

An Investment Framework for Clean Energy and Development



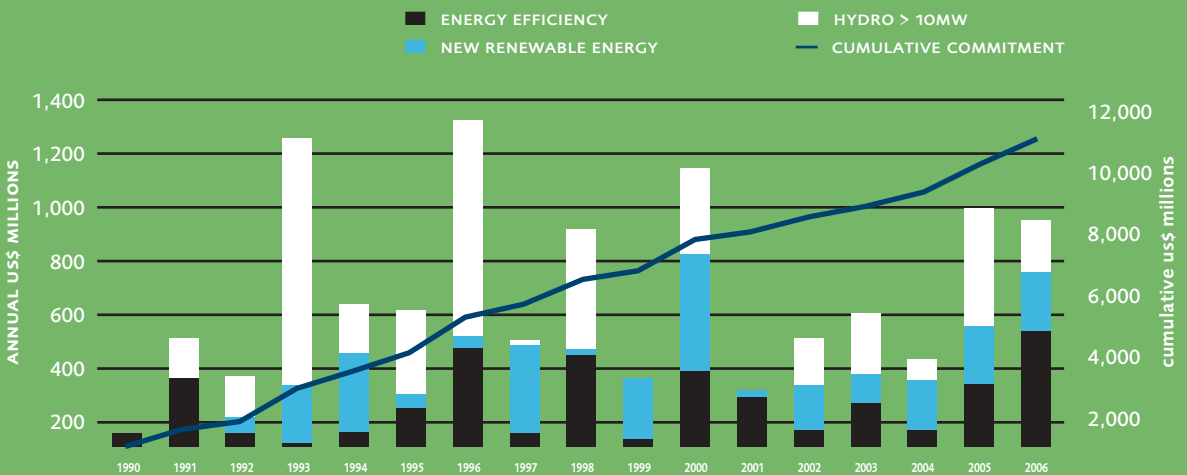
A PLATFORM FOR CONVERGENCE OF
PUBLIC AND PRIVATE INVESTMENTS

T H E W O R L D B A N K

Powering economic growth using clean and renewable forms of energy is one of the most challenging topics in development today. How will we meet the burgeoning energy needs of the developing world without causing irreversible damage to the earth's climate or exposing economies to energy shortages? The answer requires concerted action over the long term by many partners in industry, finance, government, academia, and international organizations. Remarkable achievements have been made, as the examples on these pages demonstrate. But those achievements will not enter the mainstream unless new approaches—on the policy front, and in finance—come to complement existing initiatives. The problem is this: sustainable development through clean energy is still being addressed through short-term financing and regulatory frameworks that are not aligned to the immense scale of the challenge facing the globe.

FIGURE 1

SINCE 1990 THE WBG HAS COMMITTED MORE THAN US\$10 BILLION TOWARD RENEWABLE ENERGY AND ENERGY EFFICIENCY



WORLD BANK COMMITMENTS FOR RENEWABLE ENERGY AND ENERGY EFFICIENCY IN FISCAL YEAR 2006
IN US\$ MILLIONS

SOURCE OF FUNDS	RENEWABLE ENERGY	HYDRO > 10MW	ENERGY EFFICIENCY	TOTAL
World Bank (IBRD/IDA)	135.7	118.6	115.3	369.5
World Bank (GEF and Carbon Finance Unit)	54.7	6.0	1.2	62.0
IFC (own funds)	17.4	67.0	309.0	393.4
IFC (GF, Carbon Finance, and other trust funds)	13.0	0.0	20.1	33.1
MIGA	0.0	0.0	1.8	1.8
TOTAL	220.8	191.6	447.4	858.8

NOTE: IBRD INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT, IDA INTERNATIONAL DEVELOPMENT ASSOCIATION, IFC INTERNATIONAL FINANCE CORPORATION, MIGA MULTILATERAL INVESTMENT GUARANTEE AGENCY.

