative Group on International Energy Research (CGIER).
- The platform of the World Economic Forum can convene talks to discuss, design and launch a collaborative international process to develop the CGIER. The aim is for the network of low-carbon technology innovation arrangements, platforms and centres to be open for business before 1 January 2013. The process could involve organisations such as the World Business Council for Sustainable Development, the IEA, the United Nations Foundation and a suite of leading universities, business schools, regional/national expert organizations, business associations, think tanks and innovation centres from around the world, as well as government and international organization officials.
- There is a suite of domestic energy policy and innovation ideas suitable for particular countries, regions or economies that are ready for discussion with national governments, especially in relation to accelerating investment in wind, solar and biofuels. We list some of these particular actions and welcome an uptake in national public-private dialogues to develop them further, perhaps in relation to NAMA or Low Carbon Growth Plan discussions.

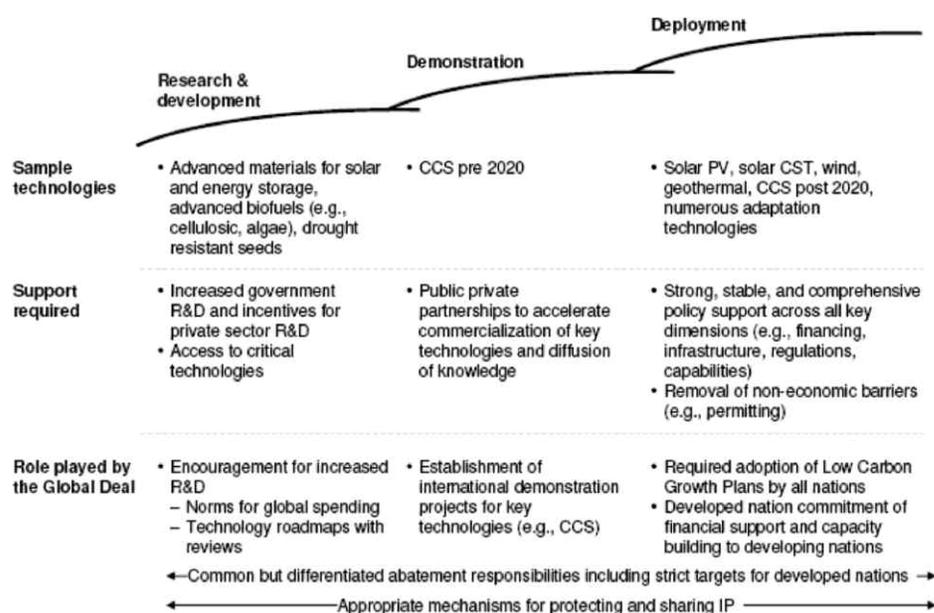
- A key international enabler to the acceleration of investment in low-carbon technologies is the removal of energy subsidies. This issue lies outside of the Framework negotiations. The platform of the World Economic Forum, in collaboration with the IEA, OECD and others, can host an informal dialogue for OPEC and G20 members to research, develop, and discuss a potential international agreement on energy subsidies, for formal consideration by the G8 and G20 during 2011 or 2012.
- Sector-specific low-carbon technology-related actions for scaling up renewables (including on-grid and off-grid solar, wind, low-carbon powered transportation and biofuels) could be implemented as part of a national government's NAMA or Low Carbon Growth Strategy Plan, in conjunction with private sector and expert representatives.
- Demand for coal has been growing faster than any other energy source. A particular public-private international initiative on carbon capture and storage is proposed to create an international portfolio of up to 25 CCS demonstration projects by 2025 linked to major (1 GW) coal plants across the major coal using nations including China, India and South Africa. An advanced coal initiative might also make progress on encouraging wider use of much more efficient coal-combustion technologies.
- Task Force members have also outlined some key issues related to the acceleration of international investment in nuclear power. There is still some difference of opinion on nuclear power, but it is clear it will be a low-carbon energy technology in the future energy mix. We propose that an informal international public-private dialogue on nuclear power is launched, to establish international procedures, frameworks and targets for accelerating investments in nuclear, but also to address issues of safety, standardization and security. The informal dialogue could report to a variety of formal intergovernmental platforms on energy and low-carbon growth, such as the G8, the G20, the Major Economies Forum and UNFCCC Conference of Parties meetings in 2010 through 2012.

Background: Identifying opportunities

1. This section reasserts the main low-carbon energy technology opportunities on offer; reiterates the enabling policies national governments can deploy to attract investment in these low-carbon technologies; and explores how the private sector can work with other stakeholders to develop business networks, systems and platforms to exploit the emergent low-carbon opportunity space, kick starting a low-carbon energy technology deal flow quickly and to scale.
2. The Task Force looked at the following low-carbon energy technologies: solar (photo-voltaic and concentrated solar thermal [CST]); wind (both on and offshore); biofuels (cellulosic, algae, ethanol); nuclear; and carbon capture and storage.
3. There has been much research on the technical capabilities and the GHG abatement potential for these technologies, including work by Princeton University's Stephen Pacala and Robert Socolow; the World Business Council for Sustainable Development; the IEA, Stanford University and Project Catalyst². Recent microeconomic analysis suggests that the main group of low-carbon technologies will play a pivotal role in GHG abatement—perhaps up to 11% of a deflection of business-as-usual GHG emissions by 2030 and up to 27%, potentially more, by 2050.³ Consequently, various financial analyses suggest that low-carbon technology investment opportunities could be potentially huge over the next few decades. For example, to achieve the level of emission reductions required by a 450ppm future, clean power technologies will have to be widely spread across the globe, accounting for 60-80% of

- power capacity additions in most developed countries, by 2030⁴. According to the IEA, the average year-by-year investments 2010 through 2050 required to de-carbonize the world's power sector include, among others, 55 fossil-fuelled power plants with CCS, 32 nuclear plants, 17,500 large wind turbines, and 215 million square meters of solar panels⁵.
4. Investment in the sustainable energy market to date seems robust—it has in some ways defied the global recession, growing by around 5%, from US\$ 148 billion in 2007 to around US\$ 155 billion in 2008⁶. Recent estimates suggest it could reach over US\$ 500 billion a year to 2030 if the incremental costs of moving to a low-carbon energy system are met⁷.
 5. However, not all clean energy technologies are at the same stage of market readiness. This means that different types of support from national governments and the new international framework will be required at different stages to accelerate their implementation. (Figure 2.1 below).
 6. This makes accelerating investment in low-carbon technology quite a challenging activity for many national governments, especially in developing countries. As Figure 2.1 illustrates, governments will be required to develop long-term, consistent and multi-dimensional national policy approaches that encourage low-carbon technology development and demonstration, with complementary links to the global framework. This is a more nuanced approach than simply receiving technology transfers from north to south.
 7. Navigating low-carbon technologies through their various research, development and demonstration (RD&D) stages will also be expensive. It has been estimated that the total global investment needed to reach a mature clean technology portfolio for the next 20 years will be US\$ 1.75 trillion, with another US\$ 5.25 trillion required between 2030 and 2050. This will require a step change increase in energy technology RD&D of about an extra US\$ 10-100 billion per year for the next 15 years⁸.

Figure 2.1: Market readiness of key low-carbon technologies and policy support required



Source: Project Catalyst, *Enabling Technologies for Low-Carbon Growth*, May 2009

8. In this respect, setting goals to limit GHG emissions and creating related policies that put a price on GHG emissions are important. They not only help direct new investment to climate-friendly outcomes by making clean technology more profitable, but they also provide incentives for private investment R&D – to accelerate development of the next generation of green technologies. OECD calculations show that policies seeking to stabilize CO₂ concentrations at 450 ppm (roughly 550 ppm CO₂ -eq.) could stimulate a fourfold increase in world energy spending on R&D⁹. On top of these policy signals, public R&D policies are also important, especially in current circumstances when the private sector faces liquidity difficulties in making large-scale new R&D investments. We are already seeing the economic downturn starting to undercut innovation in the private sector, in particular via sharp reductions in venture capital spending and patent filings. This is partly because investment in innovation is essentially pro-cyclical. Additionally, the lower the price of oil and raw materials, the less the immediate pressure to take “green action”.
9. In the longer run, new low-carbon technologies will become cheaper the more widely they become deployed. This means investment opportunities will increase if more RD&D is invested upfront, enabling more of these technologies to move down the learning curve. A report by Project Catalyst estimates that cost reductions of 3- 25% for each doubling of volume in deployment are commonly achieved, leading to large reductions in cost over the longer run (the 54% reduction in the cost of solar PV modules between 2000 and 2009 is a good example)¹⁰. Interestingly, in many cases, this means that fossil fuels will not, in fact, be a viable alternative to clean technologies in the long run, as these costs are already mature¹¹.
10. In other words, if governments commit to shifting to a low-carbon economy, considerable policy reforms (in both developed and developing countries) will be needed to accelerate investment in low-carbon technologies, including clear goals to limit GHG emissions and clear prices for GHG emissions. Yet, while necessary, these actions will not be sufficient. Internationally, there must also be a step change of investment in RD&D, as well as investment in the low-carbon technologies that are already market-ready, which will also require public sector commitments, at least in the short run. Overall, scaled up R&D activity holds promise for technology breakthroughs. Recent OECD analysis suggests that in the power sector, for example, such breakthroughs could halve the costs of mitigation by 2050, create new business opportunities and making more ambitious climate policies affordable¹².
11. How can governments accelerate investment across the board in low-carbon technologies, especially in the short run? What specific actions can the business and expert community take to reciprocate, in order to help catalyse a step change in investment activity in the low-carbon technology space?

Creating enabling policies

12. There are three overarching policy commitments that national governments can signal to the business sector, which will help create a step change in investor interest in low-carbon technologies. These are listed below.

Agree a second commitment period

13. A fundamental international policy signal to help accelerate low-carbon technology development and investment will be agreement to a second commitment period among parties to the Framework, from 2012 onward. This policy signal is required soon from the official community in order to give confidence to international business and the capital markets that governments are serious about continuing and accelerating the global low-carbon agenda after the Kyoto Protocol commitment period ends on 31 December 2012.
14. Agreement on a second commitment period at the COP15 by parties to the Framework would be the minimum signal required to help accelerate investment in low-carbon technologies.

Negotiate an international agreement on energy subsidies

15. The major energy producing and consuming economies can agree to launch a process to negotiate an international agreement on energy subsidies. The IEA has estimated that subsidies to energy consumers alone in 20 non-OECD countries amounted to US\$ 310 billion in 2007, implying a total annual subsidy to non-OECD energy consumers of the order of US\$ 400 billion. The scale of production subsidies is uncertain: the Global Subsidies Initiative estimates that production subsidies worldwide could be of a similar magnitude as consumption subsidies. They occur in both developed and developing countries — the US alone provides around US\$ 50 billion per year to its energy producers¹³. Overall, global energy subsidy levels are similar in scale to the estimated annual investment needed in clean energy technology to 2030 (between US\$ 170 billion and US\$ 550 billion¹⁴).
16. According to recent OECD modelling, eliminating the US\$ 310 billion of annual energy subsidies to developing country consumers would reduce emissions in some countries by over 30% by 2050, and reduce global GHG emissions by about 10% by 2050 while at the same time raising economic efficiency. For example, OECD modelling suggests that energy subsidy removal would increase household real income by 2.5% in India and by 0.7% in China by 2050¹⁵. The corollary also holds. Reducing emissions by financing low-carbon infrastructure projects in emerging economies will be counteracted if those same countries continue to subsidize high-carbon energy production and consumption.
17. Reforming energy subsidies presents challenges, but these are not insurmountable. Governments could explore the following potential actions:
- Charging fossil-fuels for the external costs they impose on society through pollution and their contribution to climate change:* This, as well as removing subsidies to their production and use, would likely prove significantly more cost-effective than attempting to “pick winners” by selectively subsidizing renewable energy in an attempt to level the playing field. It would also markedly reduce the public incentives private-sector investors would need to invest in alternative energy.
 - Use targeted welfare payments to protect the most vulnerable members of society:* This is likely to achieve the same protection of the vulnerable at much lower cost and a lower level of energy consumption, with consequently lower environmental impacts and healthier energy sector finances.

18. To open up these and other related discussions, the platform of the World Economic Forum, in collaboration with the IEA, OECD and others, could host an informal expert dialogue for officials from the major energy producing and consuming economies (for example OPEC and G20 members). The objective would be to help governments research, consider and discuss actions, such as those listed above, in order to develop a potential international agreement on energy subsidies, for formal consideration by the G8 and G20 during 2011 or 2012.

Agree to develop low-carbon growth plans

19. Governments should agree to develop national domestic plans that provide a road map for low-carbon growth; this would provide a clear signal as to the prospect of market expansion for low-carbon technologies in their own country. Under the UNFCCC for example, the Bali Action Plan encourages developing countries to carry out nationally appropriate mitigation actions “in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner¹⁶.”
20. To put NAMAs into operation, the global climate deal will need to establish workable financial and governance mechanisms. No agreement yet exists, however, on the scope of NAMAs or the financing or governance arrangements that will be put in place to implement them. Using NAMAs as detailed low-carbon technology investment plans for potential financiers could help the proposition come alive for the negotiations.
21. Another option to help national governments create enabling policies that accelerate low-carbon technology investments is the development and adoption of comprehensive low-carbon growth plans in all nations. Low Carbon Growth Plans are not part of the formal negotiations but were mentioned for the first time at the Major Economies Forum summit of July 2009¹⁷. These plans are more comprehensive than NAMAs—the suggestion is that they cover technology needs for growth, adaptation, and abatement across all sectors (power, transport, buildings, etc). They might include critical actions across all key areas, including:
 - a. *infrastructure*, such as grid enhancements to handle intermittency or electric vehicle recharging;
 - b. *policies and regulations*, such as market design, interconnection standards, streamlined approval processes, policies that put a price on carbon, and reform subsidies that boost emissions;
 - c. *capacity building*, such as training local engineers to build, operate and maintain clean power generation and to operate the grid in the presence of intermittency, or providing potential project developers with reliable information on technology options, costs, and performance, and with assistance in building credible business cases, or advising local regulators on effective approaches for financial subsidies;
 - d. *supporting finance*, such as subsidized loans for the development of a nation’s low-carbon power, building and transport sectors.
22. The UNFCCC negotiations provide the space for parties to the Framework to agree to NAMAs. Irrespective of whether Parties agree on NAMAs, however, members of the Major Economies Forum can themselves agree to each develop more comprehensive Low Carbon Growth Plans.
23. Some corporate members of the Task Force have set out sector specific ideas for particular national or regional policies that such NAMAs or Low Carbon Growth Plans might contain, in order to accelerate low-carbon technology investments. These ideas (for the wind, solar and bio-fuel sectors) are summarized below in the section on sector-specific, low-carbon technology-

related actions. During 2010-2012 a series of public-private expert working groups could help national governments around the world (as part of their NAMAs or Low Carbon Growth Plans) to develop practical policy frameworks that enable the acceleration of wind, solar and biofuels projects as part of their domestic energy mix.

Develop networks of low-carbon technology innovation

24. Despite the necessary signals that governments can give through policy commitments such as NAMAs and Low Carbon Growth Plans and through the removal of energy subsidies, substantive developments are also required within the business ecosystem itself, if clean energy research, innovation, demonstration and project development is to be scaled up.
25. To complement a shift in government strategies, a new generation of collaborative networks and innovation platforms needs to emerge, connecting together research centres, business schools, companies and investors around the world (and especially within developing countries) who are interested in low-carbon technology.
26. These networks can emerge either within countries, across countries through bilateral arrangements, or through multi-country partnerships; they can be project-centric or permanent; they can be virtual through the creation of new social networks, or physical through the construction of new centres of excellence and technology parks. Across all of these initiatives, however, a common goal should be to build processes, build experience and build capacity to pull various low-carbon technologies through the RD&D stage, incubate them in various countries and regions and then move them to scale for widespread investment and deployment.
27. Interesting analogues exist in the pharmaceutical and information technology and communications industries for the development of such technology collaboration and innovation networks. Some examples are also starting to emerge in the low-carbon technology space. For example (and by no means exhaustively):
 - a. Innovation hubs where academic R&D centres are positioned in proximity to technology industrial parks—classically in the US at Silicon Valley (Stanford University), and Route 128 Boston (MIT). Recent developments specifically for low-carbon technology include the MASDAR Institute of Science and Technology in Abu Dhabi, and BP's collaboration with the Chinese Academy of Sciences to develop a clean-tech commercialization centre in Shanghai's Pudong Science Innovation and Technology Park.
 - b. Initiatives within domestic technology institutions themselves to improve their R&D links to applied demonstration and deployment, such as Imperial Innovations at Imperial College London, or the Smith School of Enterprise and the Environment at Oxford University. (See: <http://www.imperialinnovations.co.uk> and <http://www.smithschool.ox.ac.uk>.)
 - c. The creation of high-profile drivers for innovation in RD&D, such as the X Prize Foundation or the Zayed Future Energy Prize. (See: <http://www.xprize.org> and <http://www.zayedfutureenergyprize.com>.)
 - d. The linking together of similar entities—such as cities, universities, investors etc—to share research lessons and scale up technical, institutional and policy innovations. Examples include the C-40 initiative, the UNIDO/UNESCO/WIPO U-40 initiative, and the P-8 Group. (See: <http://www.c40cities.org>, <http://www.unido.org>, and <http://www.cpi.cam.ac.uk>.)
 - e. Public-private research agreements such as Cooperative Research and Development Agreements (CRADA). These are a US government device to jointly develop new technologies with private sector companies. They are housed within the National Energy Technology Laboratory, part of the

- Department of Energy's National Laboratory System. CRADAs have standard intellectual property-sharing agreements, allowing both the government and private companies to contribute according to their strongest capabilities. (See <http://www.netl.doe.gov/business/crada/crada.html>.)
- f. The growth of collaborative innovation platforms across industries, such as the China Greentech Initiative (CGTI). This is an open source, commercial collaboration of 80 of the world's leading technology and service companies, entrepreneurs, investors, NGOs and policy advisors. Through CGTI, these organizations have come together to define greentech market opportunities and solutions for China. (See: <http://www.china-greentech.com>.)
 - g. The emergence of large project-based, public-private innovation platforms and foundations, such as Desertec in the EU-MENA region. (See: <http://www.desertec.org>.)
 - h. The rising potential for virtual collaborative research, through the use of meaning-based computing, which enables computers to analyze and understand relationships that exist between disparate pieces of information, thus providing users with relevant data they didn't know existed. (See: <http://www.autonomy.com>.)
28. It is likely that the flourishing of the kinds of researcher-business-investor networks of "bottom up" initiatives listed above, which can exist within or outside of a new international climate deal, will have more of a material impact on the accelerated diffusion and investment in low-carbon technologies around the world over the next two decades than any one universal technology transfer fund or mechanism housed by an international organization. A practical objective, therefore, should be to stimulate a worldwide blooming and interconnection of such business innovation networks for the low-carbon technology sector over the next two to three years. As the world economy inches out of recession over the next 24 months and investors look for signals of growth and confidence, the timing of such an initiative could be just right.
29. With a "top-down" policy pull by governments focused on establishing a clear international signal of intent, the business and research communities can reciprocate with a bottom-up push from within their own ranks to develop more of these kinds of networks and arrangements around the world. Stimulating many more of these new sorts of business innovation models in developing countries and regions will be especially important, in order to enable a comprehensive international acceleration of investment in low-carbon technologies.
30. To this end, we propose a private sector expert-led initiative to stimulate networks of low-carbon technology innovations around the world over the next two to three years, especially in developing countries. These networks could be based upon the development of a number of specific new innovation centres, especially in developing countries, on widespread business, researcher and official engagement in open source collaboration platforms to encourage technological and project development between business and government parties, and on the development of new IPR approaches.

Innovation centres

31. Our proposal is to establish a global public-private fund of US\$1 to 2 billion (drawn from foundations, businesses, university endowments, public sector donors, etc.) to create a network of low-carbon technology innovation centres in five or six developing countries within the next five years. These low-carbon technology innovation centres would work in each county or region to develop and deploy technologies appropriate to the needs of those countries.
32. The network of centres could leverage some of the institutions and networks mentioned above, establishing deeper links between developed and developing countries and creating a much stronger north-south, low-carbon, technology research and innovation network. The centres could involve publicly funded organizations that work in individual countries across a wide range of technologies appropriate to the needs of those countries, and engage both national and multinational companies to overcome the local barriers to the development and deployment of these technologies.
33. By looking at innovation from an innovation system perspective, the network would also address “valley of death” issues, i.e. the early stages of a technology’s life, where companies developing low-carbon technologies may fail to attract large-scale private sector investment needed to succeed. They would also serve to address the issue of energy poverty, and how the latest technologies and innovations can help leapfrog existing energy options to help address energy poverty quickly, cleanly and to scale.
34. The network of centres would aim to *provide practical support* to domestic and regional businesses and consumers, *identify the gaps to address in the local environment* and provide solutions appropriate to local resources and capabilities (such as capacity building, field trials, seed capital and business incubation), *foster a full-life-cycle view on technology innovation* from initial idea creation to functioning commercial enterprise, and *establish a ‘pull’ model of technology diffusion*, both internal to the country and through links to other countries
35. Fundamentally, the aim of the innovation centre model is to share the risks of clean energy technology innovation and deployment so that private investors are more likely to be willing to invest their capital in these new and emerging technologies where market pull is weak and the prospects of acceptable returns on invested capital are uncertain. Sharing and overcoming risk is a fundamental characteristic of the proposed centres.
36. A historical precedent could be the Consultative Group of International Agricultural Research (CGIAR). Established in 1971 to promote a more coordinated public-private research push in agriculture in response to rising concerns about population growth, famine and future food security, the CGIAR is a strategic partnership with 64 member countries, four private foundations and 13 international organizations supporting 15 international centres around the world. The centres work in collaboration with many hundreds of government and civil society organizations as well as private business. CGIAR supports a wider network of more than 8,000 associated scientists and staff active in over 100 countries throughout the world.
37. Lessons from CGIAR suggest that the benefits from international collaboration on technology R&D will be greater when there are strong links with national and local dissemination systems as well as a minimum of domestic absorptive capacity in place. They highlight the need to strike a balance between nurturing scientific and technological excellence, while also taking into account multiple stakeholder viewpoints and complex social and environmental problems that inevitably vary by location. The CGIAR experience demonstrates

that international collaboration can play a key role in helping countries harness the private sector's potential to conduct R&D activities and facilitate the dissemination of new technologies.¹⁸

38. In terms of the low-carbon technology sector, there is an emergent platform to potentially build this network upon. The UK DFID and InfoDev (from the World Bank) are currently piloting a low-carbon innovation centre concept, investigating country-specific interventions to accelerate the development, deployment and transfer of locally relevant climate technologies in middle- and low-income countries, as part of a climate technology programme. It is conceivable that this model could be the start point for a scale up of innovation centres in key developing countries, which could be linked to existing innovation centres or hubs in developed countries. (See: <http://www.infodev.org/en/Topic.19.html>.)

Open source collaboration platforms

39. The multi-business Greentech initiative in China has helped uncover an innovative multistakeholder collaboration model for technological development, with a focused aim of accelerating investment decisions and the deployment of capital. (See: <http://www.china-greentech.com>.) Through an open source, collaborative and professionally managed process, knowledge from businesses, financiers, NGOs and governments has been pooled together to provide cross-sectoral *analysis of the market and environmental issues* of a country (in this case China), analyze the country's *regulatory response*, identify the *available technical solutions* that can be used to address these issues, and spot the *key development challenges and opportunities* to accelerate greentech market growth.
40. Lessons to date from China Greentech suggest that partner-members have been able to create a depth and breadth of knowledge that no one organization could have achieved alone or by way of limited partnerships. Such an open-source collaboration model also helped to uncover innovative solutions to particular low-carbon technology challenges more quickly, exceeding the results possible for any single partner-member to achieve in the same time frame and at the same cost on their own. Further, it has reduced each partner-member's opportunity costs for engaging in R&D activities and also—by functioning in an open-source mode—addressed intellectual property rights issues at the market research level.¹⁹
41. Based on the experiences of China Greentech and involving those companies who took part, our proposition is to undertake an initiative over the next two years that replicates this kind of platform in other key developing country markets around the world, such as Brazil, India, Mexico and South Africa. These entrepreneurial, deal-focused, and non-permanent collaborative platforms and networks would complement the more permanent, research-focused aims of the low-carbon technology innovation centres. They can focus on understanding the host country's NAMA or Low Carbon Action Plan and develop the business plan to make it a reality.

Next steps

42. The industry and regional platforms of the World Economic Forum can be used in 2010 through 2012 to convene talks that discuss, design and launch a process to develop networks of low-carbon technology innovation as suggested above, perhaps leveraging the DFID/World Bank Climate Technology Program. The aim could be for the various arrangements, platforms and centres to be ready for business before 1 January 2013. The process should involve international organizations from the business, energy and financing sectors, a suite of leading universities, business schools, regional/national expert organizations, business associations, think tanks and innovation centres from around the world, and government and international organization officials. The Task Force would seek UN or governmental support to help undertake these discussions over the next 24 months.
43. Inspired by the Consultative Group on International Agricultural Research as a working concept (with its public-private funding structure, its networked applied research agenda and its impact on food security through the deployment of enhanced crop science technology, especially in developing countries), we term this overall public-private-expert push to create new networks of innovation as establishing a Consultative Group on International Energy Research. The network of applied, regional energy research centres envisaged would offer a natural complement to the international policy agenda of the IEA.
44. Supporting by and linked to this process of developing a regional network of innovation in energy would be the establishment of a suite of China Greentech style initiatives around the world. These initiatives would provide practical sets of issues, hurdles and opportunities for the networks to help address.

