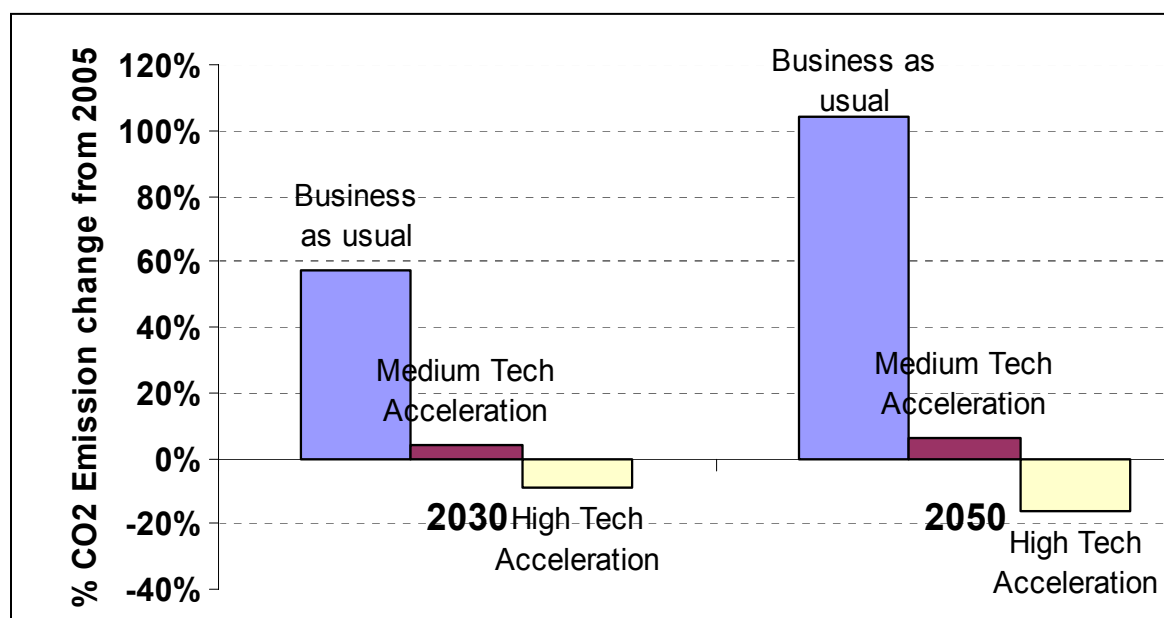


8. ACCELERATE TECHNOLOGY DEVELOPMENT AND DEPLOYMENT (ACTION AREA 5)

109. **Technology is central to both adaptation and mitigation solutions.** The scale of changes needed in the global GHG emissions trajectory, agricultural productivity and water use efficiency to reconcile the high growth needed in developing countries, climate and other sustainability considerations cannot be achieved with technologies commercially available today. The WBG has an essential role to play in helping to lay the foundation for, and to work closely with, the private and public sector stakeholders to stimulate investment in the dissemination of climate-friendly and resilient technologies.

110. **The approach to adaptation** will have to be more flexible and less monolithic compared to clean energy. One of the key challenges will be to increase food production in a sustainable and affordable manner to meet growing demands in the context of climate change and the impacts of its policies on the agricultural sector. The Consultative Group on International Agricultural Research's (CGIAR) role is becoming ever more important and support by the WBG will be scaled-up and reinvigorated to deliver on this task.

Figure 7: Future GHG Emission Reductions: With and Without Accelerated Technology Deployment



Source: IEA, "Energy Technology Perspective." Note: the first scenario assumes that only technologies already commercialized or nearly so would be available. The scenario developed under these "business-as-usual" assumptions results in a 60% growth of CO₂ emissions from 2005 to the year 2030 and a 100% growth by 2050. A second scenario, labeled "Medium Technology Acceleration" would limit growth of CO₂ emissions to an increase of approximately 10% over 2005 emissions for both 2030 and 2050. Only under a third scenario labeled "High Technology Acceleration" is there any chance to reduce global CO₂ emissions below their 2005 levels by the years 2030 and 2050.