GENESIS In July 2005, the leaders of the G8 countries, meeting in Gleneagles, Scotland, launched a new dialogue on climate change, clean energy, and sustainable development involving 20 energy-intensive economies. The goal was to create a forum, outside the formal negotiations on the United Nations Framework Convention on Climate Change, to discuss ways to reduce emissions of greenhouse gases and promote greater levels of investment in green technologies, while expanding access to the energy needed for growth and poverty reduction in developing countries.

At the Gleneagles Summit, the G8 and the so-called +5 countries (Brazil, China, India, Mexico, and South Africa) agreed on the Gleneagles Plan of Action on Climate Change, Clean Energy, and Sustainable Development. As part of that plan, they asked the World Bank to prepare, in consultation with other international financial institutions and multilateral development banks, an Investment Framework for Clean Energy and Development to address the investment challenges ahead.

Following consultations that included the private sector, civil society, and a network of legislators from the G8 and +5 countries, early versions of the Investment Framework were favorably reviewed by the ministers of finance and of development that make up the World Bank's governing body, the Development Committee.

The Bank's Development Committee has voiced broad support for the approach taken in the framework, which is organized around three linked pillars that represent key policy issues:

- 1. Meeting the energy needs of developing countries and widening access to energy services for their citizens in an environmentally responsible way**
- 2. Reducing greenhouse gas emissions and speeding the transition to a low-carbon economy**
- 3. Helping developing countries adapt to climate risks**

GOAL The overall goal of the Investment Framework is to catalyze investments from public and private sources to increase access to energy in developing countries and, thereby, to spur development, while using cleaner technologies that protect the environment. To achieve that goal, the Bank is exploring the potential value of new financial approaches to accelerate investment in clean, sustainable, cost-effective, and efficient energy. As its roadmap for accelerating investments that will bring modern and efficient energy services to people who need them most, the Investment Framework reaffirms the primacy of the United Nations Framework Convention on Climate Change, including the emphasis on "common, but differentiated responsibilities" among rich and developing countries.

The World Bank's Investment Framework for Clean Energy and Development

Our goal is to provide our partners with funding options and programs to accelerate investment so that developing countries can meet energy demands for growth and poverty alleviation in an environmentally sustainable way.

—PAUL WOLFOWITZ, PRESIDENT,
THE WORLD BANK

We are now facing the reality of climate change. The common man knows already what science is concluding as he faces the reality—severe summers, poor harvests, increased water scarcity, cyclones, floods, and droughts. This is the window showing us our future.

—HON. SURESH PRABHU, FORMER INDIAN
CABINET MINISTER FOR TRADE, ENERGY, AND
DEVELOPMENT

Energy for Development and Energy Access for the Poor

PILLAR 1

ENERGY FOR DEVELOPMENT The International Energy Agency estimates that developing countries need an annual investment for electricity supply of \$160 billion through 2010, increasing at about 3 percent per year through 2030. Presently, underinvestment in energy reduces GDP growth in some countries by as much as 1 to 4 percent annually.

Unfortunately, only half of the necessary financing is readily identifiable, leaving a financing gap in the energy sector of about \$80 billion per year (figure 2). The international financial institutions, aid donors, and the private sector can close the gap by \$11 billion per year through additional investments using existing financial instruments. But closing the remaining gap can occur only in an environment conducive to investment and sustained profitable operations. Building that environment will depend on a combination of policy advice, technical assistance, and lending to support accelerated reforms of national power sectors—notably policies governing pricing, subsidies, and energy efficiency.

FIGURE 2

MIND THE GAP—FINANCING THE ELECTRICITY NEEDS OF THE DEVELOPING WORLD THROUGH 2010

SOURCE: INTERNATIONAL ENERGY AGENCY AND PRICEWATERHOUSECOOPERS

\$160 BILLION IS NEEDED ANNUALLY TO MEET THE ELECTRICITY NEEDS OF THE DEVELOPING WORLD. \$80 BILLION IS PRESENTLY AVAILABLE.



If those reforms can be achieved, the financing gap can be converted into an important investment opportunity.

ACCESS TO ENERGY Today some 1.6 billion of the world's people lack access to the electricity they need to work and learn efficiently and healthily. Unless investment is increased, that number will not be much changed by 2030. Some countries, such as India, are aggressively tackling the problem of access to energy, but in Sub-Saharan Africa the rate of electrification is still less than the rate of new household formation.