The Issue of intellectual property rights

45. In discussions of the Parties, issues of intellectual property rights (IPR) and technology transfer are often referred to together and are sometimes mistakenly conflated. IPR is simply a system for ascribing ownership to products, processes and know-how. IPR turns technology into discrete, publicly identifiable assets, and provides a framework for transacting technology with others. It creates incentives for research by promising a return on investment; it encourages investment in other markets that respect IPR; and it spurs further indigenous research and development through the building of skills in the recipient market and the publication of patent literature.
46. IPR alone does not dictate where low-carbon technology is deployed or how to accelerate its deployment. To have a positive impact, the markets to which a low-carbon technology might be transferred must be able to effectively deploy it. If the recipient market does not have the regulatory, technical or innovation/entrepreneurial capacity to utilize the technology, it is of little value. This is why the initiatives listed above aim to develop markets for the deployment of low-carbon technologies, rather than focusing solely on IPR issues.
47. Some detailed suggestions on how to address in a practical way some of the main barriers related to IPR transfer and protection in developing countries are presented below. Three core ideas include:
 - a. *Encouraging greentech patenting* in developing countries by reducing both the cost of ownership and the time to grant. This could be achieved through a fast-track examination for greentech patents, a reduction or total exemption of official fees and annuities for such greentech patents, public loan facilities on favourable terms to offset costs of patenting, and public

- patent mortgages (or other forms of IP-backed securities), which allow patent owners to obtain loans from commercial banks securitized against patents.
- b. *Establishing and linking national and international platforms for technology exchange* specifically for greentech. At the international level, such platforms could comprise a needs assessment programme and technology information database that could be used to build in-country capabilities for collecting technology information and actively sourcing required technologies from vendors. The technology exchanges could act as a matchmaking portal for public or private services that lower barriers to transactions between vendors and local partners and operate as a platform for patent trading. This model has been successfully used in a number of countries and could be applied specifically to the greentech sector.
 - c. *Providing financial incentives for encouraging investment in greentech IPR* in the host developing country. These could include developing domestic financial incentives for technology transactions, such as lowering taxes and removing capital controls on greentech royalties, setting up IP commercialization funds to directly purchase rights to proven patented technologies from owners who do not intend to commercialize their inventions (thus creating national, regional or global portfolios of open sourced IP with which to work), encouraging private sector incubation and commercialization of new technologies from research institutions and universities, with the commercial benefits shared by both, and setting up expert advisory bodies at the international level to provide models and best practices for technology commercialization between institutions and private sector and to make policy recommendations that encourage this process.
48. Developing these practical initiatives on IPR within different regional contexts can form part of the work programme of the low-carbon innovation networks set out above.
 49. Finally, it should be noted that the establishment of an international IP acquisition fund to purchase and own rights to technologies outright, as promoted by some parties to the Framework, is not viewed as a good idea by Task Force experts. A number of problems are suggested with such a model—not least the dynamic and highly variable nature of technologies, problems of selection, valuation, commercialization, ongoing innovation, and dealing with infringement. Such a fund has the potential to balloon in cost, but result in a decaying portfolio. IPR portfolios are constantly evolving and historically have been better managed through private sector ownership and exploitation. Our suggestion would be that limited public funds be used to stimulate the processes outlined above, rather than creating an international IP acquisition fund.

Sector-specific, low-carbon technology-related actions

50. There are a number of sector-specific, low-carbon technology-related actions for accelerating investment in solar, wind, biofuels and transportation that Task Force experts believe could be implemented as part of a national government's NAMA or Low Carbon Growth Strategy plans, in conjunction with private sector and expert representatives. Some of the more promising strategies are outlined below.

Shift to large-scale on-grid solar

51. While solar energy has seen tremendous growth over recent years, its overall market penetration has been too small to make any meaningful impact, as it currently accounts for less than 0.1% of the electricity generated in the world. Given the high degree of overlap between the electricity demand pattern and the solar generation profile during any given day, and the relatively high costs of peak power generation, solar has the potential to replace well over 500 GW

in the US, the EU and China today. In 2008, only about 5 GW of solar PV capacity was added to the energy mix globally, but to make a real impact, installed solar must reach the scale of hundreds of GW over the next decade.

52. The two key challenges for solar PV are cost and market access. Solar power becomes more affordable and pervasive through industrialization and innovation. Today, most of the solar industry is concentrated on residential and commercial rooftops, which, while desirable and necessary, does not allow the industry to scale up quickly and lower costs more rapidly. To get to the deployment scale of well into the hundreds of GW, the focus must shift to large-scale, industrialized solar installations that are cost efficient, and connected into electrical grids by utilities.
53. While some of the most effective measures for moving large-scale solar are interpretations of classical instruments (such as tax holidays and local tax exemptions, import duty exemptions on manufacturing equipment, and setting up dedicated solar manufacturing areas or parks), we would like to suggest further innovative measures:
 - a. A *green bank* that could make low- or no-cost loans and provide loan guarantees for PV projects. The green bank would allow for more favorable financing of renewable resources through lower cost of debt and higher leveraging ability.
 - b. federal and state governments could *promote and implement off-take agreements with PV manufacturers* that will provide market certainty for the business sector to invest in large-scale manufacturing needed to dramatically lower solar PV costs.
 - c. The *Clean Development Mechanism could be extended* to help fund large-scale solar projects in China.

Accelerate investment in off-grid solar in the developing world

54. It is generally assumed that poor people living in off-grid areas in the developing world would need subsidies to afford solar power. However, solar is only expensive for people who have a choice of grid versus solar. Where populations live on kerosene or diesel and suffer foregone incomes because of lack of access to electricity, solar makes sense and often represents an affordable solution. Barriers to off-grid solar are *site specific* and in many cases *segment specific*²⁰. Often, it is not the cost of the technology that is a barrier, but other specific country, community, or enabling environment-related factors that are particular to the poor in developing countries.
55. Some steps that can be taken to enhance the sustainable diffusion of solar in the developing world include:
 - a. *Creating solar energy portfolios in international financial institutions*: A certain percentage (at least 5%) of priority sector financing should be earmarked for solar energy financing and dedicated to entrepreneurs to create a network (sales and after-sales service) and to end-users²¹.
 - b. *Substituting a capital subsidy with an interest subsidy*: Divert the earmarked subsidy for capital reduction to financial institutions for reduction in interest rates. Well-performing entrepreneurs, low-income groups, and clients with good re-payment histories should get the benefits of reduced interest rates²².
 - c. *Removing consumption taxes such as VAT on off-grid solar*: A skewed VAT structure for solar systems exists in developing countries. These kinds of taxes do not account for the benefit of replacing fossil fuels with renewable sources²³.
 - d. *Adopting a systemic view for diffusing off-grid solar*: Diffusion of technologies like solar can also be done by providing income-generating products like sewing machines, silk weaving looms, etc. Developing countries need to build capacity for a supply chain of high efficient income-generating products that run of solar energy.

- e. *Weighing the effectiveness of feed-in tariffs vs. discounted financing for off-grid solar:* Since off-grid solar is a decentralized solution, discounted financing supplied via international financial institutions would have a greater and more sustainable impact across developing countries. In addition, tariffs result in focusing more on the solar panel technology and not the whole system and its ability to cater to a need.
- f. *Developing human capacity in the sector:* There is a very severe shortage of skilled workers in the off-grid solar sector, from good technologists at the design stage to skilled technicians at the ground level. In addition, large groups of the society, such as architecture associations and builders associations, could be given incentives to help take solar energy implementation to the next level.

Accelerate investment in wind energy

- 56. Wind projects are capital intensive but have low operational costs, since wind is free. This is similar to solar and hydro, but different from biofuel, biogas and other renewable energy sources. This implies that the feasibility of wind investments is very sensitive to the availability of long-term debt and “patient” equity. The internal rate of return (IRR) for investors in high capital expenditure projects critically depends on the maturity of debt, the cost of debt and the ratio between equity and debt. These conditions have critically changed with the economic crisis²⁴.
- 57. Wholesale sources of institutional capital are neither well-suited to accept development risks, nor to handle construction risks of individual projects. Commercial banks are better equipped to handle these risks. Carbon and renewables-focused fund managers and private equity companies are looking to work with those risks. Therefore, our suggestion is that development and construction finance be facilitated by commercial banks and supported by export credit agencies (ECA) if required. In turn, wholesale sources of capital may offer an “exit” for the commercial banks by offering long-term debt and equity—once projects are fully developed, constructed and grid-connected. The following actions could be taken:
 - a. Development finance institutions could consider as suitable structures *attracting wholesale sources of institutional capital under B-loans*²⁵.
 - b. *Pooling of projects* could be encouraged under the umbrella of public finance institutions such as multilateral banks or the ECAs, to lower volatility and increase debt size compared to a project-by-project approach.
 - c. *ECAs could insure* equity and debt finance investments from wholesale institutional investors in emerging markets.
- 58. In addition, the key legal and regulatory framework elements for creating business case certainty for wind include:
 - a. *targets and timetables* for wind energy;
 - b. a *pricing mechanism*, (for example, through feed-in tariffs or green certificate systems, capital investment subsidies or grants, production subsidies, tax credits or rebates, special loan schemes);
 - c. *priority access to the grid*, including facilitated connection procedures, transparent and fair access to the grids, a short processing time for applications, and reducing or eliminating the cost of grid connection;
 - d. *clear, effective national planning procedures* that reduce the number of authorities involved in the permitting process, shorten long lead times to obtain permits, and introduce a one-stop shopping approach;
 - e. *public support and acceptance* through appropriate information and transparency.

Enable the transition to low-carbon powered transportation

59. The transportation sector is the second-largest and fastest-growing source of CO₂ emissions globally. It is also the biggest user of oil. According to the IEA the sector accounts for 66% of oil consumption, and that share is expected to increase to 72% by 2030. The impact of the transportation sector will increase: the current global fleet of 800 million cars and trucks is forecast to grow to 2.3 billion vehicles by 2030.
60. Switching to low-carbon transportation – such as electric vehicles (EV), for example – could provide immediate emission reductions that will increase over time as a greater percentage of the energy supply is generated by renewable sources. The process of vehicle electrification is underway using the same lithium-ion battery technology that powers the computer industry today. The reason for the shift is that EVs have a lower total cost of ownership, electricity is significantly cheaper than oil on a per-kilometre basis, and they produce zero emissions.
61. In July of 2009 hybrid EV sales in the US represented just 4% of new vehicle sales. In order to deploy EVs more widely, multiple interdependencies must be solved. Vehicle electrification requires lithium-ion batteries, charging and range extension infrastructure (e.g. battery swap stations), and an adequate supply of the vehicles themselves. The build out is a Catch-22, as scaled up car development is waiting for infrastructure deployments, private capital is hesitant to fund infrastructure without cars, and both need to exist for there to be scale battery players.
62. Public capital can be the solution. A government can invest in deploying infrastructure. This removes the risks from the investments of car and battery companies, attracting private capital. The scaling of the car and battery industries offer ample incentives for the private sector to deploy additional infrastructure. The initial public outlay can be repaid, with a return, and the country will benefit from energy independence, lower emissions, and a vibrant new industry.
63. At a macro level, government investment will be needed to support a nascent industry. Gasoline is seen as easy and cheaper because the infrastructure is already in place. EVs need capital and the eminent domain to deploy their infrastructure. They also need support to reach scale and drive down the cost of cars and batteries. Early demand stimulation can involve a range of instruments, including the removal of gas subsidies or increased gas taxation, registration taxes for gas-powered vehicles, direct subsidies, battery financing, emissions taxes, increased vehicle efficiency standards and levies on inefficient vehicles.

Accelerate investment in biofuels

64. Advanced biofuels can save as much as 90% in CO₂ emissions, compared to gasoline and can replace 25% of the needed transportation fuel in 2030. By then, some 2.3 billion vehicles are expected to be on the road, the vast majority of them powered by internal combustion engines. Biofuels also lie at the heart of the air industry's aim to lower overall emission. Despite growing traffic the industry aims for a 50% net emission reduction in 2050 compared to 1990 levels (see www.iata.org). However, as with all renewable technologies, the deployment of biofuels is largely dependent on the energy and climate policies implemented by different governments, which must be both comprehensive and cohesive over the long term.
65. Regulatory limits on biofuel use, or the lack of support or incentives for the creation of downstream infrastructure such as fueling stations, block the upstream investments needed to drive the intended production scale-up and

use of advanced biofuels. Further, mutually inclusive vehicle technologies, such as cost-neutral “flex fuel” for biofuels already in use today, are compatible with current hybrids or future extended-range-electric vehicles.

66. Between 2003-2007, global biofuel production increased 200%, with 2008 global production totalling 17.3 billion gallons and projections forecasting a 15% annual increase in demand to 2022. Production of first-generation biofuels is well established in several parts of the world, and the technology to produce advanced biofuels such as cellulosic ethanol will be ready from 2010. The private sector will make the investments necessary to deploy it at scale—provided governments set it as a clear goal to replace fossil fuels with renewables and to implement policy to enable and create incentives for deployment in both the developed and developing nations.
67. Components of a policy to drive deployment of advanced biofuels should address issues such as:
 - a. *An even and fair comparison between the environmental and economic impact of different transport fuel alternatives:* This should guide policy-making and drive private sector investments towards sustainable solutions.
 - b. *Incentives and risk mitigation:* Financial incentives to help mature and scale-up an advanced biofuel industry must be sufficiently long-term in nature—and must be complemented by capital and risk-management instruments for bio-refinery construction, product blending, and distribution.
 - c. *Fuel blending:* Blending of biofuels in gasoline and diesel should be mandated, including a long-term fixed set of annual targets.
 - d. *Infrastructure:* Investment in the necessary infrastructure for biofuel to be blended, distributed and sold must be commensurate with the timeline laid out by the biofuel mandate.
 - e. *Vehicle fleet:* Policy-makers must understand that the approved blend-level for the legacy fleet and the number of vehicles compatible with higher blends will affect the ability to fulfill mandates, and thus the ability to replace petroleum.
 - f. *Pricing:* Pricing of petroleum and renewables should take direct and indirect environmental costs fully into account.
 - g. *Fossil fuel subsidies:* These should be phased out over a predetermined timeframe so as to facilitate the development of alternative fuel sources.

A sector-based, multi-country partnership to develop carbon capture and storage

68. The issue of coal and CCS requires special attention. Demand for coal has been growing faster than any other energy source and is projected to account for more than a third of incremental global energy demand to 2030²⁶. The IEA projects that to be market-ready from 2030 onward, at least 20 large-scale CCS demonstration projects linked to large-scale coal-fired power stations will be required worldwide by 2030. Currently, there are no large-scale demonstration projects of this nature, though several are now under discussion.
69. Work on technology options from Project Catalyst sets out the CCS challenge clearly: One recent ClimateWorks paper expressed the challenge this way: *“Some technologies operate on such a large scale that their learning curves are shaped more like large steps. With CCS, the steps come in billion dollar increments, and it will require several of them. But CCS is crucial for several dozen nations, and not all of them can afford to take all of these steps. This suggests a dual imperative: First, we need an internationally coordinated research and deployment plan for those countries (the US, EU, and Canada, so far) that have allocated more than a billion dollars to the technology. Second, and more complicated, there should be a joint technology development and deployment program that includes India, China, and other*

key nations. This might be in the form of a series of bilateral agreements, or a more international consortium, but it should involve meaningful participation by all parties in the form of technology, sites, finance, and management²⁷."

70. The implications are clear. Rapid development of CCS, leading to significant deployment of this technology from 2030 onward, can only take place only through a series of large-scale targeted demonstration projects over the coming decade. These demonstration projects are probably best delivered by industrial concerns in the power, oil and gas and heavy equipment manufacturing sectors responding to clear and unambiguous market signals and incentive packages created by governments. A demonstration programme needs to be based on clear objectives, have a timeline for action, have funding commensurate with the task at hand, and focus on the delivery of fewer complete projects, rather than providing limited funding for many.
71. To this end, our proposal is to undertake a public-private initiative to create an international portfolio of up to 25 CCS demonstration projects by 2025 linked to major (1 GW) coal plants across the major coal-using nations, including China, India and South Africa.
72. Above and beyond the financing mechanisms discussed in the next section, core policy related components of this process may include:
 - a. *An additional Clean Technology Mechanism:* This would financially support and deliver large-scale mitigation projects in selected sectors that are at points on the abatement cost curve broadly comparable to the marginal emission abatement options in developed countries. Financial support would be delivered through certificates of emission reduction as in the CDM and these could be extended to include emission avoided by CCS.
 - b. *The introduction of a large-scale sector-based approach into the climate framework:* This would allow an early focus on high-emitting sectors where the costs of emission abatement options are similar to the prevailing price of emission allowances in developed countries.
 - c. *Development of an international carbon sequestration unit (CSU) that is based on internationally accepted criteria for the longevity of storage:* This could apply anywhere in the world and would be awarded on the basis of ensuring long-term storage according to procedures detailed in the 2006 IPCC Guidelines for National Gas Inventories.
73. With the above elements in place, an international approach that mirrors the CCS framework developed in the EU could then be implemented, with a first focus on the coal-fired power generation sector in rapidly developing economies, such as China, India and South Africa, that combined use 80% of developing world coal. A sector-based agreement²⁸ that sets out to establish CCS facilities, infrastructure and technical capacity in China, India and South Africa over the period 2013 to 2020-25 could be negotiated. Other parties to the agreement might be the US, Japan, the EU and Australia. As a result, CCS in these emerging economies would initially be funded by the major developed economies. Later, developing countries would support CCS in their own right through policy instruments such as, for example, "cap-and-trade".
74. Such an approach could link up with a number of initiatives exploring bilateral or multi-country vehicles for CCS demonstration in developing countries. Notably, these include Australia's Global CCS Initiative, the Asia Society-Centre for American Progress's US-China CCS Initiative, and the Major Economies Forum's Technology Working Group on CCS, led by Australia and the UK. Each of these activities could benefit from a more substantive private sector interaction platform as proposed here.

A dialogue on nuclear power

75. Although consensus was not reached in this working group, nuclear power will play a role in the low-carbon energy mix moving forward. In 2007 the 439 existing nuclear power reactors operating in 30 countries provided about 15% of the world's electricity²⁹. By 2030, nuclear power capacity may have doubled. Most new reactors currently planned are in Asia, which has fast-growing economies and rapidly rising electricity demand. Electricity generation from nuclear power in China, for example, is projected to grow at an average annual rate of 8.8% from 2005 to 2030, and in India by an average of 9.4% per year³⁰.
76. Barriers to the expansion of nuclear power include the high capital costs and long development period involved, as well as concerns over safety and geopolitical issues related to weapons proliferation. Another major obstacle is the lack of production capacity for nuclear reactor equipment. After the significant decline in interest in nuclear power in the mid-1980s, only a few countries in the world (among them France, the US, Japan, Russia) still possess such production facilities.
77. Suggestions to promote the uptake of nuclear energy are to *include it in market mechanisms under the second commitment period*, such as the CDM and Joint Implementation. It could also form part of the lending from development finance institutions such as the World Bank. Many also suggest the imperative of establishing international *harmonization of safety standards*, which would be required to standardize reactor design. This would reduce construction and operating costs and lead to greater efficiencies and simplicity in nuclear plant operations. Finally, *cooperation mechanisms* currently in place could be extended, to help new entrants into the nuclear energy club.
78. To this end, the platform of the World Economic Forum could be used to launch a dialogue from 2010 through 2012 on nuclear power and its role in accelerating our clean energy future. Outcomes of the dialogue could be fed to the Parties at COP 16, 17 and 18, and to the Major Economies Forum.

On smart grids

79. Echoing the findings of the Energy Efficiency Working Group, we believe 'smart' grids can be a key accelerator for low-carbon technology (and a low-carbon technology web in itself). Using new techniques in information technology and telecommunications, building intelligent electricity grids in and of itself would reduce emissions related to energy production and grid loss. More importantly, however, smarter grids can act as an enabler for the wider transition to a low-carbon economy, accelerating the uptake of a range of low-carbon technologies in energy, buildings and transport. The reader is referred to the Energy Efficiency Working Group's proposal in section 1 of this report for a public-private initiative to create an international portfolio of ten large-scale, integrated smart grid demonstration projects across different regulatory regimes.

Endnotes

- 1 *Enabling Technologies for Low-Carbon Growth*. April, 2009. San Francisco: ClimateWorks Foundation.
- 2 Pacala, S. and Socolow, R. Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies. In *Science*, 2004, 305: 968-972. (<http://carbonsequestration.us/Papers-presentations/html/Pacala-Socolow-ScienceMag-Aug2004.pdf>); *Pathways to 2050—Energy & Climate Change*. December, 2005. Geneva: World Business Council for Sustainable Development. (<http://www.wbcsd.org/web/publications/pathways.pdf>); *The Outlook to 2050 and the Role of Energy Technology*. July, 2005. Paris: IEA. (<http://www.iea.org/Textbase/npsum/enertech2006SUM.pdf>); Enkvist, P., Nauclér, T., and Rosander, J. A cost curve for greenhouse gas reduction. In *McKinsey Quarterly*, 2007, No. 1:35-45. (http://www.mckinseyquarterly.com/A_cost_curve_for_greenhouse_gas_reduction_1911); *Carbon Capture and Storage at Scale: Lessons from the Growth of Analogous Energy Technologies*. February, 2009. Stanford University Programme on Energy and Sustainable Development. (http://pesd.stanford.edu/publications/ccs_analogs/).
- 3 Project Catalyst suggests nine key technologies (wind, solar PV, solar CST, CCS, geothermal, second-generation biofuels, hybrids, plug-in hybrids, and electric vehicles) have a large and rapidly growing abatement potential of at least 2 Gt, or 3% of business as usual (BAU), in 2020; 8 Gt, or 11% of BAU, in 2030; and 24 Gt, or 27% of BAU, in 2050, perhaps more with concerted policy change and innovation investments.
- 4 McKinsey Global GHG Abatement Cost Curve v2.0
- 5 *World Energy Outlook 2008*. November, 2008. Paris: IEA.
- 6 For more on the state of investment in green technologies, see: *Green Investing: Towards a Clean Energy Infrastructure*. January, 2009. Geneva: World Economic Forum in collaboration with New Energy Finance (www.weforum.org/pdf/climate/Green.pdf).
- 7 *Global Trends in Sustainable Energy Investment 2009*. 2009. Paris: UNEP SEFI and New Energy Finance. (<http://sefi.unep.org/english/globaltrends2009.html>).
- 8 Current low-carbon innovation programs are not adequate to meet the climate change challenge. Despite some very recent increases—notably in the US—public energy R&D funding has fallen by up to 50% in real terms in major developed countries over the last 25 years. Studies such as the Stern review and the IEA's Energy Technology Perspective 2008 have called for a doubling and even quadrupling of public R&D funding from the actual annual US\$ 10 billion. Current estimates of private R&D and demonstration funding for low-carbon technologies stand at US\$ 13-60 billion. *IEA Energy Technologies Perspectives 2008*. June, 2008. Paris: IEA.
- 9 *Economics of Climate Change Mitigation: Policies and Options for Global Action Beyond 2012*. September, 2009. Paris: OECD.
- 10 *Enabling Technologies for Low-Carbon Growth*, ClimateWorks Foundation, *supra*.
- 11 This is particularly true in remote rural areas where large-scale fossil plants and long-distance grid connections are prohibitively expensive, and in cases with distributed generation (e.g., rooftop PV in cities and solar-powered highway lighting) where fossil fuels simply cannot generate electricity economically on the required small scale.
- 12 *Economics of Climate Change Mitigation: Policies and Options for Global Action Beyond 2012*, *supra*.
- 13 The Global Subsidies Initiative (GSI) of the International Institute for Sustainable Development (IISD) (<http://www.globalsubsidies.org>).
- 14 *Green Investing: Towards a Clean Energy Infrastructure*, January 2009, World Economic Forum.
- 15 *Economics of Climate Change Mitigation: Policies and Options for Global Action Beyond 2012*, *supra*.
- 16 *UNFCCC Bali Action Plan, Decision 1/CP.13*. December, 2007. Bonn: UNFCCC.
- 17 *Declaration of the Leaders*. April, 2009. Washington DC: The Major Economies Forum on Energy and Climate. (<http://www.mofa.go.jp/policy/economy/summit/2009/declaration2-2.pdf>).
- 18 *International Energy Technology Collaboration and Climate Change Mitigation; Case Study 2: Cooperation in Agriculture: R&D on High-Yielding Crop Varieties*. 2004. Paris: OECD/IEA (<http://www.oecd.org/dataoecd/25/10/34008665.pdf>).
- 19 The open source multistakeholder collaboration model builds on experiences of the China Greentech Initiative, an open source, commercial collaboration of 80 of the world's leading technology and service companies, entrepreneurs, investors, NGOs and policy advisors. Through CGTI, these organizations have come together to define greentech market opportunities and solutions, which will contribute to a sustainable China and world. (For more details, see www.china-greentech.com).
- 20 For example, street vendors in Bangalore work with financing models that require daily payments, while silk weavers from other parts of Bangalore require market linkages to their production that might be enhanced by having four hours of solar lighting
- 21 The methods of implementation can be borrowed from years of learning in agricultural sector financing. Dual financing (for service providers and end-users) will lead to a sustained effort to promote the use of solar energy (especially in rural areas). Rural networks of various banks have been some of the best agents of propagation of technology. Apex financial institutions like the Reserve Bank of India (RBI) and the National Bank for Agriculture and Rural Development (NABARD) (in the case of India, for example) could get involved in the implementation of these programs. They have shown success in

other fields like agriculture and could do the same in the field of solar and renewable energy. The RBI, for example, is propagating the concept of financial inclusion. Renewable energy could be easily brought under that umbrella—as sustainable energies like solar can be powerful agents of poverty reduction.

²² Many of the programs for the implementation of solar systems (lighting, pumping, etc.) using capital subsidy via nodal agencies have failed. They have been primarily “product centric” rather than focused on the whole issue of needs-based systems, supply chains, after-sales service and appropriate financing (typically done in any other service sector).

²³ For example, a street vendor in Gujarat who buys a solar lighting system for her vending cart pays between 12.5 to 15% tax on the solar system she buys from Karnataka, whereas by using a solar energy source, she replaces kerosene that is being imported and subsidized.

²⁴ The financial and economic crisis has hit the renewable energy sector. In the wind sector specifically, the finance crisis hit in early 2009, when asset financing of wind farms, including refinancing and acquisitions, fell by 65% in the first quarter of 2009 compared to the fourth quarter of 2007. Terms for lending in wind projects have tightened to margins of 200-300 basis points (vs. approx. 100 in 2007) and maturities of 13-15 years (vs. 15-18 years in 2007) as reported by Dexia Bank (March 2009). As reported by the same source, after the credit crunch, banks’ financial resources have not only become more expensive but also scarcer. As a result, project developers have found the required debt capital and equity ratios for mid-sized projects reduced to approximately 70%, vs. 90% or even higher in 2009.

²⁵ B-Loans are loans from development finance Institutions sourced from private banks and provided to wind (or other renewable energy) projects. This structure allows private banks to reduce their pay-back risks in general and political risks in particular while allowing development finance institutions to lend more to the projects they aim to foster.

²⁶ In non-OECD countries, coal will account for 40% of incremental energy demand by 2030, compared to 10% in OECD countries. Source: *World Energy Outlook 2008*, supra.

²⁷ Enabling Technologies for Low-Carbon Growth, 2009, The Climate Works Foundation.