111. **Many clean energy technologies** exist that are commercialized but not yet being fully deployed in developed or developing countries, while they can significantly reduce emissions, often at negative incremental costs. Yet, accelerated investment in technology and R&D combined with effective North-South and South-South partnership models for its rapid

dissemination and deployment in developing countries is the key to reducing the future costs and making the task of fighting climate change feasible (see Figure 8). Unfortunately, global investments in clean energy R&D reached some of its lowest levels during 1990s, and despite a rise in public spending in the past few years, at US\$ 16.3 billion in 2006 they remain much below the levels in 1980s when measured in real terms.

112. **The WBG will tailor its clean energy technology support to the needs of its different client countries** along the four stages of the technology cycle: (i) the research and development stage (R&D); (ii) the Demonstration stage; (iii) the Scale-up Stage; and (iv) the Commercial Stage. This needs to take into account the capacity of the WBG's client countries and the market conditions for specific clean energy technologies in those countries. For example, in some developing countries, wind farms can readily be established under existing policy frameworks, utilizing financing made available from local sources, and even obtaining turbines from local companies. In other countries, the capacity to measure the wind speed accurately or to identify the steps in moving towards the establishment of a grid-connected wind farm may not even exist. Market barriers and non-market barriers may exist for the development and dissemination of those technologies, which may be considered relatively commercialized in a relatively mature market elsewhere. Some countries have the capacity and the resources to become actively engaged with a technology which is considered to be at the R&D or early-stage Demonstration Stage, whereas others do not. The challenge is further compounded as the technology sectors are increased and by the nature of the markets in the various client countries.

113. **The WBG will adopt the following approaches to technology acceleration:**

- *Its role with technologies in the Commercial Stage will remain active through its policy and advisory functions, and in its regular lending operations.* Both the World Bank and IFC have significant roles to play in stimulating the growth of the markets for the clean, mature energy generation, energy efficient, industrial, and transport technologies as they work with the private sector to expand these markets in their client countries (see Box 24 for examples in Africa). In some lower-income countries, some mature technologies might still require Bank support in the policy and regulatory framework as well as to scale-up to make the local markets viable.
- *For technologies in the Scale-Up stage, the WBG's role will be to find innovative and creative ways to encourage the early adopters of the technology, to work to grow the market, and to scale-up the number of installations where the new, clean technology is deployed.* As part of its analytic and advisory work, the WBG can support countries in the development of a technology-specific regulatory environment to encourage investments in the clean energy technology. The WBG, including IFC and MIGA, will work closely with and build upon past initiatives of the GEF, and other partners, as well as utilizing the resources made available to it through the CTF and the GEF/IFC Earth Fund (see Box 23).

Box 23: The GEF/IFC Earth Fund

The GEF Earth Fund was approved by the GEF Council in June 2007, and endorsed by the GEF CEO in May 2008. The purpose of the GEF Earth Fund is to leverage private sector funds, creativity and energy to generate global environmental benefits in a sustainable and cost-effective manner. It is envisioned that the GEF Earth Fund could be a first step for the GEF to more systematically engage with the private sector, fostering innovation and opening new markets that would deliver environmental benefits. The GEF Earth Fund has an initial allocation of US\$ 50M to fund a variety of "platforms", or envelopes of funding managed by GEF eligible agencies, or other entities approved by the GEF Council. Platforms can be "thematic" or "programmatic" consistent with the GEF Strategic Priorities and are approved by the GEF Council on a no-objection basis with recommendation by the GEF Earth Fund Board, a Board established to provide strategic guidance to the Platforms and the GEF Council.

The IFC will manage the first Platform (the "IFC Earth Fund") with an initial funding of US\$ 40M, with an allocation from the GEF Earth Fund of US\$ 30M. The IFC Earth Fund will fund a portfolio of sub-projects that contribute to market transformation through (i) the testing, development and establishment of new technologies, financial products/structures and business models, and (ii) the scale up of previously successfully tested initiatives, with a priority given to those projects with the highest potential to make a significant contribution to the reduction of GHG emissions or the highest contribution to Biodiversity objectives of the GEF. The IFC Earth Fund is expected to begin receiving proposals in the Fall, 2008.