The World Bank has designed an Africa Energy Access Action Plan that it hopes will be implemented in partnership with the Africa Infrastructure Consortium, the African Development Bank, the European Union, international financial institutions, and bilateral donors.

Action on the five parallel tracks of the Action Plan would increase poor people's access to energy in Sub-Saharan Africa from 23 percent today to 47 percent by 2030—a difficult but achievable goal. To implement the plan, concessional support (grants, zero-interest loans) will need to double to \$4 billion per year—thus additional financing will have to be mobilized.

The Investment Framework's emphasis on energy access is most welcome. We can talk about low-carbon economies, reducing energy consumption, and so on, but that makes absolutely no sense to people who don't have access to electricity at all.

—VALLI MOOSA, PRESIDENT, WORLD CONSERVATION UNION, AND FORMER MINISTER OF ENVIRONMENT, SOUTH AFRICA

POWER TO THE PEOPLE IN TIMOR-LESTE

Large-scale deployment of energy-efficient lighting technologies has featured in several ongoing and new World Bank projects. Here is one example.

Since it gained independence in May 2002, Timor-Leste has made substantial progress in rebuilding its power infrastructure. Still, almost 80 percent of the population has no access to electricity, and those who do pay an electricity tariff that is among the highest in the world. Compounding this is the limited capability of the national power company, *Electricidade de Timor-Leste (EDTL)*, to operate the main power system on a commercial basis.

To counter the culture of nonpayment of bills, the government designed a prepaid meter program. To date, approximately 23,000 prepaid meters have been installed in Dili, the capital. When customers approach EDTL to pay their electric-



ity bill, the company distributes compact fluorescent lamps (CFLs). Since September 2005, more than 27,000 CFLs have been distributed free of charge to EDTL customers who have acquired prepayment meters. The project has helped to reduce the peak load for EDTL and the need for fuel imports into Timor-Leste. More-

LIGHTING EFFICIENTLY

over, people pay less for their power when they use these energy-efficient light bulbs.

This successful initiative was a collaborative effort of the Timor-Leste Ministry of Natural Resources, Mineral and Energy Policy, EDTL, the World Bank, and other donors.

Toward a Low-Carbon Economy

PILLAR 2

The demand for primary energy is projected to increase globally by a factor of 1.6 to 3.5 between now and 2050, and in developing countries by a factor of 2.3 to 5.2. During this period, unless policies change and ways are found to facilitate investments in new technologies, developing countries are expected to follow a carbon-intensive development path, similar to that taken by industrialized nations.

That would constitute a lost opportunity of immense proportions, because the consequences of the investment decisions made today and tomorrow will be with us for decades. By 2015, for example, fully half of China's urban residential and commercial buildings will have been built after 2000, and that stock will remain in use for another 50 to 100 years. Meanwhile, the effects of carbon-intensive growth—including air pollution and climate change—sabotage development and stall progress on the Millennium Development Goals set by the international community at the turn of the century.

A WINDOW OF OPPORTUNITY We have a chance today to link the expansion of energy investments in countries such as China and India with strategies to reduce local and regional pollution, and simultaneously to lower carbon emissions.

But “decarbonizing” future investments is not a trivial proposition. Doing so in the power production sector, for example, will require incremental investments of up to \$30 billion per year in developing countries (beyond the basic needs for electricity generation). To meet that need, a sustained program of increasingly concerted action by authorities at all levels will be required to unlock the vast investment potential of the private sector, without which the world has scant hope of keeping either consumption or emissions at sustainable levels.

PROTECTING THE RIGHT TO GROW Because a low-carbon economy is a global benefit, it is in the global interest to encourage rapidly growing developing countries to invest in cleaner technologies. For example, the “clean coal” technologies known as integrated gasification combined cycle (IGCC) and carbon capture and storage (CSS) have the potential to deliver plentiful energy (through very large reserves in China, India, and the United States) in an environmentally friendly way. But IGCC and CSS are more expensive than conventional technologies. The challenge for the international community is to reduce the incremental cost of clean technologies so that developing countries can exercise their right to grow—in a cleaner and greener way.