²⁸ More details on how the agreement could be structured include:

- A programme is agreed for some 25 1 GW CCS coal- fired power plants across China, India and South Africa (i.e. equivalent to the 10-12 project programme in the EU).
- CCS is recognized as a mitigation option within the CDM or new clean technology mechanism (CTM) and is supported by an agreed CO₂ storage certification approach, such as Carbon Sequestration Unit (CSU). This provides the underlying CO₂ price needed to support CCS.
- The EU (or US or Australia) sets aside the necessary space within its ETS to absorb the flow of CCS-certified reductions. In the case of the EU, the objective to move from a 20% reduction target to a 30% reduction by 2020, provides the necessary space. Within the ETS sector, the 10% shift is equivalent to the 25 power plants.
- Clean technology funds are identified to augment the higher cost of the first CCS facilities. This equates to the 300 million EU allowance set-aside. In the EU case, at say €30 per tonne of CO₂, the funding equates to some €9 billion. For a 25-project programme across three countries, funding of up to €20 billion may be required, although much will depend on the speed of development of this technology as OECD demonstration programmes also kick in.
- The host countries agree to adopt specific sector targets post 2020/2025.

²⁹ Mohamed El Baradei, *Nuclear power: an evolving scenario*. In *IAEA Bulletin*, June, 2004, 46:5.

³⁰ *International Energy Outlook 2008*. September, 2008. Washington DC: Energy Information Administration, US Department of Energy.

Participants in the Task Force Working Group on Accelerating Investment in Low-carbon Technology

A complete list of participants for Accelerating Investment in Low-Carbon Technologies is available on page 75.

3 Working Group on Accelerating Investment: Developing Countries

Key Messages

Catalyzing private capital through public finance: the case for regional funds in developing economies

We remain hopeful that the COP15 negotiations will deliver new and better public financing arrangements to meet the challenges of climate change, especially in developing countries. Given the scale of these challenges, however, an overwhelming share of the investment for climate mitigation and adaptation inevitably will have to come from private sources.

This means that any public funding arrangements for climate finance must contain features that significantly catalyse greater flows of private capital into low-carbon investments in developing economies, at scale and fast. This will require a public finance mechanism that should, amongst other things:

- seed private-capital funds with an investment mandate for low carbon infrastructure;
- support risk-mitigation products to help private capital funds (as well as projects) address political, credit and related risks;
- facilitate project and asset finance (through bond products and other mechanisms) for low-carbon technology deployment at scale on favourable tenor and terms;
- provide technical assistance to stimulate a stronger deal flow of bankable low-carbon projects in developing economies.

Alongside other critical decisions to be taken at Copenhagen in December, the parties need to recognize that public funding arrangements must create public finance mechanisms that align with the needs of private investment. Failure to do so will materially affect the likelihood that the required private capital will migrate to low-carbon investment choices in the timeframe and to the scale we are advised it must for developing economies.

This paper is a contribution to the general discussion on catalysing capital toward the low-carbon economy in developing economies. We propose a new generation of public finance mechanisms that can catalyse private capital quickly and to scale. Many recognise the need for developing these mechanisms, but few have taken the analysis to the next level. This paper seeks precisely to fill this gap by providing workable, pragmatic proposals for officials to consider.

Engaging institutional end-investors in funds geared toward financing low-carbon/climate resilient infrastructure projects in developing economies lies at the heart of our proposition. We suggest two, sequenced investment models. The first model requires the establishment of a new challenge fund process. It would involve the multilateral development finance institutions soliciting bids from private fund managers to access packages of public finance mechanisms to support low-carbon investment funds. This model could catalyse up to US\$ 10 billion for each bid-winning fund on a three-year cycle, and could be ready before the end of 2011. The second model could create a suite of regional, market-based investment funds, each able to mobilise US\$ 50-75 billion, again on a three-year cycle. The second model would require government support, especially from developing economies, to help create a suitable architecture. It could be ready for business by January 1, 2013. Importantly, as both these mechanisms would be regional market-based funds, their governance will require engagement from developing economies.

Key Messages

These ideas are fully in line with the G20 commitment given at the London Summit in April 2009 to make the transition towards clean, innovative, resource-efficient, low-carbon technologies and infrastructure, particularly regarding the need for the multilateral development banks to contribute fully to the achievement of this objective.

We invite the UN or some of the negotiating parties to ask a group of leading investors, financial experts, and industry representatives to work with finance ministers and their officials to develop the ideas contained in this paper and elsewhere. A major public-private climate finance process could be launched at the time of the COP15 in December. Linked to a suitable international forum, it could progress for 20 months or so until the models are developed and ready to deploy.

Disclaimer

The views expressed in this section represent a collation of various viewpoints emerging from a series of discussions among the participants in the Working Group on Accelerating Investment in Low-carbon Technology. Although the observations and proposals in this section enjoy broad support, they do not necessarily reflect the views of every individual participant nor do they necessarily reflect the individual institutional viewpoints of any of the companies or institutions that took part, or of the World Economic Forum.

Summary

- In addition to significant reductions in GHG emissions in the developed countries, achieving low-carbon growth in developing countries is also crucial to avoid dangerous climate change. For developing economies to grow within a low-emissions trajectory, system transformation will be required in crucial areas such as energy infrastructure, buildings, transport, agriculture and forestry. Such a transformation must begin now. Achieving this transformation will require significant inflows of public and private capital as soon as possible.
- Despite welcome progress in the UNFCCC-hosted negotiations on climate change, a transfer of public funds likely will not be sufficient to meet the costs of moving to a low-emissions growth path. Nor, in the short run at least, will the finance available from carbon markets or international offsets. This means that public finance mechanisms to leverage *private* finance on the scale required must be rapidly developed.
- Most of the finance required (either for mitigation or for adaptation) will be for investment in new or improved infrastructure. This means these public finance mechanisms must facilitate investment in productive capital with a long life span where costs can be amortized over the life of the assets. The key therefore will be to link these public finance mechanisms to sources of private finance suitable for infrastructure investment—sources of private finance which can offer patient equity¹ and long-dated debt, giving time for cash flows from domestic and international sources to meet current capital costs.
- Our proposition is that *institutional* private capital possesses these characteristics. Some institutions that manage institutional private capital (such as pension funds, sovereign wealth funds (SWF), insurance companies, endowments) are currently less capital-constrained than many governments. If the terms and conditions of the public finance mechanisms are right, some of this private institutional capital could be mobilized on a large scale to help meet low-carbon investment needs in emerging and developing economies.
- While some private institutional investment can be mobilized through public finance mechanisms for individual low-carbon infrastructure projects, dimensionally larger capital can be mobilized by establishing investment funds. To get equity investment to scale, multilateral and bilateral development finance institutions should scale up their support for low-carbon focused funds and also develop risk mitigation and other products that support the investments of such funds. This will attract institutional co-investment on a much larger scale.

- Initiatives such as the CalPERS Green Wave programme in California, the United States Overseas Private Investment Corporation (OPIC), the UK Private Finance Initiative (PFI) and the strategic climate funds of the World Bank, together provide design inspiration for the sorts of private-public investment models for the kinds of low-carbon infrastructure funds and project financing arrangements that can be constructed.
- We set out two potential models that use public finance mechanisms at the fund level to leverage private capital for low-carbon infrastructure investments in developing countries. Both models recognize the transformative role that multilateral and bilateral development finance institutions can play in this process.
- The first model centres on a “challenge fund” mechanism, involving the multilateral development finance institutions, which could mobilize finance relatively quickly. In this model, multilateral (and bilateral) institutions would bid out preferential access to regional packages of their public finance mechanisms. Leading global or regional fund management firms would tender for the bids, explaining how they would leverage the mechanisms on offer to create a new fund (or strengthen an existing fund) and generate enhanced investment flows as a result. Analysis suggests this model could leverage on the order of US\$ 10 billion from the capital markets per fund in the short to medium term and that several funds could be catalysed. The model could be ready for business before end of 2011. The funds could work on a three-year cycle, and the right to access the public finance mechanisms would be re-tendered every five to seven years.
- The development finance institutions providing the public finance mechanisms would have a very limited sphere of influence in how the fund manager invests; the focus would be on allowing fund managers to pursue financial objectives in the low-carbon space. Initial success would send an important market signal regarding the potential for private-public investment mechanisms to leverage capital (and also the long-term policy intent of governments). Quick success with this model would also improve liquidity in the low-carbon sector, stimulating further investment interest.
- Our second proposed model could be developed in parallel. It would build on the experience of model one, but would scale up the ambition level. It would consequently take a little longer to construct. To launch its development, a government-led process would be required (perhaps involving the G20, the Major Economies Forum or the UN and, importantly, some key developing country governments). These governments would ask large institutional investors, fund managers and public finance officials to work together to create a new architecture of private-public investment for developing countries.
- The architecture could be developed as follows: With government/UN backing, a suite of privately financed regional investment vehicles, with a public-private board would be created (in this paper, we call them private investment corporations, or PICs). Each PIC would secure US\$ 500 million to 1 billion of anchor equity from private institutional investors, creating a cornerstone fund. PICs would bid out portions of these cornerstone funds to private fund managers, perhaps forming five new regional climate-infrastructure related funds as a result. Each fund manager would seek to raise additional institutional capital for these funds, and then lever that capital via both direct co-investment and appropriate debt facilities, such that each fund catalysed in the region of US \$10-15 billion (the regional PIC vehicle thus mobilizing US \$50-75 billion in total).
- Multilateral and bilateral development finance institutions would form arrangements with the PICs, so that the new climate-infrastructure related funds could preferentially access risk-reducing public finance mechanisms (as in model one). This would enhance the potential for the various fund managers to

leverage their portion of the cornerstone fund with secondary equity and debt. Also as in model one, the funds could be managed on a three-year cycle, and re-bid every six years or so. This means the period 2013 through 2030 would allow for about six cycles of each set of PIC funds, potentially mobilizing US\$ 300-US\$ 450 billion per region by 2030. With PICs in each key developing economy region around the world, model two could play a potentially significant role in closing the climate finance gap, particularly for infrastructure investment in mitigation and adaptation.

- The establishment of both models will involve new collaborations between institutional investors, investment managers, and commercial banks, as well as multilateral and bilateral agencies. While they do align investment and business interests, the markets alone will not make these initiatives happen—the processes will require a political move to start them (similar to Green Wave, OPIC or PFI initiatives). However, with the support of private investment institutions *and* public financing institutions, the models should gain the confidence of the investor community. This is because they would not be new investment models; rather they would repackage and scale up proven infrastructure debt/equity investment processes, within proven institutional wrappers. Importantly, private sector expertise will govern, deploy and manage the investment process in both cases: They will be “returns-led” and not “mission-led” initiatives to upscale low-carbon investments.
- Our proposals would see multilateral and bilateral development finance institutions playing a pivotal role in both of these private-public models, by using public finance mechanisms both to reduce risks for investors and to catalyse the provision of long-dated debt in both local and foreign currencies. Using public money to help the private sector spread and reduce risk represents a more fiscally efficient means of committing public capital to low-carbon programmes in emerging economies. Importantly, as both these models would be regional, market-based funds, their governance will require engagement with both developed *and* developing economy governments.
- It is also critical to help governments and industries in developing countries identify and develop large-scale bankable projects to absorb these investment flows. This will require technical assistance and capacity building. Nonfinancial actors, such as the multilateral and bilateral development institutions and international organisations such as the UN Environmental Programme (UNEP), could play an important role, especially in areas such as capacity building, regulatory and institutional reform, and investment project identification, feasibility and preparation.
- To help develop these and other proposals, we call on the UN Secretary General and/or government leaders to ask a group of leading institutional and private investors, financial experts, and industry representatives to work with finance ministers and their officials to develop the climate finance ideas contained in this paper and elsewhere. A major public-private climate finance process could be launched at the time of the COP15. Linked to a suitable international forum, this process could progress for 20 months or so until the models are developed and ready to deploy.

Background: The need for scale and speed

1. The International Energy Agency's World Energy Outlook for 2008 estimates that global demand for energy will increase by 45% by 2030. Non-OECD countries account for 87% of this increase. McKinsey & Company estimates that 77% of the world's future energy infrastructure required by 2030 is still to be built. The majority of these projects will be in emerging economies.
2. Investment in energy is critical for the growth of developing countries. About 1.6 billion people in the developing world have no access to modern energy. The World Bank estimates that energy poverty can reduce GDP growth by as much as 4% annually. Developing and emerging economies need a step change in energy infrastructure investment over the next two decades to sustain and accelerate their economic growth.
3. Under the 2008 World Energy Outlook reference scenario, oil and coal will account for almost 50% of future energy demand. This reference scenario estimates a 700 ppm CO₂ equivalent by 2050, with 97% of the projected increase in GHG emissions from energy coming from non-OECD countries. The IPCC advises that global emissions should stay within a 450ppm CO_{2-eq.} envelope in order to lower the odds of dangerous climate change occurring. This means that energy investments in developing and emerging economies must be in low-carbon technologies.
4. As most clean energy technologies are currently more expensive than traditional ones, this adds a "clean energy" incremental cost to the scale of investment required in developing economies. Global figures vary, but the total estimated clean energy annual investment cost out to 2030 lies between US\$ 170 billion and US \$550billion.² The World Bank in 2007 estimated that approximately US \$160 billion a year will be required to ensure energy needs in developing countries are met, with a US\$ 30 billion incremental cost on top of that to ensure the investments made are clean energy investments. 2008 analysis by Project Catalyst suggests the extra cost for clean energy investment in all developing countries could reach up to US\$60 billion per year.
5. It seems clear from the above that developing economies³ will likely need hundreds of billions in US dollars in order to meet their growth demands to 2030 with low-carbon technologies. This extra investment is required to pay for the gap between what finance does exist and what is required to accelerate energy investments; to pay for the incremental cost of ensuring these accelerated investments are in low-carbon energy technologies; and to pay for the extra costs of wider infrastructure that will be resilient to a changing climate. Additional urgency arises from the fact that this investment needs to start soon, in order to avoid a "lock in" to high-carbon infrastructure projects, leading to a continued rise in emissions levels.
6. These are very large figures. In this context, we welcome the recent developments on public funding arrangements as part of the current climate negotiations. For example, the recent Mexican proposal on climate finance seeks to raise a US\$10 billion fund from government pledges; the Norwegian proposal for a 2% auctioning of assigned amount units in the carbon markets will raise an estimated US\$ 15-25 billion per year; the least developed country suggestions for levies on international air travel and bunker fuels are expected to yield US\$ 8-25 billion per year combined⁴; and the strategic Climate Investment Funds (CIF) of the World Bank have an initial target of US \$5 billion.⁵
7. If all of these mechanisms were created and each delivered to their maximum ambition, the sum would be US\$60 billion a year, a substantial amount.⁶ There are also some stimulus packages across the OECD which contain public finance mechanisms designed to leverage finance from the private sector into

low-carbon investments (most notably in South Korea⁷), but as these are mostly domestically orientated initiatives, their wider impact on low-carbon investment flows into emerging and developing economies will likely be more limited. A very interesting development is UK Prime Minister Gordon Brown's recent announcement of a proposal for a US\$ 100 billion-a-year fund, half of which is to be financed from carbon market transactions.⁸ The plan is for the fund to gradually increase, reaching US\$100 billion by 2020. This is a bold and welcome development. The challenge will be to use the public finance being mobilized from across all of these initiatives to somehow attract even more capital.

8. Given the current strain on OECD government finances, additional official development assistance is unlikely to be available as a major source of new capital to meet these investment needs. Furthermore, carbon markets and international offset schemes like the clean development mechanism, while necessary, will not deliver sufficient financial flows in the short term to meet the scale of these investment needs. The challenge will be to secure long-dated debt and patient equity in the short run, allowing time for cash flow from a much larger international offset market to grow and meet current capital costs.
9. Equally importantly, developing economies do not know in advance exactly how much international investment will flow from such future carbon finance schemes. Despite attempts to model these potential future revenue streams, there is inevitably much uncertainty. The climate finance "ask" from developing economies for predictable fiscal transfers from richer countries therefore remains. Though reasonable in principle given the historical responsibilities of the developed countries, these requests may be on a scale that is not achievable in practice, especially given current levels of public debt among OECD governments.
10. If bilateral fiscal resources or multilateral agencies cannot provide the required capital and carbon finance markets are not the silver-bullet, at least in the short run, then other sources of finance need to be found.

Institutional capital

11. In order to rapidly achieve the scale of investment required to create a materially significant low-carbon growth trajectory in developing economies, it is necessary to attract *institutional* capital in much greater quantities. Key wholesale sources of institutional capital include:
 - a. sovereign wealth funds;
 - b. state and public pension funds;
 - c. private and corporate pension funds;
 - d. insurance companies;
 - e. endowments;
 - f. private banks;
 - g. investment management companies.
12. The so-called "end-investors" in charge of these institutions look to managers to structure and manage funds that represent robust investment vehicles for their invested capital. While most of these end-investors are capital-constrained to some extent as a result of the financial crisis, in aggregate they are still less capital-constrained than governments and multilateral development finance institutions. Even in today's financial crisis, therefore, there is internationally investible institutional capital potentially available for deployment in the low-carbon space in the developing markets, if the terms and conditions on offer from fund managers are right.⁹
13. Most institutional investors are looking for predictable, infrastructure-style rates of return, commensurate with energy infrastructure investing. This is particularly true of pension funds that require long-term investment horizons to match their

long-term predictable pension liabilities. Although institutional investors such as pension funds or SWFs command the bulk of investible capital in major capital markets, to date there has been little engagement with these investors on how to attract them into financing low-carbon growth, especially in developing or emerging markets.

14. Recent consultations (such as within the P8 pension funds, the Investors Group on Climate Change (IGCC), the UNEP Finance Initiative, the World Economic Forum, etc.) have revealed a desire among pension funds in particular to make clean energy and technology investments on a larger scale across their risk portfolio, if investment risks and returns can be appropriately structured to meet their needs.¹⁰ However, as discussed, even with carbon finance in place, a gap exists between the risk/return expectations of such investors and the risk/return characteristics of clean energy and low-carbon technology and infrastructure projects, especially in emerging markets.

The role of multilateral and bilateral public finance

15. The investor community trusts the multilateral and bilateral development finance institutions, especially the credit ratings they offer. This means these entities can play a transformative role in enabling the deployment of more private capital to build the low-carbon economy, especially in emerging and developing economies. Their role in helping to fill the rate-of-return gap is pivotal. Well-targeted sovereign and multilateral credit support can reduce risk and hence improve the required rate of return. This can unlock significant flows of private institutional capital. Improving capital efficiency and flow by reducing risks is a comparative advantage that these public institutions can offer. Many are experienced at using limited public funds to create public finance mechanisms that can catalyse or leverage larger flows of private sector investments in infrastructure, energy, and—more recently—climate change mitigation activities in developing countries.^{11,12}
16. The presence of public, multilateral, or bilateral participation is often a critical requirement for institutional investors to enter into new markets and new investment classes in a material way. Work by UNEP Finance Initiative suggests that such public finance mechanisms can include, *inter alia*:
 - a. *credit lines* to local commercial financial institutions for providing both senior and mezzanine debt to low-carbon projects in sectors where local banks may have had historical reluctance to lend (such as buildings energy efficiency programmes);
 - b. *guarantees* to share with local commercial financial institutions the commercial risks of lending to projects;
 - c. *debt financing* of projects by entities other than commercial financial institutions;
 - d. *private equity funds* investing risk capital in companies and projects;
 - e. *venture capital funds* investing risk capital in technology innovations;
 - f. *sustainable infrastructure funds* investing in the roll out of operating assets delivering low carbon attributes;
 - g. *carbon finance facilities* that monetize the advanced sale of emissions reductions to finance project investment costs;
 - h. *grants and contingent grants* to share project development costs;
 - i. *technical assistance* to build the capacity of all actors along the financing chain and to identify and develop low-carbon project investment opportunities;
 - j. *specific risk-mitigation products* to address currency, regulatory and political risks—to power purchase agreements, for example;
 - k. *export credit guarantees*.¹³
17. To derive the most effective use from the limited public finance available, it is important that multilateral and bilateral development finance institutions free up their balance sheets from direct loans to public sector actors (especially where

such loans may be delivering minimal leverage of private capital) in favour of supporting public finance mechanisms that can lever far greater quantities of private capital. Furthermore, given that *scalable* low-carbon investments in emerging markets is an urgently needed public good, it is also appropriate that multilateral and bilateral development finance institutions refocus their balance sheets by offering greater support to the provision of anchor investments to funds with a low-carbon focus, as well as to individual projects.

18. Most institutional investors invest in funds. This allows them to access a wide variety of investible projects in markets far from their centres of operation, to exercise effective governance, achieve targeted 'exit' returns and, most importantly, diversify their risk. With multilateral and bilateral development finance institutions also supporting more funds, it becomes easier to fine-tune the risk/return criteria at scale—through the sovereign and multilateral risk mechanisms described above, for example. It is likely that the presence of multilateral and bilateral development finance institutions as anchor participants will emerge as a requirement, or at least a very desirable feature, to attract institutional investors to participate in low-carbon funds focused on emerging markets.
19. On the basis of this proposed change in emphasis on the part of development finance institutions from projects to funds, and a corresponding shift to improving the efficiency and flow of capital from such funds through the use of public finance mechanisms, it should be possible to develop a suite of privately financed regional investment funds. These new funds would focus on offering finance to low-carbon technology or infrastructure projects in emerging economies and would be managed for purely financial objectives.
20. The proposed funds would gain the confidence of the investor community because they would be run as commercial entities and would not be promoting new investment models. Rather, they would repackage and scale up proven infrastructure debt/equity investment processes, with multilateral and bilateral development finance institutions playing an important role in:
 - a. reducing risk at the fund and project level;
 - b. undertaking a range of capacity building and technical assistance interventions to improve the policy, regulatory and institutional environment; and
 - c. helping to develop a pipeline of bankable low carbon technology and infrastructure projects for funds to invest in.

The proposition

21. Most proposals for raising low-carbon investment focus on mobilizing public or climate finance at the project level. As a consequence, they do not come close to satisfactorily meeting the financing challenge. To resolve this challenge, the paucity of institutional intermediary structures and transactions at the meso-level in international finance needs to be addressed. Our proposition takes an institutional investors perspective and addresses this challenge head on. With some work over the next several months, a sequence of investment models can be designed, constructed and ready for business by 1 January 2011. We envisage a process that can create proof points at first and then gradually attract institutional investors to scale into the low-carbon space, delivering by 2015 the supply of private finance that developing and emerging economies need to be able to access at the scale and speed required.
22. We draw our inspiration from some existing, successful initiatives that have sought to leverage limited public funding or attract institutional end-investors into low carbon or emerging market opportunities. On example, the "Green Wave" programme, led by the California Public Employees' Retirement System (CalPERS) and introduced by California State Treasurer Phil Angelides in 2004, has catalysed clean energy and clean technology funds across the US. In 2005, CalPERS allocated US\$ 200 million as an anchor investment in qualified

- clean sector investment funds. This initial allocation was invested by a manager into seven premier clean-tech venture capital funds, which received total commitments of US \$2 billion. Following the successful deployment of the initial funds, the manager established a clean-tech fund-of-funds with commitments of US\$ 400 million from CalPERS and another US\$ 200 million from New York City pension funds.
23. With a typical maximum contribution of 20% in any one fund, the Green Wave programme has catalyzed investments of another \$4 billion in clean technology venture capital firms, funding hundreds of early- to mid-stage clean technology and energy companies. The potential to scale up the “Green Wave” model has been discussed with various large institutional investors, including members of the P8, which includes some of the largest pension funds in the world.¹⁴
 24. The Overseas Private Investment Corporation is an agency of the US government that mobilizes risk capital for emerging markets by providing, through guarantees, long-term debt capital to private equity funds.¹⁵ Since 1971, OPIC has encouraged institutional investors who may not routinely invest in emerging markets to participate in such funds. OPIC’s support, in addition to equity raised by fund managers from private-sector institutions, is directly invested in private companies in the emerging markets. OPIC provides in most instances approximately one-third of the fund’s total capital. The debt is structured similar to that of a zero coupon bond: most of the interest expense is capitalized until the fund liquidates its investments, with the tenor often in parallel to the fund’s life, and repayment occurring in the later stages of the fund’s life.
 25. OPIC-supported fund managers also provide knowledge and experience to the companies in which they invest. These fund managers guide the strategic direction of portfolio companies, participate actively on company boards, and help companies recruit experienced operational managers. This means that successful fund managers are central to OPIC’s success. To accomplish this, OPIC utilizes an open, competitive process in selecting fund managers, initiated periodically through the publication of a “call for proposals” in private equity trade journals and on OPIC’s website. A selection committee established within OPIC conducts extensive manager evaluations and due diligence prior to recommending any proposal to OPIC’s board of directors.
 26. To ensure that OPIC’s portfolio of investment funds operates on a self-sustaining basis, reflects current policy priorities, and addresses the dynamics of the private equity market, OPIC utilizes asset allocation planning to coordinate its response to policy initiatives and market needs while maintaining a diversified portfolio of funds. In addition, OPIC actively monitors and conducts periodic reviews of the funds it supports as well as their portfolio companies to ensure compliance with OPIC’s investment policy requirements.
 27. The UK’s Public Finance Initiative scheme was introduced by the UK Government in the late 1990s. The PFI was a public-private intervention that directed billions of pounds from the debt markets towards constructing schools, hospitals and other related building infrastructure. The private sector assumed significant construction risk and the public sector gained a new method of financing and completing projects that was faster and more cost-effective than traditional procurement methods. An important lesson of the PFI scheme has been the need for an appropriate dialogue with the private sector to help achieve public policy goals in the fastest possible time frame that the capital markets can accommodate.
 28. Drawing on our knowledge of the Green Wave, OPIC, PFI and other examples, we suggest a sequence of public-private climate finance models that could help pull the required scale of private capital toward low-carbon investments in

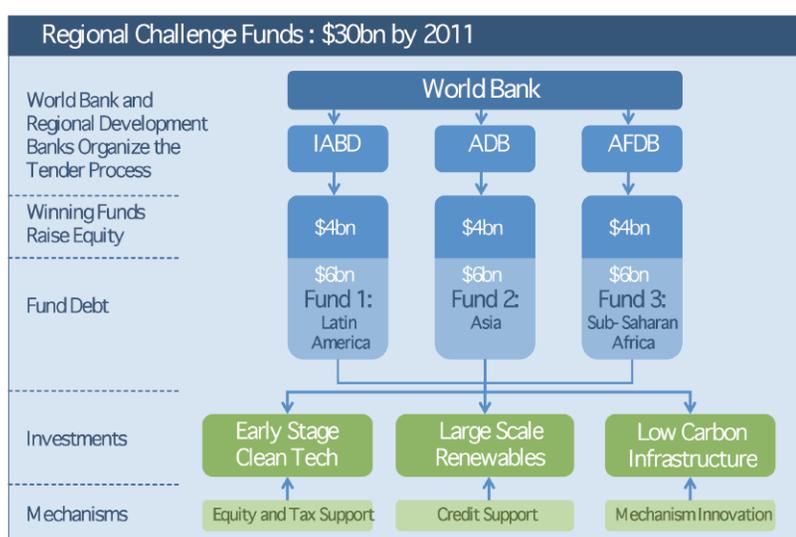
emerging and developing markets at the required speed and at little extra fiscal cost to OECD governments. The first model is a challenge fund style mechanism involving the multilateral development banks, which could mobilize finance relatively quickly and which we think could be ready for business by 1 January 2011. The second model is a cornerstone fund style mechanism, which would require deeper political engagement to start it up, but which could be ready for business by 1 January 2013, getting into full gear by 2015. While the second model has a higher degree of ambition and complexity, the two models are not mutually exclusive; indeed, one can build on the other, as confidence and liquidity in the low-carbon investment space improve.