- *The WBG's support to the deployment of clean technologies in the Demonstration Stage will have to be very strategic and focus on creating the knowledge base to facilitate countries' decision making.* Technologies still in this nascent stage of development tend to be more expensive than their more mature competitors and can impose both significant incremental costs and incremental risks upon the early adopters. The WBG will need to be careful not to put itself into the position of "picking winners" in the technology game, while realizing that increased risk is part of the nature of working with new technologies. With support from the GEF, the WBG, and particularly the IFC, have played a role in early-stage demonstrations of clean energy technologies in developing countries, such as concentrating solar power, advanced biomass power generation, stationary fuel cells, and light-emitting diodes (LED's). Lessons of these experiments will need to be carefully assessed, possibly by a third party.
- *The WBG is exploring its role in Technology Research and Development.* The WBG is not an R&D institution. R&D is an expensive, risky process that frequently leads to dead-ends or to long, circuitous routes to solve technological problems. Yet, the WBG recognizes the need to help client countries become (or remain) appropriately engaged in the R&D process for clean energy technologies and, particularly, accelerate connecting R&D to the next stages of the Technology Cycle. The recently established – jointly by the GEF and IFC – "Earth Fund" can, among other things, explore early innovations in the clean energy area particularly through the use of prize competitions for clean technologies.

Box 24: The Scope for Technology Acceleration and Deployment in Sub-Saharan Africa

Technology development can help developing countries avoid the energy intensive development path of today's rich countries. Sub-Saharan Africa (SSA), with a largely untapped demand for energy services, has perhaps one of the greatest potentials for the development of clean energy technologies. Below are some examples of how the World Bank is tapping that potential.

African Rift Geothermal Development Facility: Currently, only less than 5% of the Rift Valley geothermal resource potential is being utilized, primarily in Kenya. If developed, such potential would represent between one-quarter and three-quarters of current worldwide production from geothermal sources. Geothermal-energy based power can reduce dependency on expensive imports of petroleum fuels, hedge hydrology risk, and mitigate climate change through substituting and avoiding fossil fuels. The World Bank is preparing a GEF-funded African Rift Geothermal Development Facility project which will help bring down the necessary costs linked the development of the technology.

At present, 80% of SSA's population does not have access to electricity services. Most of these consumers rely on kerosene and battery in households, and diesel generators for business. However, most renewable energy resources, including small hydro, biomass, solar, and wind, are nearly untapped in Africa. The World Bank is helping a number of Sub-Saharan African countries to put in place legal, policy, and regulatory frameworks for the private sector to sell electricity to the grid, provide financing, and build capacities for local developers.

Compact Fluorescent Lamps (CFLs) can enable energy savings of up to 80 percent for residential customers. Bulk procurement and distribution of CFLs is the quickest way to assure load reduction and mitigate power crisis at less than a tenth of supply costs. Distributing a large number of CFLs through such programs helps market development for high quality and low costs CFLs, and build up customer confidence and CFL image, which will lead to increased market acceptance. The Bank financed distribution of approximately 2,000,000 CFLs in Ethiopia, Rwanda, and Uganda, which can cut peak demand by 100 MW, resulting in US\$ 40/peak kW reduced. In addition, Ghana distributed 6 million CFLs on their own as the short-term response to the power crisis last year, and South Africa distributed 7-8 million CFLs and plan for 30 million more.

Source: The WBG

114. The World Bank has undertaken a review of technology development models and is formulating specific concepts for moving forward.¹⁷ Based largely on the lessons drawn from successful cases of client country technical innovation from other sectors, the review has identified several ideas that can be explored for potential adapting to different aspects of clean energy R&D. The World Bank will develop several concepts by the end of calendar year 2008 and promote collaborative processes, including both North-South and South-South partnership models, and harness the growing innovation potential in developing countries.

115. The IFC proposes to increase its efforts to address financing, and knowledge management gaps in order to accelerate investment in promising early stage clean technologies in developing country markets. The IFC currently has a small Cleaner Technologies group that looks to invest in early stage clean-tech companies. It is developing a broader corporate-wide strategy for investing in clean technologies which will take into consideration the various stages of support for commercial, scale-up, demonstration, and R&D of technology; the relative risk profile at each point; and the resources available for these types of investments.

¹⁷ World Bank 2008, Accelerating Clean Energy Technology Research, Development and Deployment: Lessons from Non-Energy Sectors, Washington, DC.