SCALING UP: AN IMPERATIVE FOR REDUCING GREENHOUSE GAS EMISSIONS Presently, three sources of funds are available to mitigate green-



house gas emissions: carbon trading mechanisms, international grants, and voluntary actions. These sources, and the financial mechanisms that they employ, must be scaled up significantly for greater impact in the transition to a low-carbon economy through the development of markets that reward investments in energy efficiency and renewable energy. As presently configured, however, the existing sources of funds cannot make a meaningful reduction in greenhouse gas emissions owing to governance and operational limitations.

WELL-REGULATED CARBON MARKETS—A GLOBAL GOOD The emissions trading markets enable low-carbon energy producers to reduce their costs through the sale of carbon credits (figure 3).

The uses of carbon funds are proliferating quickly. One promising potential application: tradable credits for documented efforts to preserve forest cover. The process of clearing, burning, and otherwise degrading tropical forests is estimated to account for up to a quarter of global emissions of carbon dioxide. A system of tradable credits would reward efforts to reduce forest loss while generating an additional income stream.

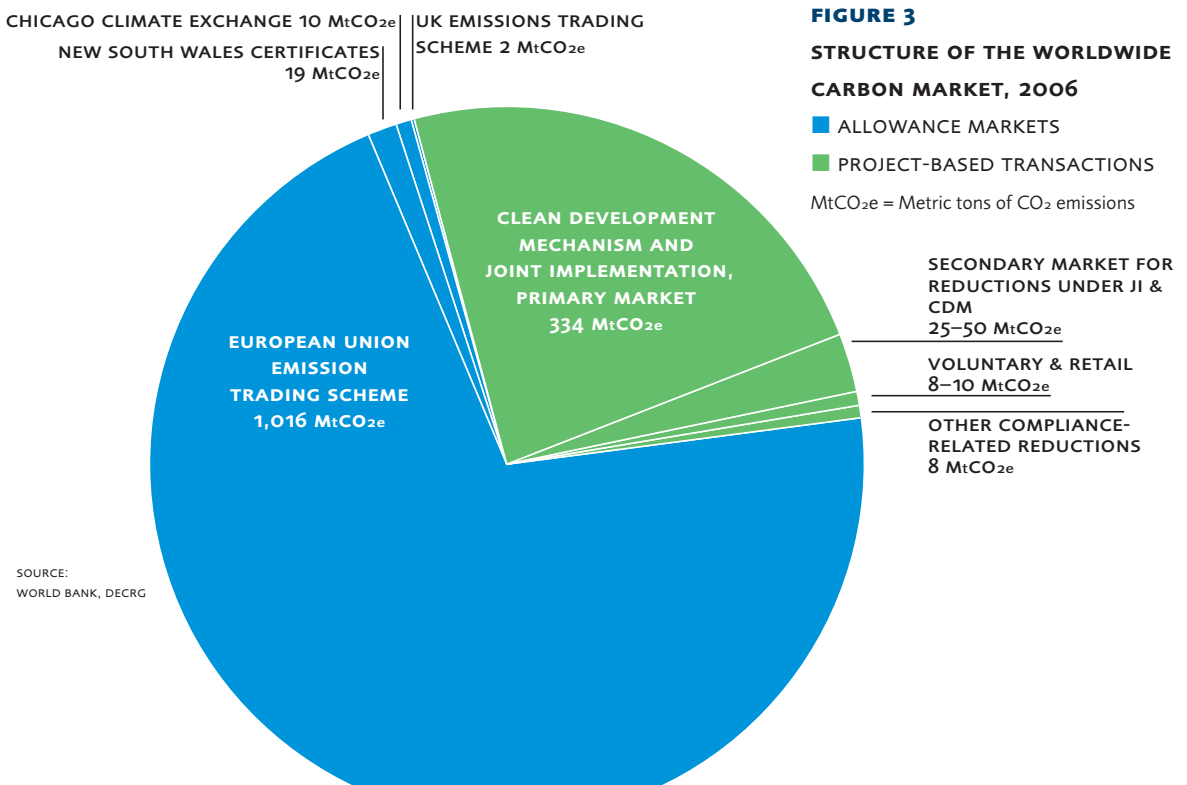
But despite rapid growth and clear opportunities to extend carbon-trading mechanisms to many development purposes, the carbon market has yet to make a significant difference in many developing countries. Among the constraints:

- Higher investment costs render projects less financially attractive, resulting in relatively little equity and debt capital for cleaner technologies.
- Current carbon prices are too low to catalyze the mobilization of substantial private capital.