29. In the first model, multilateral and bilateral development finance institutions would bid out preferential access to regional packages of their public finance mechanisms, as set out in paragraph 15 above. Leading global or regional fund management firms would tender for the bids, explaining how they would leverage the mechanisms on offer to create a new fund (or strengthen an existing fund) and generate enhanced investment flows as a result. Access to the credit-support package offered from the development finance institutions would create a strong incentive for fund managers to bid: It would improve the risk/return ratio of projects supported by their fund, thereby allowing the available rates of return from their low carbon projects to equal the risk weighted-returns required from any other similar investment.

Based on the reputation and track record of the fund manager, top end or secondary institutional investors might join the fund management firm's bid, offering the multilateral finance institution more confidence about the offer. Packages of support could also be available for end-investors to bid for themselves, allowing them to select the fund managers with whom they would prefer to work. Initial analysis suggests this model could leverage approximately US\$10 billion from the capital markets per fund in the short to medium term.

30. The model would require major shareholders of the multilateral development banks to undertake a strategic initiative to create such a challenge fund structure. Once in existence, however, it would be a relatively easy model for innovative fund managers to understand and then bid against. The fund managers would be paid a negotiated fee to manage the fund. There would also be profit-motivated incentives for fund managers to be early to market with the new fund product for institutional investors. With a concerted effort, the model could be ready for business before end of 2011.
31. If the regional development banks plus the World Bank Group were able to award tenders to three bids (one for Latin America, one for Sub-Saharan Africa, one for Asia, for example), roughly US\$ 30 billion could be leveraged from private capital markets within a couple of years. The funds could work on a three-year cycle, and the right to access the public finance mechanisms could be re-tendered every five to seven years. Importantly, the development finance institutions providing the public finance mechanisms would have very limited influence over how fund managers invest. The focus would be on pursuing financial objectives in the low-carbon space. (See Figure 3.1, for a pictorial representation of this model, including the sorts of public finance mechanisms that could be used in different ways for different funds.)
32. In the second model¹⁶, the UN Secretary General and/or government leaders (perhaps via the G20, the Major Economies Forum on Energy and Climate, or as parties to the UNFCCC, but involving developing economy governments) would ask major institutional investors and fund managers to work with them to find a way to crowd dimensionally much more private finance into low-carbon infrastructure and adaptation projects, especially in developing countries. A major public-private dialogue could be established involving finance officials from key developed and developing nations, institutional investors, fund managers and other experts. The objective could be to find new architectures

Figure 3.1: A representation of the challenge fund model

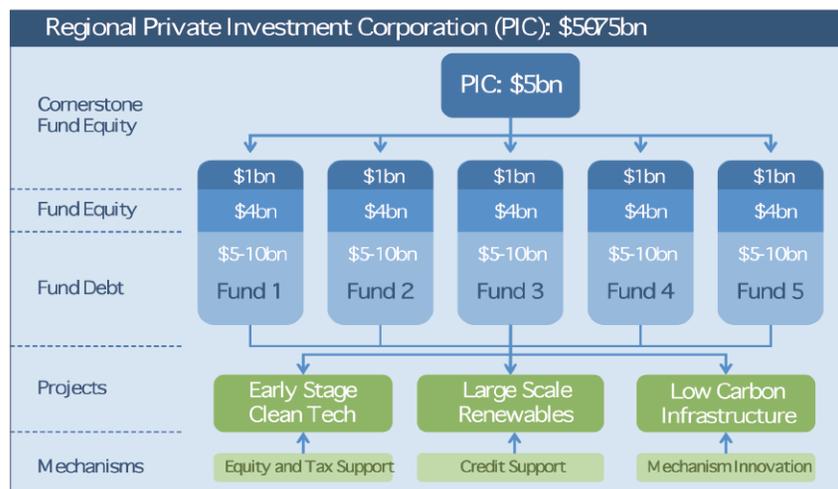


to mobilize significant flows of capital in a clear, defined and predictable way for each key developing economic region of the world—perhaps via regularly replenished, privately managed funds for low-carbon investment.

33. One possible approach to catalyse these more ambitious flows of finance could be through the following “waterfall structure” (we use India as the example region):
 - a. A single \$5 billion India regional investment vehicle is established. This could be administered by a regional multilateral development bank, such as the Asian Development Bank. Alternatively, a specialized institution could be created, similar to the OPIC model—an Indian Private Investment Corporation (IPIC), for example.
 - b. End-investors in this IPIC would consist of leaders from among the largest sovereign wealth funds, pension funds and other institutional investors in the world. The public-private process mentioned above would create the IPIC vehicle and invite end-investors to come together and provide anchor equity of US \$5 billion for it.¹⁷ To reach this US \$5 billion target, let us say that 25 institutional investors come together under the process, committing US\$ 250 million each.
 - c. With the anchor equity of US\$5 billion, IPIC establishes a cornerstone fund. IPIC would then invite some of the leading global or regional fund management firms to establish five US \$5 billion Indian green energy funds, clean infrastructure funds, green building funds, green-tech funds, etc., by bidding for an “anchor” investment from the IPIC cornerstone fund.
 - d. To create incentives for the management firms to bid for and establish each of these new low-carbon funds, IPIC would commit US\$1 billion to “anchor” each bid-winning fund from its cornerstone fund. The firms would be expected to galvanise their (normally significant) fund-raising capacity/sales force and investor network to raise a further US\$4 billion, based on the large anchor commitment. This would be raised from the wider universe of secondary institutional investors who invest in global emerging markets.
 - e. To further motivate the establishment of these funds, multilateral and bilateral development finance institutions active in the region would be invited to establish an agreement with IPIC to provide preferential access to a tailored package of their public finance mechanisms for its various funds (as set out in paragraph 15 above).
 - f. Based upon these incentives, US\$ 20 billion of equity from secondary institutional investors for India (or any region) could quite realistically be raised by good fund managers across a total of five such funds at a low cost to OECD Governments. This means the IPIC overall would have catalysed US \$25 billion of equity.

- g. Since most of the projects the various new funds would subsequently invest in would have infrastructure-style investment characteristics, each fund could be expected to secure at least a 66% debt-to-equity ratio for its project portfolio, a proposition that would be expected to have the ‘in principle’ support of the largest infrastructure-providing banks and debt capital markets.¹⁸ In this way, across the five IPIC-catalysed Funds, US\$ 25 billion of equity could finance US\$ 50-75 billion of projects.
 - h. The IPIC-catalysed funds could operate on a three-year investment cycle, and be re-tendered every five to seven years. This means that during the period 2013 to 2030 roughly six investment cycles could occur, representing a potential investment flow of US\$ 300-450 billion.
34. The same model could be used to create flows of investible capital for other key developing economies (through the establishment of a Middle East North Africa (MENA) PIC; a Sub-Saharan Africa PIC, a Latin America PIC, an ASEAN PIC, etc.). Each time, a government invitation would be required to help stakeholders create the PIC vehicle, establish its cornerstone fund and develop an arrangement with regional multilateral and bilateral development finance institutions for use of their public finance mechanisms. (See *Figure 3.2*, below, for a pictorial representation of this model, including the sorts of public finance mechanisms that could be used in different ways for different funds.)
 35. The market-based principles of this model are important for driving down costs and maximizing impact. Within (and across) each region, the particular fund management firms would compete directly with each other (and be benchmarked against each other). At key intervals there would be a chance to re-bid for management of the funds. Some funds, and the supporting public finance mechanisms, could be designed for niche purposes—to focus on first-of-a-kind-technology development/demonstration where much higher returns are needed, for example, or on energy efficiency or market-ready clean energy technology deployment or adaptation. There is also great potential for domestic capital or budget surpluses from the developing economies themselves to be drawn into any regional cornerstone fund.
 36. This second model will need some work to create the required architecture, governance arrangements and partnerships across a number of players in the investment value chain in each key region. Importantly, the “anchor” equity for each regional private investment corporation will, as noted, require a compelling political invitation to bring institutional investors together to work

Figure 3.2: A representation of regional funds using cornerstone equity



- collaboratively and create regional PIC architectures.¹⁹ It will also take time and effort (a multistakeholder process) and an appropriate forum to help set up the architecture and negotiate fiscally appropriate treatment for the fund.
37. Importantly, because these would be regional institutions, their governance will require engagement with both developed *and* developing countries. It will also be important to establish the structure of the regional funds clearly and in detail prior to the bidding process, especially to gain the confidence of the private capital markets; some suggestions for this structure are provided in the endnotes.²⁰
 38. A further challenge will be to ensure the new funds do not negatively influence pricing in localized markets and push out quality private market investors (or indeed motivate existing private investors to keep these new funds out of the good deals), as has happened, at least in part, with alternative energy projects in recent years. Some suggestions on how to mitigate these challenges are provided in the endnotes.²¹
 39. We estimate it would take two years to get a couple of pilot regional PICs and their cornerstone funds established and their related funds up and running. We believe a pilot model in two regions could be ready for business 1 January 2013, and scale (six regional models each investing US \$50-75 billion on a three-year cycle) achieved by 2015. Of course, the more the model progresses, bringing more end-investors into play, the more the risk can be spread and/or the greater the number of funds that can be capitalized, creating more competition.
 40. In both of our proposed models, parties bidding for support should be required to demonstrate appropriate levels of experience and competence. Work will be required to assemble appropriate packets of multilateral development finance support, so that bidders can see what is on offer and make their judgements accordingly. Governments (shareholders of the multilateral development finance institutions in particular) could also establish a system in which there is a degree of competition among the multilateral institutions themselves to attract private sector interest—i.e., by offering the best products possible. Both the fund managers, through the bidding process, and the multilateral development finance institutions and regional PICs, through periodic assessment by shareholders, could have their performance evaluated, based on their success at leveraging private investment.
 41. The two models are, of course, not mutually exclusive. Challenge funds may attract some types of institutional investor and the regional PIC and cornerstone fund approach some others. However the key point remains—these are both proven, market-based models that can be scaled up to use public finance mechanisms to bring institutional investors into low-carbon technology and infrastructure fund financing quickly, and to scale, in the developing economies. Demonstrating success—particularly in the short term through the challenge fund model—would send an important market signal regarding the scale of the investment opportunity and the permanent direction of the broader low-carbon policy environment.
 42. Another pertinent point is that infrastructure investments of this nature typically have good-to-excellent levels of liquidity through secondary markets. This ensures market participants can increase or reduce their investments based upon their own capital requirements and appetite for risk over time (it is often noted that a barrier to exit due to liquidity factors actually creates a significant barrier to entry, especially for long-term investors). Because the clean energy sector (wind and solar in particular) is still in its relatively early stages, liquidity is not yet evident to the market. This leads to an additional shortfall in investment, especially in the current financial environment. If challenge funds

are used to up-scale investment to clean energy projects, especially in the short term, liquidity is likely to be significantly improved. This would stimulate a virtuous circle of further investment interest in the low-carbon sector, which the regional PIC and cornerstone fund model could then build on.²²

Creating the deal flow

43. The corollary to creating a sufficient supply of finance is, of course, creating a sufficient demand side: a pipeline of large, good-quality bankable projects to absorb US\$ 50-75 billion a year in each region. This is a non-trivial issue. Strong, stable, transparent, coherent and credible long-term national policies will be the key to catalysing the actual deployment of these funds in developing countries.²³
44. In addition to being in sufficient supply, these projects will also provide cash flow and risk-return profiles that marry well with the requirements of large institutional investors. Multilateral and bilateral development finance institutions and national governments could work together to ensure a range of public financing mechanisms that support technologies at varying levels of maturity and thus varying levels of risk:
 - a. Grants programmes, tax relief and public venture funds can support investment in early-stage, high risk-return technologies like wave, micro wind, efficiency technologies, thin-film PV, carbon capture and sequestration, power storage and second-generation biofuels.
 - b. Credit lines, guarantees and carbon finance can help provide a stable platform for the large-scale deployment of wind, solar and biomass projects to match the long-term stable cash flow requirements of large institutional investors such as pension funds and insurers.
 - c. Innovative credit market mechanisms could help catalyze long-term infrastructure investment in sectors like building efficiency, low-carbon transport, the smart grid, waste management, and forestry.
45. By using stable mechanisms together with national policy, a project pipeline of the required scale and investment profile could be developed to match the return expectations of institutional investors, helping to balance the portfolios of the respective funds.
46. We welcome the move toward defining Nationally Appropriate Mitigation Actions (NAMAs) and low-carbon growth plans, and see this as an opportunity to scale up the climate finance formulas currently available. The finance mechanisms proposed in this paper are particularly well-suited to provide financing for these national efforts to develop climate-friendly and climate-resilient projects, as part of a broader plan to enable low-carbon growth. The philosophy of low-carbon growth plans, combined with these private-public finance mechanisms, would enable win-win opportunities for host-countries and investors alike: Funding would be available for host countries to improve their infrastructure (provided good projects were available), and national commitments to low-carbon growth might help provide the kind of loud, clear and legal signals that investors need to deploy capital, especially in emerging economies.
47. We suggest this “demand-side” challenge also offers another key role for multilateral and bilateral development finance institutions. Through the use of technical assistance and capacity building grants, these institutions can work with host governments to establish a credible deal flow to attract and absorb the scale of private-public investment on offer. This would help the country’s national commitment to low-carbon growth come alive, by creating what would be in effect a detailed, project-specific clean energy, clean technology, and climate resilient infrastructure investment plan.

48. To create a vehicle that provides the degree of project granularity required to successfully convince private capital markets of the commitment to low-carbon growth, one analogue could be the project templates used to attract private sector bids for the UK PFI. Again, there is a role for technical assistance and capacity building support from the multilateral and bilateral development finance institutions. Finally, experience would suggest that with the scale of private finance on offer, host countries may be more willing to evolve their policy-enabling environments to secure investments (special growth zones, etc.), than to undertake policy reforms in the absence of any real investment flow. In other words, it may be that the likely and predictable availability of such large funds would itself play a key role in catalysing further domestic commitments to low-carbon growth.²⁴
49. We would be delighted to engage with developing economy governments (and development finance experts) to help expedite these processes. We could, for example, help identify those projects or cases where private capital is close to being invested, where small and simple domestic policy changes could make it happen, and where these changes could be applied quickly and at scale. These would then be the easy wins to start on.

Next steps

50. We offer ideas for market-based models that can catalyse and absorb the finance required for low-carbon growth in developing economies. We believe these models could offer a transformation in the energy and adaptation investment debate. They are, of course simply one set of ideas, but we hope they trigger interest.
51. To help develop this and other proposals, we call on the UN Secretary General and/or government leaders (in the G20, the UN or among the developing countries themselves) to invite a group of leading institutional and private investors, financial experts, and industry representatives to work with their finance ministers and other officials to develop the climate finance ideas contained in this paper and elsewhere. A major public-private climate finance process could be launched at the time of the COP15 in December. Linked to a suitable international forum, it could progress for 20 months or so until the models are developed and ready to deploy.

Endnotes

¹ Patient equity can be defined as finance that is softened to allow for a longer return horizon or lower level of return than normally required of private investors.

² *Green Investing: Towards a Clean Energy Infrastructure*, January 2009, World Economic Forum.

³ For ease of reference, we define six key developing or emerging economic regions of the world that are of relevance to the low-carbon investment challenge: China, India, Latin America (particularly Argentina, Brazil, and Mexico), the Middle East North Africa (MENA), Sub-Saharan Africa (particularly South Africa) and the Association of Southeast Asian Nations (ASEAN) region.

⁴ The least developed countries' proposal to create a levy on international air travel (the International Air Travel Adaptation Level, or ATAL) is estimated to provide a nominal annual level of funding of US\$ 4-10 billion annually, to be spent on mitigation and adaptation activities. Their proposal to create a levy on bunker fuels (the International Maritime Emission Reduction Scheme, or IMERS) is estimated to provide US\$ 4-15 billion annually, for adaptation only. Source: *Recommendations on future financing options for enhancing the development, deployment, diffusion and transfer of technologies under the Convention, Annex VI, Table 25, p. 97.* (UNFCCC/SB/2009/2) June, 2009. Bonn: UNFCCC.

⁵ In 2008 the World Bank and regional development banks established the Climate Investment Funds: the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF). The CTF is designed to promote scaled-up demonstration, deployment and transfer of low-carbon technologies in the power sector, transportation, and energy efficiency in buildings, industry and agriculture. The SCF will provide financing to pilot new development approaches or to scale up activities aimed at a specific climate change challenge through targeted programs. The SCF will pilot national-level actions for enhancing climate resilience in a few highly vulnerable countries. Other programs under consideration include support for energy efficient and renewable energy technologies to increase access to "green" energy in low-income countries, and investments to reduce emissions from deforestation and forest degradation through sustainable forest management. The funds have an initial target of US\$ 5 billion. Each fund will be managed by a committee with equal representation from donor and recipient countries.

⁶ A further challenge also relates to the governance of public funds for climate finance under the Framework. A recent proposal for a reformed financial mechanism (RFM) has gained considerable traction in the current international climate change negotiations, particularly among developing countries (as witnessed by the language introduced by India into the finance negotiation text). It is based on two key design principles, namely (i) *consolidation* of the currently fragmented funding streams both at the national and the international level, and (ii) *decentralization* of decision making through the *devolution* of funding decisions to national funding hubs ('designated funding entities'). The rationale behind this architecture is not only to follow the principle of subsidiarity and avoid an unmanageable international administrative task, but also to generate genuine country ownership over funding decisions. It is also to achieve two of the central requirements for climate finance through the consolidation of international funding streams: (i) an equitable distribution of the funding, and (ii) a balanced allocation between the different funding purposes (e.g. mitigation, adaptation, technology transfer etc.). For more on the proposal, see <http://www.oxfordclimatepolicy.org/publications/mueller.html>

⁷ South Korea's domestic stimulus package is particularly interesting in its plan to raise and leverage money from the private sector for green industries and investment. The government aims to raise 2.0 trillion won (US\$ 1.6 billion) from the private sector and increase fiscal and financial aid to help "green" industries. The capital will be raised by funds, bonds and savings that are subject to tax incentives. The state-run Korea Development Bank (KDB) and state-run pension funds also plan to set up a 500 billion won private equity fund for green investments.

⁸ On 26 June 2009, Prime Minister Gordon Brown made a speech on financing climate change in developing countries. Arguing that a new model of 'low-carbon, climate-resilient development' is needed, which enables developing countries to leapfrog the energy and transport technologies on which the developed world's industrialization was based, and to adapt to what is now an already severely changing climate, his speech set out a proposal for a financing package worth US\$ 100 billion per annum by 2020. This would be directed at low-carbon mitigation technologies, avoided deforestation, and adaptation. It would be made up of flows through an expanded and reformed carbon market, a limited proportion of official development assistance, and a completely new climate financing system, separate from and additional to ODA, funded by new revenue-raising mechanisms. The Prime Minister pledged the UK to providing additional funds on top of its existing aid commitment of 0.7% of national income. He gave UK support to the Norwegian proposal that a small proportion of national emissions allowances should be auctioned to provide climate financing, and he expressed interest in exploring the possibility that the inclusion of aviation and maritime emissions in a global agreement might yield revenues that could also be used for this purpose. For the full speech see <http://www.number10.gov.uk/Page19813>

⁹ There is no clear estimate as to exactly how much institutional capital there is in the world today. Prior to the financial crisis, in 2005, the International Bank of Settlements estimated that there was about US\$ 58 trillion of institutional investor holdings. They estimated this could increase to US\$ 160 trillion by 2015. See Carnody, J. and Ritchie D. *Investing in Clean Energy and Low Carbon Alternatives in Asia*. 2007. Manila: Asian Development Bank. p38. A frequently cited report on sovereign wealth funds is Jen, S. *How Big Could Sovereign Wealth Funds Be by 2015?* May, 2007. London: Morgan Stanley Research. This article suggested that assets under management of SWFs had reached US\$ 3 trillion in 2007—and could increase to US\$ 12 trillion by 2015. One recent report estimates the assets of the global fund management industry (including conventional assets, pension funds etc., SWFs, hedge funds, private equity funds, and funds of wealthy individuals) probably totalled around US\$110 trillion at the end of 2007. See *Fund Management 2008*. October, 2008. London: International Financial Services London. At <http://www.ifsl.org.uk/output/ReportItem.aspx?NewsID=47>

¹⁰ Interestingly, pension funds are looking for a range of investment opportunities across different parts of their risk-return spectrum of needs, which closely match the range of financing requirements that different types of low-carbon technologies require. Long-term predictable cash flows from the right kinds of infrastructure investment provide a match with long-term predictable pension liabilities. However, in other parts of the portfolio higher-risk, higher-return

investments like private equity are sought. The same characteristics are generally true of SWFs. This means the portfolio of investment requirements from institutional capital end-investors is a good match with the range of investment needs in the low-carbon infrastructure and technology space.

¹¹ UNEP's experience with a number of public financing mechanisms such as these shows that leverage ratios ranging from 3 to 15 can be achieved.

¹² A recent and comprehensive analysis on this topic is the output from a recent public-private discussion coordinated by Lord Nicholas Stern, entitled "Meeting the Climate Challenge: Using Public Funds to Leverage Private Investment in Developing Countries". ESRC Centre for Climate Change Economics and Policy, <http://www.lse.ac.uk/collections/granthamInstitute/MeetingtheClimateChallenge.htm>, 2009.

¹³ Another potential public finance mechanism attracting some interest is the use of public funds to provide first-loss equity tranches in private sector funds, or to enable, *pari passu* with other LPs, using public funds to provide a first-loss position in guarantee regimes

¹⁴ The P8 Group brings together senior leaders from some of the world's largest public pension funds to develop actions relating to global issues and particularly climate change. It is an initiative of the University of Cambridge Programme for Sustainability Leadership and HRH Prince of Wales, supported by the Environmental Capital Group, the Nand & Jeet Khemka Foundation and the Zennstrom Foundation. The P8 Group involves twelve leading global pension funds and SWFs, including representatives from Europe, Asia, Australasia and North America. They represent over US\$ 3 trillion of investment capital and as pension funds have an inherently long-term focus. In November 2007 the first P8 Summit was held. This brought together leaders from eight of the world's largest public pension funds with key experts including Vice President Al Gore and HRH Prince of Wales. The group, now 12 pension funds, has continued to meet and the last Summit was hosted by the World Bank Group in Washington DC in March 2009.

¹⁵ For more information on OPIC, see <http://www.opic.gov/>

¹⁶ This model has evolved from discussions involving the Nand and Jeet Khemka Foundation and the Environmental Capital Group, with other pension funds and SWFs, including those involved with the P8 initiative.

¹⁷ This political move could, for example, take the form of a communiqué from the G20 (or the major government shareholders of the development banks), which asks the presidents of the multilateral development banks to convene a public-private process that brings end-investors together to provide anchor equity for IPIIC.

¹⁸ This debt in turn could be supported if necessary by "green" debt capital market mechanisms currently being widely discussed (green bonds, etc.).

¹⁹ There will be non-trivial issues to overcome, especially among some pension funds. For example, different pension funds will have differences in investment strategy and in the degree of maturity of their investment strategies (US pension funds engage in a low level of infrastructure investing anywhere, much less in the emerging markets). There will also be important issues of fiduciary risk and accountability in decision-making to overcome: Can one pension fund rely on another's due diligence procedures?

²⁰ The most common fund structure is a limited partner/general partner relationship. Legal details on these fund structures are available at www.ilpa.org. In this context, the concept could be as follows: Government entities (a multilateral development bank, for example) would create and/or host a new regional entity (which we term a regional private investment corporation). The institutional end-investors who provide the initial equity for the corporation's cornerstone fund are the limited partners (LPs). The various funds the corporation then catalyses through bidding out parts of the cornerstone fund will be managed by general partners (GPs), who are paid a negotiated fee. At inception, the LPs can establish the rules for investing with the government host entity—most commonly include diversification limits and other risk constraints. However, once the contract is signed with each GP, the government entity and the LPs have limited sphere of influence on investments. The GPs will invest capital in a diversified set of projects or funds. Typically, the LP/GP relationship is structured with a set amount of committed capital to be invested over a 3-5 year period and a 10-year term to manage the fund through liquidation. For these funds we would suggest a 3-year cycle of investment and a 5-to-7 year term to manage and then dissolve the fund; i.e., two investment cycles followed by a re-bid for fund management. The LP's commitment to fund the capital over this period is an obligation that can only be exited with stiff penalties. The GP makes all investment decisions during this period, not the LP. In this case, government entities who are LPs will not be able to force strategic motivation—such as investing solely to create jobs or pulling capital from a deal for a political reason. To gain the confidence of the private capital markets these new funds would have to focus purely on pursuing financial objectives within the low carbon-space.

To help in the overall governance of the cornerstone fund and the money it bids out, the government entities and institutional end-investors (the LPs) involved in establishing the cornerstone fund could create an independent advisory panel that engages both themselves as LPs and the fund managers as GPs. The panel should consist of "independent directors" who operate in the private sector and are given a fiduciary duty to ensure the GP's decisions are driven by financial rather than political objectives. The panel could attend (and present at) annual meetings, review financial statements, and oversee the general partners. For example, each of the GP-managed funds would get allocations from the cornerstone fund in year 'zero', then would need to return to this panel in year three to get more allocations. The expert panel would review and make a recommendation to all limited partners on the investment; either to extend the investment program for another three-year cycle; close the fund and re-bid for another fund manager, and/or designate the level of investment proportional to the attractiveness of market conditions.

The role of the advisory panel therefore would be important: As an independent device to advise the GPs, it can help provide governance and apply the accelerator or brakes to the funds appropriately and based upon changes in the market every three-year cycle. Such a panel could also ensure that the investments are competitive—meaning, no one fund manager gains a proprietary interest in managing one of the funds and the public finance mechanisms of the MDBs are equally accessed by all the fund managers. Finally, the panel can also track and, if necessary, develop market mechanisms that require any GP who manages a fund to ensure a specified leverage ratio of public-to-private dollars is met. For example, the panel could develop a meaningful ratio that would require GPs to earn validation from the private market before taking any government money for the projects. Many current alternative energy loans operate with similar sorts of mechanisms.

A separate risk management adviser or panel could also be created to track and manage risk for the LPs (for example via an outsourced role to a third party in the private sector). This role would (i) look at the flows of capital from governments and institutional end-investors to the regional cornerstone fund; (ii) ascertain the underlying risk profile; and then (iii) suggest appropriate actions to address those risks. The specific concerns would be currency shifts, commodity price shifts and major regulatory changes. This may be an important device, as the GPs may or may not be making appropriate hedges on these kinds of issues. (Commonly, most GPs have no visibility to the risk that the LP is holding.) A third party can help mitigate the macro factors that can easily destroy value and undermine the program.

²¹ To mitigate these challenges, as well as having private sector investors on the advisory panel, some further ideas could include:

A “Tag-Along” Model: The cornerstone fund and each fund it catalyses in the region will need to find a way to avoid flooding the market, forcing them to pay distorted prices. One idea might be to use parts of the fund capital (or one of the funds specifically) to invest in existing infrastructure investments, in particular to help buy down the incremental cost of the low-carbon technology element of the project; hence the phrase “tag along model”. If a private market infrastructure deal gets closed, then the regional fund could engage the private investor and invest further capital to reduce emissions, implementing new or existing technology to do so. If not for the regional fund, the low-carbon investment in the project would not have been made and the opportunity to reduce emissions would have been missed. In this way, the funds would become more focused on investing in sub-projects within the portfolio of existing infrastructure funds and the new funds would look more like a bank to the existing local private funds. Both entities will share in the returns—especially the potentially lucrative carbon credits.

A “gap financing model”: While the “tag along model” is good for upgrading traditional infrastructure, projects focused on implementing new technologies—which could offer large scale emission reductions possibilities—may need a different solution. In these cases, the new fund could provide capital for these “riskier” projects, especially as few others in the market would be willing to do so. However, the role of the third-party risk manager employed by the cornerstone fund to oversee the GPs would become critical in these cases. From the outset, one could state a target to cap the percentage of GP-managed funds allocated to gap financing (dollars needed to take new technology from concept to scale) to, say, 15%. Tight governance controls could be imposed (such as tying compensation for the general partners to the returns, including clawbacks of salary for any major losses, etc.). These controls could then become a key boundary for the cornerstone fund’s risk manager to police and report back to the advisory panel. This is a pertinent issue because a GP managing one of the funds may perceive that more risk can be borne by its projects, due to the use of public finance mechanisms, than is the case in other funds. This would create the inclination for the GP to generate higher profits (i.e. higher bonuses), by taking more risks by investing in more gap-financing type projects. If this tension can be governed successfully within the overall fund structure, elements of gap financing could be used to accelerate reductions in emissions quicker than the market would have progressed them, but not in a way that puts the entire regional fund at risk. When paired with the “tag along model” for example, the combined effect might be quite potent. The issue of IGCC power stations paired with CCS is a good example.

²² The potential scale of the project activity on offer from these funds is worth contemplating. Assuming each regional PIC mobilised its fund portfolio at the mid point between US\$ 50 billion and US\$ 75 billion dollars each, then across the five funds approximately US\$ 312 billion worth of low-carbon projects with normalized funding structures could be catalysed in one cycle. Let us also assume the broad mix of this portfolio is 40% wind projects; 40% solar projects; 10% CCS demonstration projects; and 10% higher risk/higher return clean-tech R&D projects. Based on Barclays Capital industry analysis, this would equate to 83.2 GW of wind projects (representing approximately 1.2 million short to medium-term jobs, including construction workers, consultants for grid connections, turbine manufacturing and the associated supply chain) and 31.2 GW of solar projects (representing approximately 400,000 jobs that relate to the solar supply chain and associated installation of projects) against respective existing forecasts for 2013 of 49.5 GW worth of wind installations and 11.3 GW of solar installations, with a significant amount of finance still available for CCS demonstration and clean-tech R&D projects.

²³ As developed countries will be channeling more of their institutional capital (pension funds, SWFs, etc.) and public finance (through mechanisms that buy down risk and provide guarantees, etc.) under these models in order to make co-investment from private asset owners into developing countries more likely, a stable, coherent policy and governance framework becomes an important responsibility for the recipient country.

²⁴ Aside from the potential investment flow itself, a key stimulant for domestic policy reform may well be the economic growth and job creation potential that an increase in low-carbon project activity can offer emerging and developing countries. McKinsey & Company offer the following example (Oppenheim, J. and Beinhocker, E. *Climate Change and the Economy: Myths versus Realities*. January, 2009. Davos: McKinsey): If an electric utility builds a new wind or solar farm instead of, for example, investing in the same future capacity through simply buying more coal, the incremental cost will be folded into the borrowing that utilities typically undertake to finance their new plants (i.e. the wind or solar farm will be a new project). The incremental cost of this project will be viewed as a boost to investment in the GDP accounts of the country and GDP will go up. Shifting to a low-carbon economy requires a major temporary boost in infrastructure investment spending. The key is that the incremental borrowing required does not put a strain on the economy or increase interest rates. The use of the funds presented here to invest in productive assets with long life spans, where costs can be amortized over the life of the assets, such as new low-carbon infrastructure projects, avoids that problem. McKinsey cites evidence to suggest that each dollar invested in infrastructure-led stimulus can boost GDP by US\$ 1.59. Low-carbon infrastructure investments are no different. The same positive story holds true for jobs. One study shows that solar power creates 7 to 11 times more jobs per megawatt hour over the lifetime of the plant than coal or gas. (Kammen, D., Kapadia, K., and Fripp, M. *Putting Renewables at Work: How Many Jobs Can the Clean Energy Industry Generate?* April, 2004. Berkeley, CA: Renewable and Appropriate Energy Laboratory, University of California, Berkeley).

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4 Working Group on Standards and Metrics

Key Messages

The global and shared nature of climate change requires global standards and metrics for monitoring and reporting GHG emissions, climate change risks and opportunities. It also requires mitigation strategies that will support policy responses and produce the consistent, comparable and reliable information essential for the integrity of a post-2012 climate agreement. In order to progress towards global standards and metrics for climate change-related monitoring and reporting, this Working Group¹ calls upon policy-makers to:

- *Engage with business.* Responding to stakeholder calls for information about climate change, business has established commonly used practices, adopted standards and gained insights about climate change-related monitoring and reporting on which leaders can rely for policy-making.
- *Rationalize the GHG monitoring and reporting rules introduced by regulators* on behalf of governments to support policy responses to climate change, so as to elicit consistent, comparable and reliable information.
- *Align government and business approaches to monitoring and reporting GHG emissions* in support of mutually reinforcing actions that will help to achieve government-pledged cuts in GHG emissions of 80% by 2050.
- *Focus on monitoring the emission sources that are likely to yield the most significant GHG mitigation opportunities*, in particular through corporate supply chains, product emissions and the use of alternative (low-carbon) techniques and technologies.
- *Lead or form public-private partnerships to manage ongoing development and implementation of universal standards and metrics on climate change-related monitoring and reporting.*

Definitions

The terms “universal standards and metrics for monitoring and reporting related to climate change”; “climate change-related monitoring and reporting”, and “GHG measurement, monitoring and reporting practices” cover the following activities:

- calculation of GHG emissions and associated data collection;
- goal setting, tracking and progress evaluation for GHG emission and energy use reductions;
- strategies for mitigating and adapting to climate change;
- assessment of risks and opportunities related to climate change;
- disclosure of results to stakeholders.

Parties in the development of universal standards and metrics

The development of universal standards and metrics for climate change-related monitoring and reporting depends upon active partnerships among:

- *policy-makers*: to provide international leadership and to promote the use of and compliance with universal standards and metrics for climate change-related monitoring and reporting;
- *regulators and governments*: for national adoption of universal standards and metrics agreed at international level;
- *business*: to contribute tried and tested models, best practices and insights gained from actual experience of climate change-related monitoring and reporting;
- *standard setters, NGOs and academics*: to contribute support mechanisms for universal standards and metrics.

These proposals are:

- *specific*: they are supported by further detail in appendices where appropriate;
- *practical, realistic and cost effective*: they rely on existing, tried and tested practices;
- *focused*: they define priority emissions sources for monitoring and reporting;
- *Ambitious*: they provide a practical, cost effective foundation on which more sophisticated monitoring and reporting rules can be built.

Disclaimer

The views expressed in this section represent a collation of various viewpoints emerging from a series of discussions among the participants in the Working Group on Standards and Metrics. Although the observations and proposals in this section enjoy broad support, they do not necessarily reflect the views of every individual participant nor do they necessarily reflect the individual institutional viewpoints of any of the companies or institutions that took part, or of the World Economic Forum.

Introduction

1. In the fourth national communications under the Kyoto Protocol, 39 Annex 1 territories reported on their GHG measurements to the UNFCCC. In 2008, over 2,000 of the world's largest corporations disclosed information about their GHG emissions and climate risks and opportunities to the Carbon Disclosure Project. The growth, scope and scale of GHG measurement, monitoring and reporting practices bear testimony to the mantra: "What gets measured, gets managed".
2. Significant progress has been made in refining GHG monitoring and reporting practices. However, the explosion of national and/or regional policy responses to climate change and the absence of global consensus on GHG measurement and tracking mean that reporting fails to produce the consistent, comparable and reliable information that is essential for the integrity of a post-2012 climate agreement. The World Business Summit on Climate Change in May 2009 referred to the need for a "unified, coherent and reliable measurement, reporting and verification discipline for GHG emissions".² The UNFCCC negotiations have identified, through the Bali Action Plan, the need for mitigation commitments and actions that are "measurable, reportable, and verifiable".
3. Building on conversations with a broad range of business, academia and civil society representatives and on individual input provided by participants in this Working Group, this paper offers a series of recommendations to leaders on how universal standards and metrics on climate change-related monitoring and reporting may be developed. The recommendations respond to Prime Minister Gordon Brown's request for "practical proposals for product, technology and supply chain standards to further drive energy efficiency and lower emissions, including common carbon accounting standards, supply chain emissions calculation methodologies and disclosure processes".³
4. Government pledges to cut GHG emissions by 80% by 2050 in order to avert a 2° Celsius rise in temperature over pre-industrial times must be supported by actions taken by business to track and reduce their GHG emissions. This Working Group therefore *calls for aligned actions by government and business to measure, track and report GHG emissions by reference to universal standards and metrics* that recognize the global and shared nature of climate change. These actions should:
 - a. establish the common language (or global protocols) necessary for linking carbon cap and trade schemes;
 - b. align and reflect the reporting needs of preparers and users of information and, in doing so, promote compliance with and utilization of the approach;
 - c. adopt relevant principles from existing reporting models with which business is already familiar and that provide the clarity and rigour necessary for compliance, assurance and enforcement;

- d. provide businesses, investors, consumers and policy-makers with reliable information and confidence to make the decisions and take the actions needed to address climate change and support policy objectives;
 - e. facilitate trust between developed and developing countries and their policy-makers through increased transparency on the main drivers and sources of global anthropogenic GHG emissions.
5. These recommendations call on leaders to:
 - a. use the shared characteristics that have emerged from business's adoption of existing voluntary and mandatory reporting principles and standards as the starting point for any efforts to initiate or extend GHG monitoring and reporting rules;
 - b. support and incorporate into policy-making the work that is already in progress by business to clarify unresolved aspects of GHG monitoring and reporting;
 - c. rationalize the GHG monitoring and reporting aspects of policy responses to climate change introduced or anticipated by policy makers;
 - d. focus on where the greatest potential GHG mitigation benefits may be achieved by supporting and prioritizing ongoing work by business to develop standards for measuring supply chain and product emissions and indirect benefits from the use of alternative techniques and technologies that could reduce GHG emissions;
 - e. identify how ongoing work to develop universal standards and metrics will be managed beyond the G20 meeting in September 2009, so as to build upon the momentum of the Task Force and the UNFCCC negotiations.
 6. The recommendations are designed to support policy-makers in their negotiations to reach a global agreement by accelerating progress towards a universal approach to climate change-related monitoring and reporting that encourages coherence across international markets from which the foundations for a new generation of low-carbon enterprises and markets can be built.

Recommendation 1

7. *This Working Group calls on policy-makers to use the shared characteristics that have emerged from business's adoption of existing principles and standards as the starting point for any efforts to initiate or extend GHG monitoring and reporting rules.*
8. Development of universal standards and metrics for monitoring and reporting GHG emissions is complex. However, much has already been achieved by business to establish standards and metrics that are suitable for universal application. The rapid and constructive response by business to demands from their stakeholders for climate change-related information has led to the adoption of certain standards, principles and practices which share characteristics that represent a trialed and tested basis from which GHG monitoring and reporting rules may be initiated or extended.
9. Appendix 1, below, lists the shared characteristics in current GHG monitoring and reporting, the standards on which those characteristics are based, the supporting reference materials and the organizations and initiatives that rely on and/or publish them. This Working Group calls on policy-makers to build upon and not to diverge from the specific characteristics listed in Appendix 1 when devising policies that involve GHG monitoring and reporting, so as to encourage standardization based on tried and tested approaches.

Recommendation 2

10. *This Working Group calls on policy-makers to support work already in progress by business to clarify unresolved aspects of GHG monitoring and reporting.*
11. Although much has been achieved by business to develop GHG monitoring and reporting standards, there are issues that require further clarification, including the definition of business boundaries for monitoring and reporting to ensure consistency of approach, verification and assurance rules, definition of the baseline from which GHG emission reductions should be evaluated, and so on. Business has already embarked on research and testing to resolve these aspects of GHG monitoring and reporting.
12. Appendix 2 , below, lists some of the specific matters business is working to resolve. This Working Group calls on policy-makers to engage with business to support their efforts and understand how their findings may be incorporated into the formulation of policy so as to encourage standardization based on rigorous research and testing conducted by business.
13. The shared characteristics, standards and best practices referenced in Recommendation 1, above, provide a reliable approach for the immediate preparation of GHG inventories by corporations. The research and development work referenced in recommendation 2 builds on this. Taken together these two recommendations are sufficiently flexible to allow for an approach to monitoring and reporting based on a practical, cost-effective, scientifically reliable basis using default values, while at the same time permitting more precise, industry or process-specific approaches.
14. To be noted, any values (other than default values) used for the calculation of GHG emissions must have been verified according to appropriate quality control and scientific criteria, referring to specialist services offered through the UNFCCC and national governments where appropriate, and in all cases provided that the basis on which calculations are prepared is transparent to the user of the information.

Recommendation 3

15. *This Working Group calls on policy-makers to rationalize the GHG monitoring and reporting aspects of policy responses to climate change already introduced or anticipated by policy-makers.*
16. As well as the actions being taken by business on GHG monitoring and reporting, regulators and policy-makers in many jurisdictions have introduced or are contemplating introduction of GHG monitoring and reporting rules. Research indicates that over 250 policy developments focused on GHG mitigation and support for renewable energy were introduced in the eight months from July 2008 through February 2009.⁴ For example, a large multinational company operating in Australia, Canada, New Zealand, European Union and the US is likely to be subject to up to twenty existing or imminent legislative provisions aimed at regulation of GHG emissions and energy use, some of which share monitoring and reporting approaches. The variation in monitoring and reporting methodologies observed in policy responses adds to compliance and reporting burdens and is contrary to the calls for consistent and comparable information needed for effective decision-making.

17. Appendix 3, below, exemplifies this point by detailing some of the established and developing regulations on monitoring and reporting of GHGs. This Working Group calls on policy-makers to review regulatory developments that incorporate GHG monitoring and reporting rules with a view to identifying where rules diverge and where there is scope for convergence between regulatory approaches and with standards used by business for GHG monitoring and reporting.

Recommendation 4

18. *This Working Group calls on policy-makers to focus on the greatest potential for GHG mitigation by supporting work in progress by business to develop standards on measuring supply chain and product emissions and indirect benefits from the use of alternative (low-carbon) techniques and technologies.*
19. Prime Minister Gordon Brown's request that the Task Force should make recommendations on product and supply chain efficiency, emissions calculation methodologies and disclosure processes, reflects the fact that the scope, scale and impact of indirect emissions from activities of third parties through the supply chain and emissions embedded in products and services is equal to or more significant than direct emissions from sources owned and controlled by business. Work to develop standards and metrics on the monitoring and reporting of GHG emissions in corporate supply chains and products and to assess benefits available from the use of alternative low-carbon technologies must therefore be prioritized. In addition:
 - a. Monitoring product life-cycle GHG emissions information should help inform consumer purchasing decisions and ultimately lead to an overall shift away from the most environmentally damaging products.
 - b. Monitoring of GHG emissions across supply chains that span multiple countries, some of which do not regulate GHG emissions, is likely to minimize leakage.
 - c. Processes that corporations already use to manage their supply chains provide an established route for systematic identification of GHG emissions reductions.
 - d. Products consumed in developed countries often have supply chains stretching into the developing world. Monitoring of emissions in corporate supply chains can therefore bridge understanding of the opportunities for emission reductions between the developed and developing countries.
20. Many organizations, including the World Resources Institute (WRI), the World Business Council on Sustainable Development, the OECD, the International Organization for Standardization (ISO) and the Carbon Trust, are leading work to develop guidelines to be used by organisations for monitoring and reporting emissions in the supply chain and at product level. This Working Group calls on policy-makers to engage with and support those organisations in the development of a global standard for climate change-related monitoring and reporting across corporate supply chains and products complemented by national or industry standards that are consistent with the global standard.

Recommendation 5

21. *This Working Group calls on policy-makers to identify how ongoing work to develop universal standards and metrics on GHG monitoring and reporting should be led and managed beyond the G20 meeting in September 2009, so as to build on the momentum of the Task Force and support the UNFCCC negotiations.*
22. Many organizations have already established and continue to develop standards and metrics appropriate for the needs of policy-makers who have introduced or are contemplating introduction of requirements on the monitoring

and reporting of GHG emissions. In order to maximize the effect of the work that has been done and that is ongoing and to build upon the recommendations made by the Task Force, action needs to be coordinated and managed through collaboration between organizations that have experience with global standard-setting and the multidisciplinary network required to set standards that cover accounting, compliance, assurance and environmental measures.

Next Steps

23. The Working Group on Standards and Metrics recommends a joint project could be set up between the International Accounting Standards Board (IASB) and the Climate Disclosure Standards Board (CDSB) to develop a principles-based, international reporting standard for corporate climate disclosure suitable for ultimate adoption by regulators. The output of the joint project could include:
 - a. a comparative review of national regulatory policy responses to GHG disclosure requirements, drawing upon initial work being conducted by the industrial, accounting, financial and environmental communities through the CDSB;
 - b. a practical and technical assessment of the complementary effect on standards of the International Assurance Engagement Standard on GHG statements being developed by the International Federation of Accountants through the International Auditing and Assurance Standards Board;
 - b. an impact assessment identifying the types of organizations for which monitoring and reporting is likely to be material and the associated cost-benefit analysis.

Appendix 1

Standards and principles in current use—shared characteristics and leading organizations

The call from multiple stakeholders for companies to provide information about their GHG emissions, climate change-related risks, opportunities and management strategies, dates back some years but was most visibly formalized through the work of the Carbon Disclosure Project (CDP). Since 2003, CDP has provided a reporting process for the world's largest corporations to disclose their climate change impacts, including GHG emissions and strategic information such as risks, opportunities and emissions reduction targets. Other organizations and programmes, including the Global Reporting Initiative, CERES, the Climate Registry, the US Environment Protection Agency, the World Economic Forum and the UN Global Compact, have also done much to support voluntary disclosure on climate change. Many cities have also started to report their municipal and community GHG emissions.

The Greenhouse Gas Protocol developed by the World Resources Institute and WBCSD has emerged as the *de facto* standard for the preparation of corporate entity level GHG inventories. The GHG Protocol and its associated calculation tools build upon the IPCC guidelines which are the *de facto* standard for national emissions inventories. The GHG Protocol provides the accounting framework for nearly every GHG standard and programme in the world, as well as for hundreds of GHG inventories prepared by individual companies. The GHG Protocol is comparable with and in some cases forms the basis for the GHG emission calculation rules set out in the following standards and initiatives:

- **Standards:** ISO 14064-1, Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals;
- **Voluntary climate initiatives:** US EPA Climate Leaders Program; WWF Climate Savers Program; Respect Europe Business Leaders Initiative for Climate Change (BLICC); USAID Greenhouse Gas Pollution Prevention Program;
- **GHG registries:** California Climate Action Registry; The Climate Registry; Wisconsin GHG registry; World Economic Forum Global GHG Registry;
- **Reporting initiatives:** Global Reporting Initiative; CERES Sustainable Governance Initiative; French REGES Protocol; Carbon Disclosure Project; DEFRA proposed reporting guidelines;
- **Industry initiatives:** WBCSD Cement Protocol; International Forum of Forest and Paper Associations; International Aluminium Association; NZ Business Council for Sustainable Development; European, Japanese, Canadian, and Australian cement industry associations;
- **Trading schemes:** EU Commission Decision 2007/589/EC, establishing guidelines for the monitoring and reporting of GHG emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council; UK Emissions Trading Scheme; Chicago Climate Exchange;
- **Other:** European Bank for Reconstruction and Development; Climate Neutral Network.

As a result of the work that has been done by business to date and widespread coalescence around the GHG Protocol, monitoring and reporting approaches currently in use share a number of common characteristics:

- a. **The type of information that corporations disclose in relation to climate change:** This generally falls into four categories: risks and opportunities, GHG emissions, performance (including reduction activities), and governance.
- b. **The type of GHG emissions that should be measured and reported:** i.e., the six so-called Kyoto Protocol gases.
- c. **The categorization of emissions, taking into account direct and indirect sources and avoiding double counting:**
 - *Scope 1:* GHG emissions from GHG sources owned or controlled by the reporting organisation, which may be further subdivided into stationary combustion, mobile combustion, physical and chemical processes, and fugitive emission;

- *Scope 2*: emissions from the company's consumption of electricity, heat, cooling or steam brought into its reporting boundary;
 - *Scope 3*: emissions from sources that are not owned or controlled by an organization but which occur as a result of its activities.
- d. **The main approaches to calculating emissions:**
- *Direct measurement*: through the use of continuous emissions measurement technology;
 - *Calculation based*: where activity data is converted to GHG emissions by way of emissions factors;
 - *Estimation*.
- e. **Values, emission and conversion factors available for calculating GHG emissions by reference to activity data:** Currently, the IPCC National Greenhouse Gas Inventories Programme (IPCC-NGGIP) Emission Factors Database contains the IPCC default data (default data presented in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories and the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories) and the data from CORINAIR94 (which is subject to review). Emission and conversion factors are also available from the WRI/WBCSD GHG Protocol website and from national government sources. Facilities also exist through the UNFCCC's GHG Network and national government specialists for more specific, industry or process relevant values to be agreed using reliable verification processes.
- f. **The units in which emissions should be reported:** namely, in tonnes of CO₂ equivalent (CO_{2-eq}). This is the universal unit of measurement used to indicate the global warming potential of a GHG, expressed in terms of the global warming potential per one unit of carbon dioxide.

Appendix 2

Aspects of GHG monitoring and reporting that require further clarification and business activity to resolve them

The monitoring and reporting approaches that have emerged from business's response to demand for information about climate change to date provide a foundation for the formulation of universal standards and metrics. However, there are aspects of monitoring and reporting that require further clarification. This appendix lists those matters and, where possible, the organizations that are already leading work to resolve them.

- **Emissions from corporate supply chains and products:** Recommendation 4 references the work being led by the World Resources Institute, the World Business Council on Sustainable Development, the Carbon Trust, the OECD and others on the development of rules for the monitoring and reporting of GHG emissions from corporate supply chains and products.
- **Boundaries:** Outside regulatory schemes, GHG emissions results may be prepared on a number of different consolidation bases; in particular, by reference to companies over which the reporting group has operational or financial control or according to the reporting group's share of equity in its associates. This makes comparability of results between companies difficult. Research on how to regularize consolidation bases is being conducted by the Climate Disclosure Standards Board and WRI.
- **Assurance:** Verification or assurance of GHG emissions results is important to provide users of information with confidence in the results. The International Auditing and Assurance Standards Board (IAASB) and the International Federation of Accountants (IFAC) are leading work on the development of an assurance standard for carbon statements.
- **Performance metrics:** New performance indicators and metrics are required to inform data users, enhance communications and facilitate comparisons between companies. Ongoing work to establish such metrics is being co-ordinated by CDSB and this Working Group is aware that discussions on this matter are ongoing through the UNFCCC negotiations.

- **Accounting for reductions and credits:** Issues relating to measurement, documentation and disclosure of GHG reductions and credits need to be resolved, including how to calculate indirect emissions benefits attributable to the use of alternative techniques and technologies—for example, the purchase of electricity sourced from the national grid under tariffs that support renewable methods of generation, and the use of information and communications technologies.
- **Emission factors and GWPs:** One of the most urgently called for activities at the international level is the development of more current country-, industry-, and process-specific emission factors, as this will greatly contribute to the quality of emission inventories. This Working Group understands that the IPCC-NGGIP are working on this. Meanwhile, the default values in the IPCC GHG Protocol and national government databases offer a clear, simple and cost-effective method of calculating GHG emissions.
- **The expression and tracking of GHG emission and energy reduction targets:** Targets may be set in absolute or relative terms. The relative merits of these approaches for various industries and methods for evaluating progress over time needs to be better understood, including the determination of baselines for targets and the circumstances in which the baseline may be amended.
- **Sector specific approaches:** Although work has been carried out in some sectors (such as aluminium, iron and steel, beverages and paper) there is a need to ensure coherency of GHG-monitoring approaches across sectors so that products that draw inputs and materials from diverse sectors can be readily assessed in terms of their embedded emissions. Also, work to define the absolute and relative indirect benefits of techniques and technologies to reduce GHG emissions is likely to require the specialized expertise of individual industry sectors and their representatives.

Appendix 3

Review⁵ of the current state of international regulatory and other developments on monitoring and reporting of direct GHG emissions

The objectives of the review are to:

- raise awareness of and discourage the variation in approach to monitoring and reporting of direct GHG emissions that is emerging internationally;
- identify opportunities for convergence and standardization of approach;
- specify what actions should be considered by policy-makers to achieve greater convergence.

The outline of the review parameters is for illustrative purposes only and a more detailed proposal would be agreed with policy-makers if Recommendation 3 were accepted.

	Australia	Brazil	India	UK	US
National regulatory programmes: Enacted⁶	National Greenhouse Gas and Energy Reporting Act (NGER)	No regulatory GHG programme, but there are laws establishing energy efficiency requirements	No regulatory programme, but provisions in the National Action Plan on Climate Change and Energy Conservation (NAPCC) Act of 2001.	Carbon budget is part of EU-ETS.	None, but regional regulatory programmes are in place: Regional GHG Initiative and AB32 (California).
National regulatory programmes: Prospective⁷	Proposed Carbon Pollution Reduction Scheme (CPRS)	Not applicable	Eight missions are in preparation under the National Action Plan on Climate Change.	Carbon budget is part of EU-ETS, effective April 2010.	Mandatory Greenhouse Gas Reporting Rule: March 10, 2009; Proposed American Clean Energy and Security Act of 2009, HR 2454 ("Waxman Markey Bill"), March 31, 2009.
National voluntary programmes: Enacted⁸	Greenhouse Friendly – Government-led initiative	Brazil Greenhouse Gas Protocol Program	NATCOM and corporations on an individual level	Climate Change Agreements (CCA); These are voluntary, but reduce payments under the Climate Change Levy (CCL).	U.S. Department of Energy Voluntary Greenhouse Gas Reporting 1605(b); Non-government: The Climate Registry reporting protocol
Market mechanism: Yes or No	NGER establishes a reporting framework for the proposed emissions trading scheme.	No	Yes; A market for energy efficiency certificates is contemplated in the NAPCC.	CCA: No Carbon Reduction Commitment (CRC): Yes	None in force at national level, but proposed in HR 2454
Disclosure voluntary: Yes or No	No	No	No	CCA: Yes	Yes
Disclosure mandatory: Yes or No	No	As above	No	CRC: Yes Annual reporting	No
Assurance / verification requirements	Assurance framework for NGER or CPRS has yet to be released.	No	Not applicable	CCA: Verification CRC: Audit	No
Enforcement mechanism	Penalties, and holding the CEO of the corporation liable for offences.	Not applicable	As above		None in force
If GHG emission reduction targets included in mandatory or voluntary reporting:					
Baseline year⁹	The first period for NGER is 1 July 2008 to 30 June 2009.	Not applicable, but Brazil is a signatory to the Kyoto Protocol	Not applicable, but India is a signatory to the Kyoto Protocol	CCA: Specific to each sector agreement CRC: April 2010 to March 2011	None, but 2005 proposed in HR 2454
Target year¹⁰	Government to adopt a GHG reduction target of 25% by 2020 only as part of an ambitious international agreement.	Not applicable	Not applicable	CCA: 2020, 2050 CRC: As of 2013	None, but proposed legislation sets 97% of 2005 levels by 2012, 83% by 2020, 58% by 2030, and 17% by 2050
Emission reduction target¹¹	See above	Not applicable; Energy efficiency goals are indicated in the laws mentioned above.	Not applicable; Energy efficiency and renewable energy goals are indicated in the NAPCC.	Carbon budget: 34% by 2020 Climate Change Act: at least 80% reduction by 2050	See above
Annualized emission reduction target¹²	Not applicable	Not applicable; Energy efficiency goals are indicated in the laws mentioned above.	Not applicable as above	Budget 1 (2008-12): 3,018 Mt CO ₂ ; Budget 2 (2013-17): 2,819 Mt CO ₂ ; Budget 3 (2018-22): 2,570 Mt CO ₂	Not applicable
Conduct: Primary transformation target					
Enterprise level	Corporations are required to apply for registration and report according to facility and corporate thresholds.	Some corporations conduct voluntary GHG emission inventories under the requisites of the WRI/WBCSD GHG Protocol, ISO 14064, or IPCC, at plant and corporate level.	Some companies (GHG protocol, ISO 14064 without certifications, PAS 2050)	CRC: enterprise level	None
Facility level	As above	As above	As above, sometimes aggregated at enterprise level for corporate reporting	CCA: facility level	Proposed EPA Mandatory Greenhouse Gas Reporting Rule is hybrid—primarily facility level with limited exceptions
Product level¹³	No	Some corporations conduct voluntary life-cycle assessments of a product.	Not applicable	Through European ERP Directive; No GHG methodology prescribed	No

	Australia	Brazil	India	UK	US
Scope					
Scope 1: Direct GHG emissions covered? ¹⁴	NGER: Yes CPRD: Yes	Not applicable	Not applicable	Yes	Yes in pending HR 2454
Scope 2: Electricity indirect GHG emissions covered? ¹⁵	NGER: Yes CPRS: no	Not applicable	Not applicable	CRC: Yes, only on transport emissions CCA: Yes	Yes in pending HR 2454
Scope 3: Other indirect GHG emissions covered? ¹⁶	No	Not applicable	Not applicable	No	No
Defined greenhouse gases (GHGs) covered? ¹⁷	CH ₄ , CO ₂ , N ₂ O, SF ₆ , HFC, PFC	CH ₄ , CO ₂ , N ₂ O, SF ₆ , HFC, PFC	CH ₄ , CO ₂ , N ₂ O, SF ₆ , HFC, PFC	CH ₄ , CO ₂ , N ₂ O;	CRC only covers CO ₂ CH ₄ , CO ₂ , N ₂ O, SF ₆ , HFC, PFC
Type of organization within scope	Cross sector according to emission and energy thresholds applicable to facilities and corporations	Private sector organizations that carried out voluntary GHG emissions inventory	As above	Large public and private sector organizations	Suppliers of fossil fuels or industrial greenhouse gases, manufacturers of vehicles and engines, and facilities with emissions above the participation thresholds
Participation thresholds	Sliding scale of CO _{2e} emitted or energy consumed or produced, and a corporate threshold	Thresholds of the private sector organizations that carried out voluntary GHG emissions inventories are applicable at facility and corporate levels.	As above	CCA: energy intensive business (% turnover spent on energy) CRC: At least one half hourly meter (HHM) and annual electricity consumption of at least 6,000 MWh	Capacity-based threshold, where appropriate and feasible; GHG emissions in excess of 25,000 metric tons CO _{2e} per annum for other
Activities within scope	Production of GHG emissions, and/or consumption, and/or production of energy	As above	As above	Use of electricity	Production of GHG emissions and/or consumption and/or production of energy
Define sources within scope:	Above activities and fuel consumption, for an exhaustive list of industry sectors.	As above	As above	Criteria for electricity consumption	40 source categories
Regulatory authority					
Primary responsibility	Greenhouse and energy officer (GEDO) regulates NGER. Upon the passing of the CPRS, a new regulatory body is expected to come into force.	Department of Climate Change (DEMC) of the Ministry of Environment	As above	CCA: Department of Environment, Food and Rural Affairs (DEFRA) CRC: Department of Energy and Climate Change (DECC)	US EPA
Secondary responsibility	Not applicable	Not applicable	Confederation of Indian Industry (CII) / Bureau of Energy Efficiency CRC: Environment Agency	CCA: Treasury	Not applicable

	Australia	Brazil	India	UK	US
Calculations and units of reporting					
Reporting required in CO₂eq metric tonnes?: Yes or No	Yes	Yes	Not applicable	Yes	Yes
Other metrics, if any	NGERS requires energy consumption and production to be disclosed.	Not applicable	Not applicable	Not applicable	Not applicable
Emission factor sources¹⁸	NGA Factors (AU based)	GRI/WBCSD GHG calculation tools; IPCC	Various, depending on need to reduce uncertainty	DEFRA	US EPA; industry organization factors (ex. API)
GWP sources	Provided by the NGER (measurement)	IPCC	Kyoto Protocol	IPCC	IPCC)
Use of continuous emissions monitoring: Encouraged, Allowed or No	Allowed (also periodic emissions monitoring)	No	Pending further research, assumed per GHG Protocol	Encouraged	Yes in proposed EPA rule
Estimation acceptable?: Encouraged, Allowed or No	NGER allowed	Pending further research, assumed per GHG Protocol	Pending further research, assumed per GHG Protocol	Allowed—CRC	Yes
Use of default factors acceptable? Encouraged, Allowed or No	Can be applied as the NGER determination prescribes	Pending further research, assumed per GHG Protocol	Pending further research, assumed per GHG Protocol	Allowed—CRC	As prescribed by US EPA
Inclusions and exclusions					
Energy intensive	NGER covers facilities and corporations with GHG emissions or energy use above specified thresholds.	Pending further research, assumed per GHG Protocol	Being worked out under NAPCC from energy point of view	CCA covers intensive energy users	Proposed EPA rule list
Non-energy intensive	As above	Pending further research, assumed per GHG Protocol	As above	CRC covers non-intensive energy users	Proposed EPA rule list
Small and medium sized enterprises (SMEs)	Possible, according to their energy consumption/production and GHG emissions; unlikely under the proposed CPRS	Pending further research, assumed per GHG Protocol	Iron and steel mostly, leather, jute, textile, tea, coffee, dairy and poultry, electronic goods, etc.	CCA: can cover SMEs CRC: will only affect companies with an energy bill of more than approximately £1million	Not covered

Endnotes

- ¹ From the text of *The Copenhagen Call*. May, 2009. Copenhagen: Copenhagen Climate Council (<http://www.copenhagenclimatecouncil.com>).
- ² *UNFCCC Bali Action Plan, Decision 1/CP.13*. December, 2007. Bonn: UNFCCC. (<http://www.unfcccballi.org>)
- ³ See *Business-Expert Task Force on Low-Carbon Prosperity: Open Letter to G20 Leaders*. " March, 2009. Geneva: World Economic Forum. (http://www.weforum.org/pdf/climate/G20_ProspertyTaskForceLetter.pdf).
- ⁴ *Global Climate Change Regulation Policy Developments: July 2008-February 2009*. February, 2009. New York: Deutsche Bank Climate Change Advisors.
- ⁵ This draft information has been compiled via internal networks of the Carbon Disclosure Project, IHS, PricewaterhouseCoopers and Xanfeon.
- ⁶ Has country enacted and implemented a national mandatory regulatory programme to track and/or reduce GHG emissions?
- ⁷ Is country in the process of enacting and implementing a national mandatory regulatory programme to track and/or reduce GHG emissions?
- ⁸ Has country enacted and implemented a national voluntary programme to track and/or reduce GHG emissions?
- ⁹ List programme baseline year used in assessment of performance
- ¹⁰ List programme target year used in assessment of performance
- ¹¹ List overall quantitative reduction target used in assessment of performance
- ¹² Annualize quantitative reduction target used in assessment of performance
- ¹³ The EU Ecodesign Directive is the first legislation requiring assessment of GHG emissions for the life cycle of a product and therefore through a supply chain, the use phase, and the end-of-life stage of the product.
- ¹⁴ Emissions from sources that are owned or controlled by the reporting entity (e.g., boilers, furnaces, vehicles, etc.; emissions from chemical production in owned or controlled process equipment).
- ¹⁵ Emissions that are a consequence of the operations of the reporting entity, but occur at sources or controlled by another organization (e.g. purchased electricity)
- ¹⁶ Emissions that are a consequence of the entity's activities, but occur from sources not owned or controlled by the entity (e.g. business travel, supply chain, use of sold products)
- ¹⁷ Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Sulphur Hexafluoride (SF₆), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs)
- ¹⁸ Emission factors are representative values that attempt to relate the quantity of a pollutant released to the ambient air with an activity associated with the release of that pollutant.

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5 Working Group on Avoided Deforestation and Land Use Change

Key Messages

Avoiding emissions and enhancing sequestration in the forestry, agriculture and other land use sectors is a critical element of the climate change solution.

Forest-based mitigation through a mechanism such as REDD+ offers a significant win-win abatement opportunity equivalent to as much as 25% of the emission reductions required by 2020.¹

To achieve this abatement, Parties to the UNFCCC must provide an unambiguous signal on their long-term intent to price carbon through international market mechanisms alongside ambitious targets for emissions reductions.

A first phase of readiness funded by the public sector must begin immediately to build the foundations required for REDD+ at the national and international levels, including the development of robust measurement, reporting and verification (MRV) systems. This will require significant flows of public finance.

These publicly funded actions, combined with appropriate price signals, can unlock significant private sector flows of finance into REDD+ activities through the carbon markets.

There is also significant scope for further private sector engagement in REDD+ projects and more directly in the systems required for REDD+ through carbon finance.

A major public-private dialogue hosted by forest and developed nations and involving the private sector and civil society is necessary to build the international and national architecture required for REDD+ to be ready for private sector engagement by 1 January 2013, and for early action beforehand. This major initiative would include four pillars focused on the following elements:

- Enabling national policies to attract private sector finance to REDD+ activities;
- Appropriate design of credit systems, including mechanisms to address the issue of permanence, taking into account the lessons learned from forestry projects in the Clean Development Mechanism (CDM) and voluntary carbon markets;
- Building robust measurement, reporting and verification (MRV) systems, including comprehensive Earth Observation and field-level systems;
- Developing large-scale public-private partnership (PPP) models for REDD+, including undertaking specific demonstration projects as early actions to validate these models.

Disclaimer

The views expressed in this section represent a collation of various viewpoints emerging from a series of discussions among the participants in the Working Group on Avoided Deforestation and Land Use Change. Although the observations and proposals in this section enjoy broad support, they do not necessarily reflect the views of every individual participant nor do they necessarily reflect the individual institutional viewpoints of any of the companies or institutions that took part, or of the World Economic Forum.

Summary

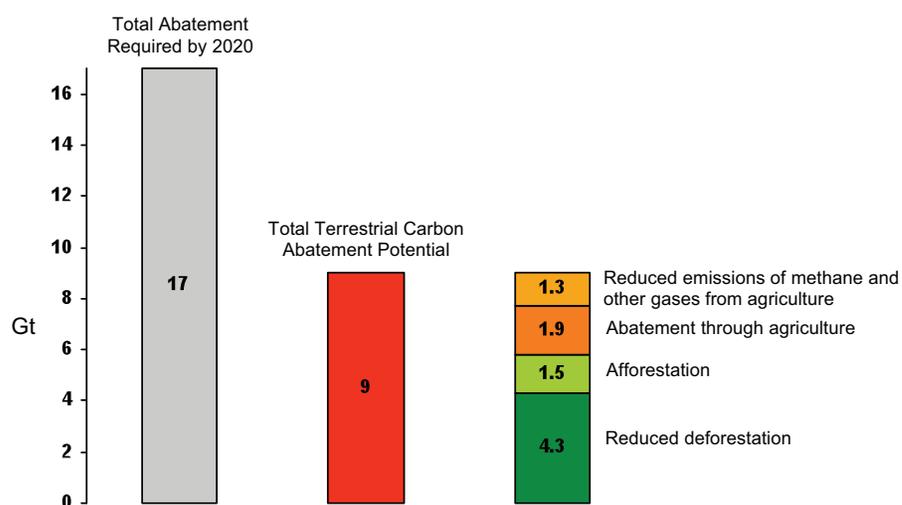
- Forest-based mitigation offers a substantial win-win abatement opportunity by 2020. Achieving half of the reductions available from terrestrial carbon, mainly through avoided deforestation, will deliver 4 to 5 Gt of abatement by 2020 – around one-quarter of the abatement required to reach a 450 ppm trajectory². These efforts are cheap relative to the abatement prize: according to analysis by Project Catalyst, achieving approximately 60% of this abatement by 2020 is likely to be on the order of 15-35 billion euros with each tonne costing well below 15 euros³.
- Investment in forest-based mitigation will create alternative livelihoods and support sustainable development for forest populations, more than half of which live in extreme poverty. Frontloading forest-based mitigation will buy time as currently expensive new clean technologies are demonstrated and made ready for large-scale deployment from 2020 onwards.
- To achieve this abatement, an agreement amongst UNFCCC Parties in Copenhagen must incorporate forest-based mitigation including REDD+, possibly extending to agro-forestry in the initial phase within a framework for the eventual incorporation of all terrestrial carbon and a long-term commitment to international carbon markets.
- Public financing will be necessary to build the foundations at the international and national levels for the large-scale implementation of REDD+ activities. This “readiness for REDD+” phase will require, at a minimum, 3 billion euros over five years for capacity building, not including the financing required for early actions.⁴ In addition to additional official development assistance, several promising options exist for raising public financing, including the rainforest bonds proposal developed by the Prince’s Rainforests Project.
- Due to the varying capacities of forest nations, this “readiness for REDD+” phase will be longer for certain less advanced nations. This makes it essential that these activities start as soon as possible and be sufficiently flexible to ensure the maximum abatement from forests can be achieved by 2020 and thereafter.
- The earlier this readiness is created, the faster private finance can be deployed to take over the burden from the public sector. Depending upon the project type and geography, and on the scale of demand created for REDD+ credits through the carbon markets, the private sector will be able to meet a portion of the financial flows required by 2020.
- Several policies are required to attract private sector finance:
 - REDD+ projects must produce carbon credits of compliance grade that are tradable as offsets and fully fungible with other credits in international carbon markets.
 - MRV procedures must be robust and include the use of systems that can ensure reliable calculations of the carbon value of projects.
 - Forest-based mitigation efforts should be made available for investment at a project level, but placed within the context of national baselines and the Nationally Appropriate Mitigation Actions (NAMA) Plans of the forest nations.
 - A risk management framework for this new asset class will be required to mitigate risks such as unforeseen reversal.The development of each of these policies will require a process of dialogue between the public, private and civil society sectors to maximize the flow of private financing to REDD+ activities.
- Alongside financing through the carbon markets, private sector resources and competencies will need to be brought to bear directly on projects at the field level to ensure that REDD+ is implemented at the scale and speed required. This will require a suite of public-private innovations for REDD+ implementation which can be developed by building upon some of the promising PPP proposals already in existence.

- The full set of terrestrial carbon, including agriculture and other land-use changes, must eventually be incorporated in the global climate regime, due to both the raw mitigation potential of agriculture and other land use and the strong interlinkages between agricultural expansion and deforestation. An agreement amongst UNFCCC Parties (potentially in Copenhagen) must include a provision for the future inclusion of the full suite of terrestrial carbon.
- A major public-private dialogue hosted by forest and developed nations and involving the private sector and civil society is necessary to build the international and national architecture required for REDD+ to be ready for private sector engagement by 1 January 2013, and for early action beforehand. This major initiative would include four pillars focused on the following elements: enabling national policies; appropriate design of credit systems, including addressing the issue of permanence; building robust MRV systems; and developing large-scale PPP models for REDD+, including undertaking specific demonstration projects as early actions to validate these models.

Background: Importance of including REDD+ in an agreement in Copenhagen

1. Forests are a necessary component of any realistic strategy to reach a 450 ppm pathway and limit temperature increases to two degrees above pre-industrial levels. According to cost analysis by Project Catalyst (Figure 5.1, below), 9 Gt of the 17 Gt of emissions reductions required by 2020 in order to reach a 450 ppm pathway could come from terrestrial carbon, much of which is from forest-based mitigation. Moreover, forestry provides the most favourable characteristics in the abatement curve as a result of its large abatement potential and relatively low costs.
2. Forest-based mitigation not only offers a relatively inexpensive option for abatement, but can also help achieve other sustainable development objectives such as poverty reduction, the broader Millennium Development Goals and biodiversity protection. Forests house more than one billion of the rural poor, more than half of which live in extreme poverty. An economy based on sustainable forest management and alternative livelihood options can help eradicate poverty in forested landscapes. Forests also hold the vast majority of the world's terrestrial species, help maintain the fertility of the soil, protect watersheds and reduce the risk of natural disasters such as floods and landslides.

Figure 5.1: Terrestrial carbon component of total required abatement by 2020



Source: ClimateWorks's Project Catalyst analysis

Attracting private sector capital to fill the financing gap

3. Deforestation does not result from the ignorance of local populations, but rather is the result of a rational decision-making process largely driven by economic factors. Simply put, conserving forests has to become a good economic option for forest owners and governments. One of the main challenges in ensuring that forests are maintained and enhanced is thus to make forests worth more standing than cut.
4. Analysis by Project Catalyst estimates the following: “The cost of delivering 3.5 to 4 Gt of emission reduction versus historical emissions rates in 2020 is likely to be on the order of 15-35 billion euros, or an annual average of 8-18 billion euros per year between 2010 and 2020⁵.” An alternate estimate by the Eliasch Review has estimated that halving emissions from the forestry sector by 2030 will require around US\$ 17-30 billion per year.
5. These figures are quite substantial when compared to the approximately US\$ 100 billion in total spent on official development assistance every year. As such, it is clear that appropriate policies will need to be put in place to attract private sector capital to fill this financing gap. The following policies are required to attract private sector capital to forest-based mitigation efforts:
 - a. Parties must include forest carbon in a new climate agreement through a mechanism such as REDD+, and ensure adequate stability of such regulation over the long term. Within such an agreement, REDD+ projects must produce carbon credits of compliance grade that are tradable as offsets and fully fungible with other credits in international carbon markets.⁶ The design of mechanisms to address the issue of permanence—for example, through a buffer approach or a credit bank to guarantee forestry credits—requires further study as proposed below.
 - b. MRV policies and procedures must be clear and robust and include the development of the infrastructure and systems that can ensure reliable calculations of the carbon value of projects.
 - c. Forest-based mitigation efforts should be made available for investment at a project level in order to provide investors with adequate certainty of the carbon value of their investments.⁷ However, to reduce the potential for leakage, these projects must fit into a framework of national baselines and the national strategy for sustainable forest management agreed within the context of a forest nation’s NAMA plan.
 - d. For this new asset class, a risk management framework will be required to mitigate unforeseen risks such as reversal through forest fires or significant changes in national forest management policy and non-compliance. Initial risk management efforts may require involvement of public sector financing until institutional capacity and investment experience is developed.
6. As noted, robust MRV practices and standards are a fundamental requirement for successful forest-based mitigation efforts, and are particularly important for attracting private sector finance. Specifically, all parties involved in REDD+ activities require accurate, real-time data that is impartial and publicly accessible.
7. Gathering such data will necessitate the further development of comprehensive Earth Observation systems. Such systems will require broad political endorsement, potentially through the UNFCCC, to ensure their wide-scale use and adoption. These systems should leverage private sector technology and know-how, particularly for data collection, storage and analysis. Several initiatives have been undertaken to this end, including a partnership between Cisco and NASA, entitled “Planetary Skin”, to provide this capacity by 2013.

8. In addition, on-the-ground measurement will be required to support and verify Earth Observation data. Such ground-level efforts will necessitate the development of appropriate institutions, standards and practices in forest nations. Private sector companies with expertise in these areas are available to partner with forest nation governments to develop such systems and could become essential partners in building these systems at the scale and speed required.

Phased development to full market-based financing

9. Private sector finance will be required to fill the financing gap for forest-based mitigation. Yet, most of the requirements for attracting private sector finance have not yet been met, particularly in the area of MRV and in relation to many current institutional arrangements and much of the technical capacity of forest nations.
10. Governments must undertake a phased approach to integrating forest-based mitigation into the carbon markets, using public finance to build up the required elements of capacity at national and international levels for eventual full access to carbon markets and private sector finance by activity type and geography. This will take time and will require public investment. The first phase of such efforts aimed at developing “readiness for REDD+”⁸ should have the following characteristics:
 - a. It should build the technical and institutional capacities of forest nations required to implement forest-based mitigation activities. These efforts will vary by geography as some forest nations are significantly more advanced than others.
 - b. Alongside the development of capacities, this phase should support the development of the sustainable forest management portions of each forest nation’s NAMA plan. These plans must integrate policies to encourage forest protection and enhancement at the national and sub-national levels, including policies concerning land use and those required to create the enabling conditions required for private sector investment.
 - c. At the same time, MRV guidelines and systems should be developed at the international and national levels. These efforts should include the development of robust Earth Observation and field measurement and monitoring systems as well as the suite of standards required to address issues such as additionality and leakage.
 - d. The international and national mechanisms developed in this phase should take into account the lessons learned from afforestation and reforestation projects in the CDM and the voluntary carbon markets. In designing the appropriate mechanisms for the full suite of REDD+ activities, emphasis should be placed on ensuring that these can be ready for implementation as soon as possible.
 - e. The public financing available in this phase should create incentives for early action across the full range of REDD+ project types for those geographies where capacities are adequate.
 - f. This initial phase should commence as quickly as possible, from 2010-2012 and last approximately until 2020, by which time the required capacities of the last forest nations should have been adequately developed. It should aim to deliver 4 to 5 Gt of forest-based mitigation by 2020 through these early actions.
11. This kind of model would involve a transition from public to private financing by project type and geography. For example, reforestation and afforestation projects may come on line more quickly than projects dealing with forest degradation, and countries with already advanced capacities for REDD+ activities may be able to access carbon market finance before others that require more time to build technical and institutional capacity.

12. This initial phase will require public funding of at minimum US\$ 3 billion over five years for capacity building (not including early actions), or significantly more per year depending upon how quickly national capacities can be developed. Though there are several laudable efforts underway on a multilateral and bilateral basis to build readiness for REDD, their combined total is in the order of tens or hundreds of millions of euros rather than the billions that are estimated to be required. Significant additional public funding will be needed for this phase, and could be raised through additional ODA commitments and/or through initiatives such as the issuance of rainforest bonds proposed by the Prince's Rainforests Project or proposed taxes on aviation and bunker fuel and emissions allowances.

Scaling up models of successful implementation

13. Attaining 4 to 5 Gt of abatement through forest-based mitigation by 2020 will necessitate an unprecedented scale-up of successful models of implementation. This will require a suite of public-private innovations for REDD+ implementation, in what has been until now a largely grant-funded government or civil society domain.
14. However, there already are a number of examples of viable and scalable REDD+ projects and some promising PPP proposals that should be further developed through a focused public-private dialogue. Developing these PPP concepts will help attract carbon financing, creating a virtuous circle and further hastening the speed of REDD+ implementation.
15. One noteworthy case is the Juma Project of the Amazonas Sustainable Foundation, which was validated by the international certification organization TUV-SUD in 2008 based on the Climate, Community and Biodiversity Alliance's (CCBA) standards (Box 5.1, below). This was the first REDD project validated in the Amazon and the first in the world to receive gold status in this scheme.

Box 5.1: Juma Reserve REDD project

The REDD project at the 589,000 hectare Juma Sustainable Development Reserve is designed to stop deforestation and related greenhouse emissions in a high land-use pressure area in Amazonas state.

The project implementation seeks to stop, until 2050, the deforestation of 329,483 hectares of tropical forests, corresponding to the avoided emission of 189,767,027 tons (0.189 Gt) of CO₂ to the atmosphere. The first validated period is 2006-2016, with 3,611,723 tons of CO₂ expected.

In September 2008, the Juma Reserve project was validated by a Climate, Community and Biodiversity Alliance (CCBA) Certification issued by TUV-SUD, an international certification organization, with the award of a gold quality standard. It is the first in Brazil of its kind and the first in the world to receive a gold standard.

The hotel chain Marriott International is financing the project with annual contributions of US\$ 500,000 during the first 4 years, combined with revenues provided by hotel's guests, invited to offset the carbon emissions related to their stay, at US\$ 1 per night. These resources have allowed the Amazonas Sustainable Foundation, in coordination with the Amazonas state government, to implement necessary measures to control and monitor deforestation inside the reserve and surrounding areas, while improving law enforcement and the standard of living in local communities.

16. A second model, proposed by Zurich Financial Services, further leverages the competencies of the private sector through their engagement in the development of alternate economic activities in already deforested land (Box 5.2, below).

Box 5.2: A biofuel value chain model for deforested land

This model focuses on creating viable economic growth activity in already deforested land. By integrating micro-economic agricultural activities with a more traditional project development scheme designed to produce liquid alternatives to fossil fuels in these deforested areas, this viable and scalable economic model is designed to generate wealth and discourage further deforestation by making it possible for indigenous people to work in a sustainable enterprise chain. The base of the value pyramid, biofuel agriculture, will be supported by insurance to protect against crop damage. Insurance will also be deployed throughout the value chain at every level to manage risk.

If further enhanced and linked to low emissions combustion technologies and carbon capture and sequestration in the developed economies, the model can provide a continuous carbon sink. The concept is modular in structure and can be implemented one piece at a time. If a complete biofuels chain cannot be assembled immediately, other useful crops can be explored. In some geographies, substantial ancillary benefits, such as displacement of socially undesirable crops, like coca, may also be derived from the model.

17. Models such as these—as well as others—that can create alternate sources of income for indigenous forest people and incentives for forest maintenance and/or enhancement will need to be developed further and brought to the appropriate scale. Substantive public-private dialogue will be required to identify the policies required to further attract private sector competencies in such ground-level implementation efforts.

Eventual inclusion of the full set of terrestrial carbon

18. The global climate regime should eventually incorporate the full set of terrestrial carbon—including agriculture and other land-use changes—in an integrated manner. Not only does agriculture account for 4 Gt of the 9 Gt of abatement potential by 2020 from terrestrial carbon, but it is also the driver of 90% of deforestation. As such, agriculture and land-use change must be addressed in order for a climate-change regime to fully reap the benefits of forestry abatement potential.
19. Steps must be taken immediately to further develop scientific and technical knowledge in these areas, as well as the national land management capacity and field-level demonstration projects required to ensure these activities can be integrated into the REDD+ regime as soon as possible.

Next steps

Forest nations should host a major public-private dialogue to build REDD+ architecture by 2013

20. This forum, which should involve both the private sector and civil society, is necessary to build the international and national architecture required for REDD+ to be ready for private sector engagement by 1 January 2013.⁹ This initiative should include four pillars focused on the following elements:
- a. Enabling national policies to develop the set of forest nation NAMAs, and growth plans that create the enabling conditions to attract private sector finance as soon as possible after “readiness for REDD+” public measures are undertaken;
 - b. Appropriate design of a system of forest-based credits, including mechanisms to address the issue of permanence and a risk-management framework, taking into account the lessons learned from forestry projects in the CDM and voluntary carbon markets, and ready for business by 1 January 2013;
 - c. A major public-private initiative to develop the Earth Observation and field measurement and monitoring systems required for REDD+ and to ensure those systems are ready for use by 1 January 2013;
 - d. Developing viable designs for large-scale PPP models for REDD+, including undertaking specific demonstration projects as early actions to validate those designs and create models that can attract private capital through the carbon markets.

Endnotes

¹ REDD+, or REDD Plus, refers to Reduced Emissions from Deforestation and Forest Degradation (REDD) combined with efforts for conservation, sustainable forest management, and enhancement of forest carbon stocks through programmes such as reforestation and afforestation. The proposition here is for this full suite of forest mitigation up to agro-forestry to be included in a Copenhagen agreement, though the various subsets (REDD, reforestation, afforestation, agro-forestry, etc.) can be dealt with through separate mechanisms as deemed appropriate.

² *Towards the inclusion of forest-based mitigation in a global climate agreement*. May, 2009. San Francisco: ClimateWorks

³ Ibid: note that Project Catalyst analysis calculates the forest-based abatement costs in euros, which this report directly quotes. An approximate conversion for the reader could be 1 euro: US\$ 1.50.

⁴ Ibid.

⁵ Ibid.

⁶ As noted above, the various types of REDD+ activities (REDD, reforestation, afforestation, agro-forestry, etc.) can be dealt with using separate mechanisms as deemed appropriate. In designing such mechanisms, the varying costs of these projects—with reforestation being more expensive than REDD, for example—must be taken into account to ensure the optimal mix of these activities across different geographies is achieved.

⁷ It should be noted that most of the current proposals for REDD+ do not allow for project-level approaches. The private sector will not be able to participate in financing such activities unless project approaches are mandated though, as mentioned above, these must be placed within the context of national baselines and national sustainable forest management plans.

⁸ This “readiness for REDD+” phase should build upon the existing efforts to this end, including those of the World Bank, UN-REDD, and other bilateral agreements.

⁹ There is a potential for this public-private dialogue to build upon the emerging dialogue with legislators on forests hosted by GLOBE International as well as with existing processes such as the Forest Dialogue.

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6 Working Group on Market Mechanisms

Key Messages

Market mechanisms and carbon markets in particular have a crucial role to play in the transition to a low-carbon economy. They can:

- Reduce the cost of meeting climate change targets;
- Internalize the cost of GHG emissions in corporate decision-making;
- Drive private capital towards emission reduction opportunities;
- Provide a means for channelling investment into emissions abatement in developing countries;
- Offer a way, through the use of auction revenues, to generate much-needed funding for adaptation and mitigation in the developing countries.

While a deep, liquid and global carbon market is a crucial future piece of the international low-carbon economy architecture, carbon markets are currently far from being a global phenomenon. Linking existing and planned emissions trading schemes (ETS) and expanded international offset mechanisms can help accelerate the creation of a global market. This will require basic agreement on the level of ambition (target setting) and common rules.

The public-private interface is the pivotal point for success in the development of carbon markets. Therefore we propose that a substantive government-business-expert dialogue on carbon markets is established to support the development of the design, the rules, and the institutions necessary to create effective and efficient carbon markets, such that the international architecture is “fit for purpose” at the start of the second commitment period.

This carbon market dialogue could report its interim findings, together with a future roadmap for the emergence of an international carbon market, to the Conferences of the Parties in 2010 and its final conclusions and recommendations in 2011.

Disclaimer

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Summary

- Governments should continue to see carbon markets as a central component of national and international policies to reduce GHG gas emissions, building on what already exists and looking to scale up their coverage as rapidly as possible, while recognizing that carbon markets will need to be complemented by a range of other policies.
- To be effective, the emission reduction targets that anchor carbon markets must be set over time frames consistent with the investment cycle, ambitious enough to generate stable market demand, and covering as wide a range of countries and sectors as possible.

- A global agreement in Copenhagen on commitments to long-term targets will provide a clear signal to private investors about the long-term prospects for their investments. However, shorter-term targets that are implemented directly and are effectively enforced will be equally important to build trust in the carbon markets and create immediate scarcity.
- An important step in building a global carbon market would be for governments to agree on a broad set of principles to ensure the system design does not impede the future development of a global market. The most important requirements for the linking of markets are a shared level of ambition (target setting); rules for the admission of international and domestic carbon credits; rules for monitoring, reporting and verification; mechanisms for avoiding excessive price fluctuations; and confidence in financial intermediaries. A realistic timeline for the development of a global carbon market should be established.
- Mechanisms for generating international carbon credits should be scaled up—in order to stimulate low-carbon investment in developing countries, reduce compliance costs, and smooth price fluctuations, while providing the foundation for all countries to move towards national targets. Well-designed policy-based, programmatic and sectoral approaches can achieve this aim, so long as they are designed in a way that encourages private sector investment.
- No new regulatory institutions are needed for effectively functioning carbon markets. Rather, subject to the appropriate regulation, carbon markets should make use of the tools already developed by financial markets to facilitate trading, risk management and reduced transaction costs. These tools include both exchange-based and over-the-counter (OTC) trading, the use of futures and options, and the wide participation of financial intermediaries. In light of the financial crisis, it is important that there is confidence in these financial market tools and the regulation around carbon markets.
- Governments should design carbon markets in a way that reduces the likelihood of the kind of excessive price fluctuations that can dissuade long-term investors, but without distorting the functioning of markets themselves. Furthermore, a predictable price of carbon will ensure that the revenue from the auctioning of allowances will be in line with expectations. Mechanisms to achieve this include regular and transparent processes for reviewing targets, the use of reserve prices in allowance auctions, and allowing banking and borrowing between periods.
- While governments have the responsibility for setting emission reductions targets in line with what the science suggests is necessary to avoid dangerous climate change, the design of carbon markets and other mechanisms would benefit greatly from the experience and expertise of the business community. We recommend therefore that a transparent and structured government-business dialogue be established to support the development of the rules and institutions necessary to create effective and efficient markets.
- This carbon market dialogue could report its interim findings, together with a future roadmap for the emergence of an international carbon market, to the Conferences of the Parties in 2010, and its final conclusions and recommendations in 2011.

Background: The case for carbon markets

1. Most government leaders now agree that any international and national policy to battle climate change must include a major role for carbon markets as an enabling mechanism to help raise capital, reduce direct emissions in capped industry sectors, and change corporate behaviour. Market mechanisms allow participants to find the most efficient ways to reduce emissions and encourage investment in low-carbon technologies and solutions, while allowing policy-makers to achieve certainty in meeting specified emission reduction targets. Furthermore, market mechanisms can make use of existing financial market frameworks, institutions and expertise.
2. However, market mechanisms are not well-suited to all sectors and circumstances, and so need to be used in conjunction with other forms of regulation and fiscal incentives. Market mechanisms cannot substitute for direct support for the development and demonstration of technologies that are not yet commercially proven or for regulations and standards in areas where non-price barriers are the most significant obstacle to investment.
3. Earlier experience with emissions trading schemes and carbon markets have provided helpful guidance for policy-makers on how to design and implement effective trading schemes. In particular, experience in Phase 1 of the European Union Emission Trading Scheme (EU-ETS) has informed plans for schemes in the US, Australia and elsewhere, as well as enabling the European Commission to address initial weaknesses and strengthen the scheme for later phases.
4. Despite early problems and mistakes, there are indications that carbon markets have had an impact on the reduction of emissions domestically. They also have channelled some investments from developed to developing countries via emission reduction projects. Markets have helped to increase awareness of climate change and emission reduction opportunities in countries and sectors covered by emissions trading schemes and project-based mechanisms, and have led to the development of new skills, services and employment that will help accelerate the transition to a low-carbon economy.
5. There is also a growing recognition of the important role that carbon markets can play in generating funds for investment to address climate change in developing markets, particularly in the wake of the economic crisis, as evidenced by recent announcements:
 - a. UK Prime Minister Gordon Brown on 26 June 2009 proposed a fund for investment in low-carbon opportunities, mostly in deforestation, adaptation and low-carbon technologies. The plan is for the fund to gradually increase, reaching US\$ 100 billion per year by 2020. Half of the fund is expected to originate from carbon markets.¹
 - b. Norway in April 2009 launched a proposal under the UNFCCC to include the auctioning of allowances from carbon markets in the new framework. It envisages that around 2% of total allowances will be auctioned. This would generate a capital flow of approximately US\$ 20-30 billion.²
 - c. Project Catalyst suggests that introducing a 25% reduction cap in developed countries by 2020 compared to 1990 levels could generate funds of US\$ 28-57 billion per year.³
6. While seemingly large, these figures are still small when compared to the total additional investment that is estimated to be necessary to put the world on a 450 ppm pathway. Project Catalyst analysis suggest that meeting this challenge would require an annual emission reduction of 17Gt of CO₂ emission reductions by 2020, of which 12 Gt need to take place in developing countries. The annual investment required to achieve this 12Gt is estimated at US\$ 93-143 billion.

7. In this context, it is worth noting that neither the public nor the private sector will be able to provide all the funding likely to be needed to address climate change impacts and the balance between the two will vary from sector to sector and region to region. Where private capital is expected to play a significant role—be it through carbon markets or other mechanisms—it is essential that policies are designed so as to provide an environment that is conducive to investment: quantifiable risk/return ratios; clear property rights and project ownership, and a stable policy framework.

Prices reflect ambition and commitment

8. The carbon market is an artificial construct, based on policy and regulation. A key lesson learned in the last decade is that the effectiveness of a market in driving down emissions and encouraging investment hinges on the ambition of the underlying policy and government's commitment to it. In particular, investment decisions are driven by expectations of future policy and targets, and their expected impact on future carbon prices, rather than by current or historic data. To this end, policy-makers in a number of key regions and countries are seeking to provide greater visibility over longer-term policy and emission reduction targets:
 - a. The EU ETS aims to reduce emissions from the main emitting industry sectors by 21% by 2020 relative to 2005. The EU has indicated it would implement a stronger reduction target contingent upon the contents of the new international deal.
 - b. The US proposals currently discussed (the American Clean Energy and Security Act and the Cap and Dividend Act) would achieve reductions of approximately 14-15% by 2020 compared to 2005 levels. With all complementary requirements from other policies and measures implemented, this reduction could go up to 28%-33%.⁴
 - c. The Australian Carbon Pollution Reduction Scheme (CPRS) aims to reduce emissions by up to 25% by 2020 compared to 2000.⁵
9. While the scale and depth of targets are crucial for efficient and effective carbon markets, other design features— including integrity, consistency, transparency and disclosure—are also important in creating an efficient market. Standardization of these features across carbon markets and trading schemes to the extent practicable would enhance the efficiency of markets, eliminate undue distortions between regions and territories and reduce compliance and trading costs.

Increasing the effectiveness of carbon markets

10. Like a market for any other traded commodity, carbon markets represent all the ways in which carbon units (the commodity, which can be either a permit to emit or a credit for a reduction) are bought and sold. Beyond this basic trading function, the critical importance of the market is that it reveals the price of carbon. As with other traded commodities, this price fluctuates as a result of supply and demand expectations. The overall cap, trading rules and regulations determine how the market functions in practice and what the 'price' of carbon is.
11. Some price fluctuation is a natural and necessary aspect of any effective market. It occurs because markets react to changes in the fundamental price drivers. Indeed, price fluctuation in the carbon markets in 2009 has been broadly similar to that in other energy commodities, while volatility has been less than other energy commodities since, unlike electricity for example, carbon is not needed at the flick of a switch.
12. However, some of the early emissions trading schemes have experienced periods of substantial price variability. In particular, during the EU ETS Phase 1 (the "learning-by-doing" phase) prices ranged from a peak of €32 per

allowance to less than €1 as a result of initial, artificial supply constraints, the realization after the first annual reporting that allowances had been over-allocated, and constraints on the banking of allowances for use in subsequent periods. The EU ETS rode this storm and changes have now been made to address these issues. However, this experience demonstrates how rigid and inflexible policies and regulations can cause short-term distortions in carbon prices and undermine confidence in the effectiveness of the market.

13. This price instability has been exacerbated by uncertainty over climate policy and the role of carbon markets (particularly the CDM) post 2012, and by a downturn in the global economy more generally. This has led to calls for intervention to limit price variability—through price caps and floors, for example—to help sustain the business case for low-carbon investment. This is a sub-optimal solution and there are real concerns among many in the market that ad hoc or politically motivated intervention is likely to do more harm than good, undermining confidence in the long-term stability of the market and underlying policy and targets, distorting and confusing price signals, and ultimately increasing compliance costs and discouraging investment. In particular, ex-post adjustment of market rules must be avoided; otherwise there is a real risk of markets becoming “carbon casinos” where investors allocate capital based on the next anticipated government intervention instead of on longer-term market fundamentals.
14. On the other hand, it is important to retain some flexibility. In particular, if we were to experience a sudden acceleration of adverse climate impacts, or new evidence led our climate scientists to advocate a much more urgent response, we would not want to be locked into an excessive emissions trajectory simply because of concerns about market integrity. In certain circumstances, therefore, it may be necessary to ratchet down the emissions caps and ratchet up carbon prices. Ideally, an explicit mechanism for reviewing targets on the basis of new scientific evidence would be built into the design of the system and take place on a periodic basis so as to increase transparency and reduce uncertainty for investors and market participants.
15. Design features that can help reduce excessive price fluctuations without distorting markets include:
 - a. *Banking and borrowing of allowances between years:* Allowance banking refers to the ability of a regulated facility to save emission allowances issued in one year for use in subsequent years. Allowance borrowing refers to a facility’s ability to bring forward allowances from a future year’s allocation to be used in the current year. Banking should prevent prices from collapsing in the event of over-allocation in an individual trading period, provided there is sufficient scarcity in the following phase to smooth out pricing and other constraints, such as cost of capital and accounting rules, don’t interfere. Allowance banking and borrowing helps protect market participants from significant price swings by enabling them to access supplies from their own future or past allocations.
 - b. *Providing a gateway for the use of robust and additional carbon credits:* Carbon credits generated from emissions reductions from project-based activities (such as the CDM, joint implementation and any future carbon credit mechanisms) are included in major emission trading schemes. Depending on the rules used for compliance purposes, carbon credits provide a shared currency that helps reduce price fluctuations and compliance costs. The use of international carbon credits also provides an important tool for channelling investment in mitigation toward developing countries and supporting their low-carbon development strategies.
 - c. *Reserve prices in primary auctions of allowances to participants:* This allows governments to set a minimum price for allowances to be auctioned. Depending on the proportion of allowances to be auctioned and the timing of the auctions, the reserve price can create an effective price floor. If the

- reserve price is above market participants' average expected cost of eliminating a ton of CO₂ (through abatement, allowance purchase, or offset), not all allowances will be auctioned.
- d. *OTC trading and market-based tools such as futures and options:* Carbon credits and allowances and related instruments should be permitted to trade on exchanges and in the OTC markets, allowing financial intermediaries can play a crucial role in providing risk management. Exchanges provide important benefits including price discovery, transparency, liquidity, and management of credit risk. OTC markets serve an important complementary function in that they allow companies to tailor trading structures to specific compliance needs or project requirements. If trading in these products were limited to exchanges, significantly fewer clean energy/carbon reducing projects would be developed. The cost of compliance would also increase, affecting the end consumer and rendering the markets less efficient. Clearly, the inclusion of carbon credits and allowances will need to be constrained by financial regulation to avoid undermining the integrity of carbon markets.
16. One key element in creating trust and building public support for any mechanism to leverage private capital through the auctioning of allowances is the allocation of the raised capital. Clear public policies that show how the capital is invested in the low-carbon economy will be required. Moreover, it is important that government revenues raised from auctions not crowd out emissions reductions activity that otherwise would be carried out by the private sector in response to the carbon price signal. As noted above, there are many areas that are not immediately amenable to financing through carbon markets; these—along with investment in the infrastructure and capacity necessary to enable markets to operate efficiently—would be obvious and appropriate uses of revenues raised.
17. Environmental integrity should be ensured by establishing the conditions that would ensure the quality of traded credits. This would require clear rules for monitoring, verification and enforcement. Recent developments in both the carbon markets and the financial markets—notably the suspension of CDM validator Det Norske Veritas (DNV), and the role of rating agencies in the financial crisis—show that system oversight should not be taken for granted and requires effort.

Towards a global carbon market

18. To meet the long-run targets suggested by the science in a cost-effective way, we need to move to an integrated global carbon market. As with any market, carbon markets need to have depth, breadth, liquidity and transparency if they are to be fully effective. Linking national and regional emissions trading schemes will help achieve this and should be accelerated. Linked markets can lower overall costs, as market participants are able to identify more diverse emission reduction options from more sources. This can also help provide greater price stability and predictability. Linking can also enable sectoral agreements and, as the CDM has shown, result in substantial inward investment in developing countries.
19. The first and foremost element when considering direct—and to a lesser extent indirect—linking of trading schemes is the relative and collective stringency of the emissions caps. Transfer of wealth may be one-way if one ETS with a stringent cap is linked to another that is less stringent, and may affect the competitiveness of the installations covered. Other areas where coordination on the design of markets will be crucial when linking markets are:
- a. *Consistency in price stabilisation policies to avoid undue price fluctuation:* As discussed earlier, this includes banking and borrowing, and auction reserve prices. Note that any price caps and floors in one ETS will be transferred to another and so can serve as a disincentive for linking.

- b. *Rules for MRV and compliance to ensure the quality of allowances and environmental integrity:* Weak compliance rules with low penalties for noncompliance may compromise the integrity of trading schemes and discourage potential linking partners who will not want to risk the credibility of their own schemes.
 - c. *Harmonization of rules on the use of international and domestic credits:* Harmonization is particularly needed on the types of credit allowed (from which mechanisms and which types of projects), limits on the number of credits imported, and differences in offset limits. Differing rules for offsets reduces the fungibility of carbon instruments and thus of market liquidity.
20. The G20 and Major Economies Forum meetings and the COP15 provide opportunities for governments to demonstrate their renewed commitment to a global carbon market, although many of the practicalities will be worked out through bilateral agreements to link national emissions trading schemes. A new international framework should allow national governments to employ those market-based domestic policies best suited to their own national circumstances, but should also facilitate the linkage of explicit or implicit carbon values established at various national and regional levels. This will foster a deep and liquid international market for carbon that takes into account international competitive pressures.
21. Endorsing the objective of linking national ETS in the international agreement in Copenhagen could do much to foster a more global carbon market, and public-private dialogues could help develop the mechanisms. This could be achieved in the following areas:
- a. the establishment of a common definition and metric for the tradable carbon commodity to allow for the fullest possible fungibility between schemes;
 - b. agreement on the key building blocks for emissions trading schemes, such as rules for monitoring and reporting emissions, or for banking and borrowing;
 - c. development of robust rules for project or sector-based mechanisms, which would support indirect linking as these mechanisms may be recognized by many national ETSs;
 - d. agreement on technical issues such as common tax and accounting standards or not limiting emissions trading by defining 'supplementarity' limits.

Scaling up developing country participation

22. To be truly effective, the carbon market needs to be global and should progressively include the participation of developing countries. The inclusion of developing nations will need to balance the need to limit emissions growth with the imperative of economic growth. The CDM has been effective in engaging developing countries and building capacity in both governments and businesses to tackle emissions growth, even if there are concerns about its efficiency and the additionality of all projects. It also establishes a common, project-based currency that can link isolated ETS.
23. The World Bank estimates that in 2008 the primary market for project-based mechanisms delivered about US\$ 7.2 billion. This was 12% below 2007 levels due to uncertainty about the second commitment period and reduced emissions due to the economic slowdown. Although there is potential for growth once more markets emerge and allow indirect linkage via offsets, almost by definition a project-by-project approach can deliver only so much. Estimates suggest the incremental cost of moving to a low-carbon economy will be in the hundreds of millions of US dollars per year until 2030 at least. Political expectations are that carbon markets can deliver up to 50% of these investments. A huge step change in volume of offset transactions is therefore needed.

24. A new framework needs to encourage greater participation in the carbon markets from unrepresented regions and set out the path for participating CDM countries to transition to sector- and national-level targets. Approaches beyond the existing mechanisms could, if well-designed, help deliver emission reductions in sectors (such as reforestation, avoided deforestation, and energy efficiency) and projects (such as carbon capture and storage) not currently targeted by climate policies. The most promising ideas that have emerged include:
 - a. *Sectoral approaches*: Emission targets are agreed at a sector level. Targets could be set at a national or international level.
 - b. *Simplified programmatic CDM*: Establishing additionality is no longer on a case-by-case basis, reducing the project development costs to participants.
 - c. *Inclusion of forestry credits (REDD)*: As addressing deforestation becomes a vital part of a global deal on climate change, incorporating the forestry sector into carbon markets will be important to drive investments into this area.
25. In this context, the distinction between Annex 1 and Annex 2 countries might not be suitable for all policies under negotiation. Different policy measures would require different target countries. For example, while an improved project-based mechanism would be very suitable for the least developed nations, sectoral approaches would better serve higher emitting developing nations, and REDD+ policies should be targeted at nations with significant forested areas.
26. Any new mechanisms should be designed in such a way so as to stimulate and scale up private sector flows of finance. For example, there should be clarity about the carbon instruments being created through each mechanism and the degree of fungibility between new instruments and existing instruments. Since the private sector is more accustomed to engage at the project, sub-sectoral, and sub-national levels—where project boundaries are clear and risks are easier to quantify and manage—one of the critical challenges to address is the need to provide well-conceived incentives, commensurate with the different inherent risks, for engagement at the sectoral or national level.

A reality check

27. In the period leading up to the COP15, a number of key areas are gradually gaining consensus—albeit the level of agreement varies significantly from country to country. Most countries recognise that:
 - a. the global target for carbon emissions reduction needs to be deep and long term;
 - b. the roles and responsibilities of developed versus developing countries will be different at least for the short term; and
 - c. the scale of investments required to finance the low-carbon technologies necessary for the transition to a low-carbon economy is large.
28. Within this broad consensus, the scope for carbon markets to address these issues depends heavily on the key issues discussed in this paper. Balancing the needs of domestic priorities, such as industry competitiveness or economic growth, against the global agenda will be a difficult political route for many leaders. Many of the new ETS that are put in place will require some form of a trial period and iterations of improvements to the design features; thus it will be some time before carbon markets can deliver the scale of emissions reductions or investments that are required. Nevertheless, the sooner governments commit themselves to market mechanisms as a tool to achieve their goals on emissions reduction, the faster the world can transition towards a low-carbon economy.

Endnotes

¹ For example, externalities relating to innovation and R&D cannot easily be addressed by markets, and thus will require additional supporting policies.

² In his speech, UK Prime Minister Brown argued that a new model of 'low carbon, climate-resilient development' is needed, which would enable developing countries to leapfrog the energy and transport technologies on which the developed world's industrialization was based, and to adapt to what is now an already severely changing climate. His speech set out a proposal for a financing package worth US\$ 100 billion per annum by 2020. This would be directed at low-carbon mitigation technologies, avoided deforestation and adaptation. It would be made up of flows through an expanded and reformed carbon market, a limited proportion of ODA, and a completely new climate-financing system, separate from and additional to ODA, funded by new revenue-raising mechanisms.

³ This figure is based on assumptions that all developed countries take on quantified economy-wide commitments corresponding to the lowest emission scenarios of the Intergovernmental Panel on Climate Change (IPCC), including a 2°C scenario.

⁴ Analysis carried out by Project Catalyst, 2009. Project Catalyst is an initiative of the ClimateWorks Foundation. It was launched in May 2008 to provide analytical and policy support for the UNFCCC negotiations on a post-Kyoto international climate agreement. See <http://www.project-catalyst.info>

⁵ A comprehensive analysis of the Waxman Markey bill was carried out by the World Resources Institute. See <http://www.wri.org/chart/emissions-reductions-under-waxman-markey-discussion-draft-2005-2050>.

⁶ For more information on the Australian CPRS scheme, see <http://www.climatechange.gov.au/emissionstrading/index.html>

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7 Working Group on Adaptation

Key Messages

Adaptation to climate change is a global imperative that must be addressed as a priority in an international climate change regime.

The private sector, ranging from large multinationals to local small and medium enterprises, will be significantly impacted by climate change. Investment from this full range of actors, which will be much larger in scale than official development assistance, should be realigned to take into account these changes.

This creates an opportunity for the public sector to leverage these actions in support of international adaptation. Well-designed international and national policies can unlock new and additional actions by the private sector in support of global adaptation needs.

Engaging the private sector in adaptation does not absolve governments in the developed world of their responsibility for funding international adaptation efforts. Rather, understanding and supporting the role of the private sector in adaptation is crucial for ensuring that public funds and associated policy instruments leverage the maximum possible adaptation actions by these actors.

A major public-private dialogue is required to deepen our understanding of the policies required to catalyse private sector engagement in adaptation, including the development of specific proposals for innovative public-private financing mechanisms.

Disclaimer

The views expressed in this section represent a collation of various viewpoints emerging from a series of discussions among the participants in the Working Group on Adaptation. Although the observations and proposals in this section enjoy broad support, they do not necessarily reflect the views of every individual participant nor do they necessarily reflect the individual institutional viewpoints of any of the companies or institutions that took part, or of the World Economic Forum.

Summary

- Even with rapid reductions in greenhouse gas emissions, changes in the climate system will continue to unfold over the coming decades with particularly severe consequences for vulnerable communities in developing countries. Adaptation to these changes is a global imperative that must be tackled as a priority in an international agreement on climate change.
- The global private sector— which includes both large multinational and national entities and millions of small and medium enterprises, informal sector businesses, small-scale farms and fisheries— will be significantly impacted by these changes. This full range of private sector entities are among the primary actors driving forward economic development in developing countries and the main source of investment in these economies.
- Public resources for climate change should thus be deployed carefully, recognizing that the much larger scales of private investment to developing countries will need to be realigned to take into account the impacts of climate change. Smartly deployed public finance has the potential to unlock significant new and additional actions for adaptation from the private sector if international and national policies are appropriately designed.

- Understanding and supporting the private sector role in adaptation does not absolve governments in the developed countries of their responsibility for funding international adaptation efforts. To the contrary, such support is crucial for ensuring that public funds and associated policy instruments leverage the maximum adaptation actions possible by the private sector and avoid perverse incentives that would promote maladaptation on their part.
- Governments have a range of public-policy mechanisms they can use to support and shape the private sector's adaptation actions, including:
 - *Incorporating the private sector into adaptation planning:* National climate-resilient growth plans should consider private sector adaptation needs, the potential for private sector contributions to national adaptation priorities and the necessary instruments for leveraging such private sector engagement.
 - *Strengthening incentives for effective adaptation by business:* National policies should strengthen the incentives for business to engage in effective adaptation actions to support their own business operations (through the use of taxes, tax breaks, subsidies, standards, and regulations, for example), but also to support governmental efforts to help broader society and the environment adapt as well. Policies in the following areas could also be developed to this end: information disclosure, mandatory insurance schemes, encouragement for businesses to make their value chains more resilient, and the development of challenge funds that can spur business innovation for adaptation.
 - *Take advantage of opportunities for mainstreaming adaptation and public-private partnerships:* Where enabling environments are too weak to suitably influence private sector behavior, governments should take advantage of opportunities for mainstreaming adaptation into business operations through the direction of broader policies on issues such as public procurement and asset management contracts (for water, energy, transport, etc.). Public-private partnerships could also be developed in areas such as insurance and for the delivery of publicly funded actions for adaptation, especially for infrastructure.
 - *Make international frameworks the springboard for engaging business in adaptation:* An international agreement on climate change should lay the foundations for engaging the private sector in adaptation—this will help provide a platform for international initiatives and will help national governments define their own business and adaptation strategies. In addition to incorporating appropriate language in the text of an agreement, international frameworks should support the development of standards to measure the effectiveness of private sector actions as well as innovative financing mechanisms which involve private capital markets.
- The role of the private sector in adaptation is a relatively new field that requires further analysis and study. Not only do the aforementioned policy suggestions require much further discussion and development, but specific public-private propositions designed to help raise additional financing for adaptation efforts also require further exploration and development.
- To this end we propose that a major public-private dialogue hosted by developing countries and involving the private sector, international organizations, bilateral aid agencies, and civil society should be launched at COP15 or shortly thereafter. This major initiative should focus on three key areas:
 - *Development of innovative public-private financing mechanisms for adaptation:* Mechanisms should be explored that build upon the successful previous experience with similar mechanisms, such as the Global Fund and Stop TB or the International Finance Facility for Immunisation (IFFIm) in the health sector.
 - *Further development of the national policies required to engage the private sector in adaptation:* The aforementioned national policies to catalyse private sector engagement need to be further developed. In particular, challenge funds to spur private sector innovation for adaptation and public-private partnerships for infrastructure are options that, among others, require additional development.

- *Specific analysis of how to engage the private sector in support of adaptation efforts in the least developed countries: As these nations represent some of the most difficult areas to engage private sector support for adaptation, there is a need for further analysis and exploration to develop public-private partnership models that can be successful.*

Background: The adaptation imperative

1. Even if society succeeds in rapidly reducing global GHG emissions, inertia in the climate system means that rising temperatures, changing rainfall patterns, changes in extreme weather events and centuries of sea level rise are unavoidable. The impacts will be severe, with consequences for health, agriculture, water supplies and many other areas vital to economic and social development.¹
2. According to one study, the most vulnerable hundred nations collectively house well over a billion people, but account for only 3.2% of global GHG emissions.² Small island states, least developed countries and mega-delta cities are at particular risk. Key risk factors are exposure to drought, flooding, desertification and infectious disease, combined with dependence on climate-sensitive sectors such as agriculture, fishing, and tourism. These risks are further exacerbated by weak institutions and lack of access to the economic resources, technology, information and capacities needed for resilience.³
3. Adaptation—the adjustments in practices, processes, or structures required to take account of changing climate conditions—is crucial.⁴ Central to adaptation are efforts to build the resilience of vulnerable communities to climate risks. Adaptation actions include both “hard” measures, such as building sea walls and improving water storage facilities, and “soft” measures, such as land use planning and natural resource management. Adaptation also includes the need to adapt to socially contingent climate impacts such as migration and resource conflict. Examples of adaptation measures by impact type and sector are shown in Figure 7.1, below.

Figure 7.1: Adaptation in practice

	Sectoral adaptation measures			
Climate change impacts	Agriculture and forestry	Water	Health	Industry settlement and society
Drying/drought	<ul style="list-style-type: none"> • Drought resistant crop varieties • Inter-cropping, mulching, weed management • Irrigation, water harvesting, hydroponics • Crop and farm income insurance 	<ul style="list-style-type: none"> • Improved water supply and loss reduction • Desalination, wastewater reclamation, water demand management • Soil moisture conservation, conservation of groundwater • Grain storage, emergency 	<ul style="list-style-type: none"> • feeding stations • Water and sanitation provision 	<ul style="list-style-type: none"> • Improved water supply • Rural to urban migration
Increased rainfall	<ul style="list-style-type: none"> • Polders, drainage • Alternative crops 	<ul style="list-style-type: none"> • Flood forecasting and warning • Enhanced wastewater treatment, flooding protection 	<ul style="list-style-type: none"> • Early warning systems, disaster preparedness, planning and relief 	<ul style="list-style-type: none"> • Improved flood protection infrastructure • Hazard mapping, warning systems
Warming/heat waves	<ul style="list-style-type: none"> • Heat resistant crop varieties • Altered cropping times • Disease tracking systems 	<ul style="list-style-type: none"> • Water demand management, pricing, metering, education 	<ul style="list-style-type: none"> • Disease tracking systems • Strengthened public health systems 	<ul style="list-style-type: none"> • Assistance for the vulnerable • Improve adaptive capacity
Storms and a rising sea level	<ul style="list-style-type: none"> • Wind resistant crop varieties • Salt resistant crop varieties 	<ul style="list-style-type: none"> • Coastal defense to protect water supply from contamination 	<ul style="list-style-type: none"> • Early warning systems, disaster preparedness, planning and relief 	<ul style="list-style-type: none"> • Planned retreat, land use planning • Coastal protection • Beach nourishment • Resilient buildings and infrastructure • Emergency preparedness • Financial risk management

Adapted from: *The Most Vulnerable People and Places*. April, 2009. London: DFID/Grantham Institute (Presented at the 14th Poverty Environment Partnership meeting, Geneva, Switzerland), and *Economic Aspects of Adaptation to Climate Change: Costs Benefits and Policy Instruments*. May, 2008. Paris: OECD.

4. Adaptation and mitigation actions can also have significant co-benefits, particularly where local energy and sequestration systems intersect, such as in agriculture, forestry and bio-energy production. However, they can also be in conflict. Increased use of air-conditioning systems (an adaptation strategy) may also result in higher energy use (a reverse mitigation strategy), for example.⁵
5. Under Article 4 of the UNFCCC, and as re-emphasized in the Bali Action Plan, the developed world has a responsibility to provide new, additional, adequate and predictable resources to developing countries to fund the agreed incremental costs of both mitigation and adaptation. International discussions on adaptation are currently focused on how to raise, govern and spend international funds to cover these incremental costs. The G77+China group of countries has taken a leadership role in proposing an international framework for adaptation. The group stresses the need to massively increase the provision of finance, technology, and capacity-building for adaptation.
6. Estimates of adaptation costs vary significantly. This variance is caused by weak data and the different methodologies employed as well as differences in the underlying reasonings and definitions used for adaptation action.⁶ Moreover, uncertainty over the location, scale and timing of climate impacts makes it difficult to determine the type, extent and timing of the adaptation measures that will be required. Most studies estimate public sector adaptation costs to be in the order of €10-20 billion per year by 2020 with a significant rise in these costs expected after 2020.⁷

The case for leveraging the private sector for adaptation

7. Whatever the final calculation of adaptation costs and the level of funding committed to adaptation in a global deal, it is clear that public resources for adaptation will be limited. These funds will need to be applied innovatively to influence the much larger scale of private sector investment in developing countries that will need to be realigned to take into account to the impacts of climate change.
8. When considering such private sector investment, it is important to recall that the private sector in developing countries includes not only large multinational or domestic actors, but also millions of small and medium enterprises (SMEs), businesses in the informal sector and “ecosystem enterprises” such as small-scale subsistence farms and artisanal fisheries. This full range of private sector entities represents the primary actors driving forward economic development in developing countries and the main source of investment in these economies.
9. Investments by these various private sector actors are not only of a substantial scale, but they will be significantly affected by climate change. For example, the private sector has invested €700 billion in infrastructure projects in developing countries over the past two decades alone.⁸ As changes and additions to infrastructure are estimated to form the bulk of adaptation costs, such private sector investment can represent an important future contribution to adaptation efforts in this sector. There are similar cases in the other sectors impacted by climate change. For example, it is estimated that €350 billion in investment is required to meet Millennium Development Goals in the water sector, a figure that does not take into account the effects of climate change.⁹
10. More importantly, private sector development is crucial for the development of the health, wealth and capacities that societies require for resilience. Sustaining growth across the private sector increases income potential, creates jobs and enables communities to access the products and services crucial for adaptation.¹⁰ Businesses growth will also be required to facilitate the economic transitions potentially necessitated by climate change—for example, where loss of productivity in agriculture, forestry, or fisheries leads people to seek more productive employment through accelerated urbanization or migration.¹¹

11. Private enterprise solutions are not a quick fix, but they do promise large and enduring benefits. Maximizing this potential will reduce the costs to the public purse of necessary adaptation, avoid locking in costly maladaptation, and increase the total amount of adaptation that can be achieved. Though there is significant scope for existing technologies to be used to address climate change challenges in the near term, climate impacts will grow non-linearly and are likely to outrun existing technologies.¹² New technologies, partnerships, business models, and ways of sharing risks will therefore become increasingly crucial.¹³
12. Understanding and supporting the private sector role in adaptation does not absolve developed country governments of their responsibility for funding the incremental costs of adaptation. Rather, such understanding and support is crucial for ensuring that public funds and associated policy instruments leverage the maximum adaptation actions possible by the private sector and avoid perverse incentives that would promote maladaptation on their part.
13. Furthermore, public-private partnerships and collaboration on adaptation must not undermine the international UNFCCC process. Equally, it is crucial that public sector adaptation policies and spending do not reduce incentives for private investment and employment, either through uncertainty or by creating a new kind of “resource curse”, where incoming financial flows for adaptation do not promote resiliency but instead fuel conflict, inequality and weak governance. At the same time, this funding should not be captured in “corporate welfare” or promote rent-seeking behavior by favored industries.

Examples of private sector action for adaptation

14. Businesses are directly involved in adaptation through their actions to address climate change risks to their own assets and operations, and through their responses to the adaptation needs of broader society—either with new products and services provided directly to customers, or in partnership with governments and civil society.
15. Examples of such actions can be found across the full spectrum of private sector actors. For instance, in India the Self Employed Women’s Association, an SME, offers housing loans to repair or replace roofs, reinforce walls and generally reduce household vulnerability to extreme weather events, while the multinational SABMiller contributes by measuring and managing its corporate water footprint. Small farmers in Niger have adopted simple, low-cost techniques to conserve soil and water, resulting in the ‘regreening’ of an ecologically vulnerable area, and global insurance companies such as Swiss Re and Munich Re are working with intermediaries to provide weather-related insurance to both small farmers and governments.¹⁴ The following box details the initial outputs of an analysis of private sector engagement in adaptation at the country level, focusing on the agriculture sector in Kenya.¹⁵

Box 7.1: Adaptation in the agricultural sector in Kenya: The role of the private sector

Government policy for adaptation

Kenya has begun to increase its capacity to cope with climate change through the strengthening of institutions such as the National Environmental Management Authority and the development of a National Climate Change Strategy (NCCS), which is to be published later this year. Despite the breadth of support at the local, national and international levels, the adaptive capacity of Kenya—particularly among the nation’s pastoralist communities—remains weak. Adaptation measures remain reactive, rather than pro-active, as most recently illustrated by the food security crisis when Kenya had to resort to requesting food aid from the international community.

Private sector engagement in adaptation

The existing institutional framework and lack of clarity regarding planned adaptation policies does not support significant action for adaptation by the private sector beyond some actions being autonomously undertaken as discussed below. That said, proposals in the government’s longer-term plans provide opportunities for deepened private sector engagement in activities such as disaster risk management, crop yield improvements, infrastructure development, bio-technology, and extension services. Additional opportunities will emerge as the NCCS is launched and develops.

Potential autonomous adaptation measures by the private sector in agriculture include changes in crops and crop varieties, improved water management and irrigation systems, and changes to planting schedules and tillage practices. Some of these measures are being undertaken by farmers with access to the right information, tools and resources, which in Kenya unfortunately limits this group to larger players in the sector. Small-scale farmers, such as those found in the tea sector (Kenya’s most important cash crop), are constrained by a lack of awareness of the effects of climate change, and economic, technological, and institutional barriers. For instance, poorer farmers are more risk averse than larger players as they have limited assets to draw upon if their experiments with new techniques or products fail. This leads to a resistance to unproven approaches and technologies unless they are externally supported. As a result, observed adaptation initiatives at the small-scale farmer level in Kenya tend to involve support from the government or civil society. One noteworthy example is a public-private partnership between the social enterprise Cafédirect and the German government-owned enterprise GTZ, which supports efforts to strengthen small-scale tea farmers’ adaptive capacities.

On the other hand, larger tea estate owners such as Unilever Tea Kenya and James Finlays, who have adequate resources and access to climate information, incorporate measures both for mitigation and adaptation either within their corporate social responsibility remits or as risk-management practices. As owners of large estates, these companies have better knowledge of best practices, can experiment with new techniques on portions of their larger land holding without significantly affecting their overall output, and have the financial resources to undertake investments. As a result, they tend to be more receptive to new ideas and better at managing their own risks.

16. In addition to positive contributions, business actions can also result in maladaptations that increase their own vulnerability or that of others to the effects of climate change. Examples of such maladaptation include deforesting mangroves, building in flood plains or in coastal areas that will be affected by sea level rise, or extracting water resources at an unsustainable rate. Business action in response to the need for mitigation can also take place at the expense of the resilience of communities to climate risk—if businesses shift their locations or supply chains in order to reduce energy use, for example.

The role of public policy in catalysing private sector engagement

17. Despite these signs of movement, the private sector overall has been slow to take actions for adaptation. Businesses are only just starting to understand and respond to the adaptation challenge. If the private sector is to help meet the challenge of adaptation in a significant manner, a deeper level of engagement and commitment to understanding and responding to the issue is required. Well-designed public policies can catalyze such action.
18. Public policies can leverage action by the private sector for adaptation, and prevent maladaptation, across three tiers:
- Autonomous actions:* Analysis of options for adaptation reveals that there are a large proportion of actions that are low-cost, no-cost or no-regret activities, many of which would be economically viable steps for individual businesses to take.¹⁶ In fact, the majority of adaptations will come from everyday decisions in the private sector. These autonomous actions do not have to be financed or directed by a public authority but may require some public intervention to prevent maladaptation.¹⁷
 - Actions that can be promoted by public policy:* Some private adaptations could occur and generate wider benefits, but they are discouraged by issues such as high risks, high transaction costs, or the short-term time horizons of investors. Public policies designed to overcome these hurdles can unlock significant private sector actions in support of adaptation. Examples of such policies include creating awareness among businesses of climate change risks, requiring them to disclose their actions to reduce these risks, and offering subsidies to businesses to encourage them to take on appropriate levels of insurance.
 - Areas where private sector action cannot deliver the necessary level of adaptation:* Where the enabling environments are insufficient, the private sector will not be able to undertake significant action for adaptation and public provision will be necessary. However, in such cases governments still may draw upon private sector capacity to overcome operational constraints, enhance performance and accelerate investment in public adaptation measures through public-private partnerships.

Crucially, the divisions between these categories of action are not fixed, but depend on the technologies and business models that define the boundaries of the possible. The speed and extent of these business responses depend, in turn, on the strength of the incentives and pressures to which they are responding.

19. While there is little doubt that the private sector will respond once risks reach internal thresholds or the market opportunities from adaptation become more apparent, in the shorter term the priority is to accelerate the cycle of business strategy, performance, and incentives, in order to shift their adaptation actions from the “could do” to the “will do” category.
20. Barriers to mobilizing an adequate business response to the adaptation challenge can already be identified. Adaptation is perceived as too complex, too uncertain and too distant a concern, has not been recognized as a material issue, or has not been incorporated into risk management systems.

SMEs and informal sector enterprises are held back from taking the actions or acquiring the technologies that would improve their resilience by a lack of information, a low appetite for risk or inadequate access to capital. Equally, markets focusing on adaptation needs are not able to function properly due to poor information, high risks and transaction costs, the short time horizons of investors and government regulators, and the lack of generally accepted systems for valuing natural resources such as water, forests, ecosystems and the services they provide.¹⁸

Key recommendations

Incorporate the private sector in adaptation planning

21. To date there has been a lack of business engagement in the policy debate on adaptation, with the result that policy makers lack understanding of the potential for business action, the obstacles faced and the policies needed. To remedy this situation, national climate-resilient growth plans should consider private sector adaptation needs, the potential for private sector contribution to national adaptation priorities and the necessary financial and non-financial instruments needed for leveraging such action. They should also consider the broad spectrum of private enterprises, including both emerging economy and global multinationals, large national businesses, SMEs, social enterprises and the informal sector.
22. Public policies for other areas of climate change, such as mitigation and forestry, as well as for industrial development, need to engage the private sector more broadly to encourage adaptation and, where possible, discourage maladaptation.

Strengthen incentives for effective adaptation by business

23. Although policy measures that successfully leverage business for adaptation will need to be context-specific, broad groups of policy levers can be identified. They build on decades of learning and development of policy toolkits for aligning business towards environmental and social performance.¹⁹
24. A key lesson has been the importance of linking social and environmental issues to opportunities for creating economic value, rather than maintaining an exclusive focus on ensuring compliance. Multi-stakeholder collaboration to share learning and develop standards has also proven valuable in scaling up good practice.²⁰ Building upon this experience, governments should put in place the following policies to strengthen the incentives for private sector adaptation action:
 - a. *Information:* Raise awareness of the commercial implications of changing weather patterns and ensure this information is made accessible and relevant to enterprises of all sizes to enable them act on climate change risks and opportunities.²¹
 - b. *Standards:* Strengthen due diligence in the business management of climate risk through voluntary or mandatory disclosure of adaptation-related risks—for example, through the Equator Principles, Carbon Disclosure Project or other frameworks.
 - c. *Regulatory support:* Reform regulatory systems that do not support forward-looking business models, in particular by removing perverse subsidies that support maladaptation, the most obvious being subsidized water and carbon-intensive energy provision.
 - d. *Insurance:* Develop policies at the national level to enable the provision of insurance and micro-insurance especially for the poor.
 - e. *Value chains:* Encourage companies to help their suppliers and distributors implement adaptation measures as part of their business relationships, and work with financial services companies, microfinance enterprises, insurers and other actors who can be instrumental in encouraging others along their value chains to implement climate adaptation measures.

- f. *Funding for innovation*: Leverage private sector resources and innovation capacity through innovative mechanisms such as challenge funds to enable competitive bidding and co-funding by businesses for the development of adaptation solutions, placing an emphasis on innovations aimed at meeting adaptation needs of the poor.

Take advantage of opportunities for public-private partnerships and mainstreaming

25. Adaptation will need to be mainstreamed into national development policies and processes, as well as addressed through stand-alone adaptation projects and funding. Therefore, mitigation funding and both current and future public-private partnerships should also support adaptation. Stand-alone public-private partnerships can also be developed to overcome financial and operational constraints in delivering public adaptation measures.
26. Governments should take advantage of these opportunities for obtaining co-benefits and developing public-private partnerships, particularly in contexts where enabling environments are otherwise insufficient for supporting engagement by the private sector. Specific opportunities for further partnership development and mainstreaming include:
- a. *Mitigation co-benefits*: Build criteria into mitigation-focused policies that encourage adaptation co-benefits—for example, within the CDM or sectoral programmes.
 - b. *Mainstream adaptation into public procurement*: Develop criteria, policies and capabilities to ensure that public expenditure, especially for procurement, encourages businesses to factor in adaptation-related needs. This should build upon the work of the World Bank and International Finance Corporation (IFC) in this area, and could also feed into existing efforts on sustainable public procurement.²²
 - c. *Delivery of publicly funded actions*: Leverage private sector resources and skills to help governments overcome operational constraints, enhance performance and accelerate investment in public adaptation support, particularly for infrastructure.
 - d. *Insurance*: Develop an insurance pool as part of international adaptation funding with the private sector providing risk management expertise and reinsurance to ensure solvency.

Make international frameworks the springboard for engaging business in adaptation

27. While adaptation will primarily be undertaken at a national level, there are key roles for international cooperation. These roles include providing adequate funding for adaptation, ensuring probity in the use of those funds, and developing a common foundation of climate change information, policy tools and models of success. COP15 offers an opportunity to ensure that the role of the private sector is enabled at the international level.
28. There is already suggested wording within the current negotiating text which recognizes and encourages the engagement of the private sector in supporting and implementing adaptation and highlights the need for enabling environments for business resilience, incentives for adaptation and public-private partnerships, and the role of insurance. An international agreement on climate change should lay the foundations for leveraging private sector actions for adaptation. Specifically, any agreement reached at COP15 should aim to deliver the following:
- a. *Supportive text*: Any agreement should retain or build upon the aforementioned supportive wording on private sector contributions to adaptation.
 - b. *Innovative public-private financing mechanisms*: Notwithstanding the significant financial flows that can be generated through the financing

mechanisms being considered by negotiating parties, such as levies on aviation and bunker fuel, recent studies suggest that there will likely remain a substantial gap in financing for international adaptation. As such, it would be useful to explore options for innovative public-private financing mechanisms such as those that have been used in the health sector. Such funding mechanisms could be built upon the successful experience of partnerships such as the Global Fund and Stop TB, which have mobilized significant levels of public, private and civil society capacity, innovation and oversight to tackle a challenge similar to climate change adaptation. Funding for such mechanisms can also draw inspiration from financial innovations in the health sector, such as the IFFIm.²³ Further public-private dialogue is required to develop these possibilities, particularly regarding the structure and relationship between the international and national levels in such mechanisms, and the various roles the private sector can play.

- c. *Signals of success*: Develop rigorous metrics for measuring how national policy environments are supporting private sector engagement in adaptation, incorporate these measures into assessments of national competitive environments, and facilitate cross-sector and cross-country development of best practice in this area.

Next steps

Begin a major public-private dialogue to further develop public-private partnerships for adaptation

29. The role of the private sector in adaptation is a relatively new field that requires further analysis and study. Not only do the aforementioned policy suggestions need to be further developed, but specific propositions designed to help raise additional financing for adaptation efforts require further exploration and development.
30. A major public-private dialogue, hosted by developing countries and involving the private sector, international organizations, bilateral aid agencies and civil society, should be launched at COP 15 or shortly thereafter. This initiative should focus on three key areas:
 - a. *Development of innovative public-private financing mechanisms*: As mentioned above, it would be useful to explore options for innovative public-private financing mechanisms for adaptation that build upon the successful previous experience of such multistakeholder mechanisms in the health sector and beyond. Representatives from developing country governments, international bilateral aid agencies, and international organizations should work with representatives from the private sector and civil society to explore and further develop these options.
 - b. *Further development of enabling national policies*: As discussed, policies to catalyse private sector engagement in adaptation require further development. In particular, challenge funds to spur private sector innovation for adaptation and public-private partnerships for infrastructure are options that require additional development. Such analysis should build upon experience with similar catalysing public policies in other sectors such as health and water. Furthermore, these policy suggestions should reflect an understanding of the barriers that prevent effective private sector engagement and offer suggestions for overcoming these barriers.
 - c. *Engaging the private sector to support adaptation in least developed countries*: These nations represent some of the most difficult areas to engage private sector support for adaptation, but will be among the hardest hit by climate change. As such, there is a need for further analysis and exploration to develop the public-private partnership models that can be successful in these countries.

Endnotes

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- 19 See for example: *Public Sector Roles in Strengthening Corporate Social Responsibility: A Baseline Study*. 2002. Washington: World Bank/IIED; *Corporate Social Responsibility: Implications for Small and Medium Enterprises in Developing Countries*. 2002. Vienna: UN Industrial Development Organization; and *Emerging Markets, Emerging Models: Market Based Solutions to the Challenges of Global Poverty*. May, 2009. Cambridge, MA: Monitor Group.
- 20 *The State of Responsible Competitiveness 2007* and *The State of Responsible Competitiveness 2008*. London: AccountAbility.
- 21 In order for the private sector to allocate and prioritize investment in adaptation, there is a need for greater confidence in the projected changes in regional weather patterns, some quantification of those changes and of the timescales over which the changes will become material.
- 22 *Managing Climate Risk: Integrating Adaptation into World Bank Group Operations*. June, 2006. Washington: World Bank.
- 23 This facility, developed in conjunction with the Global Alliance for Vaccines and Immunisation, was proposed to the G7 countries by the British government in 2005. Donor countries to the facility make 10- to 20-year, legally binding aid commitments. The IFFIm then borrows against these pledges on capital markets, raising funds that can be disbursed in an optimal way. The November 2006 IFFIm bond launch, for example, raised US\$ 1 billion

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