THE CARBON MARKET The total value of worldwide carbon transactions was \$22 billion in 2006, having risen sharply in recent years. Most transactions take one of two forms:

ALLOWANCE-BASED TRADING, in which the buyer purchases emission allowances created and allocated (or auctioned) by regulators under cap-and-trade regimes, is primarily driven by the European Union Emission Trading Scheme (EU ETS) created in 2005.

In **PROJECT-BASED TRADING** the buyer purchases emission credits from a project that can credibly and verifiably demonstrate that it reduces greenhouse gas emissions compared to what would have happened otherwise. Most project-based transactions are currently executed through the Clean Development Mechanism (CDM) under the Kyoto Protocol, generating Certified Emission Reductions.



The Chinese government has made conserving resources and creating an environmentally friendly society the basis of its future national development model, and has made tackling climate change a priority with its national development strategy.

—ZHANG WENTAI, VICE CHAIRMAN, COMMITTEE ON ENVIRONMENTAL PROTECTION AND RESOURCE CONSERVATION, NATIONAL PEOPLE'S CONGRESS OF CHINA

- Long lead times and untested technologies increase project risks, limiting the amount of financing available, especially in markets already seen as risky.
- Most important, the lack of a global framework for emissions reductions after 2012, when the first commitment period under the Kyoto Protocol is due to expire, discourages investments, particularly in large projects with long lead times.

To be able to perform on a scale commensurate with the problem, carbon markets must operate within a regulatory framework that is both global and long term. Within such a framework, they are capable of channeling tens of billions of dollars to developing countries each year.

A GROWING ROLE FOR THE WORLD BANK Almost 10 years of World Bank experience and \$2 billion of carbon funds under management (for 13 governments and 63 firms) have shown that carbon finance can contribute to clean energy financing in three ways: (a) by purchasing carbon credits from low-greenhouse-gas projects, (b) by using carbon finance to leverage additional investments, and (c) by supporting the growth of a global carbon market through capacity building in developing countries.

The Bank's carbon funds support a diverse portfolio of projects, including waste management, forestry, energy, chemicals, and transport. Carbon finance has already had a major impact on improving waste management practices around the globe due to the methane emissions associated with traditional landfills, waste water, and agricultural refuse practices.

INVESTING IN RENEWABLE ENERGY AND ENERGY EFFICIENCY The World Bank is reducing the costs and removing the barriers for near-commercial energy efficiency and renewables. At the 2004 International Conference on Renewable Energies in Bonn, the Bank committed to a target of a 20 per-

CARBON FLOWS FOR CLEAN DEVELOPMENT

GAS RECOVERY IN THE WORLD'S LARGEST STEEL INDUSTRY

The Nanjing Iron & Steel Co., Ltd. (NISCO) in Jiangsu Province of China has signed an agreement to sell reductions of greenhouse gas emissions to the World Bank, acting on behalf of the Italian Carbon Fund, which will purchase around 600,000 tons of emission reductions.

The project—the first energy efficiency project in China under the Clean Development Mechanism—will introduce converter gas recov-

ery and power generation systems that use a fourth-generation converter gas recovery system. The system will recover the gas produced by NISCO's converters in the steel production process and use it to generate 157 gigawatts of electricity per year, thereby displacing an equivalent amount of electricity from the coal-fired East China grid.

The NISCO project will be a prototype for future energy efficiency projects in the Chinese steel sector, the world's largest.

cent average annual growth in new-renewable energy (solar, wind, biomass, geothermal, as well as hydropower up to 10 MW in capacity) and energy efficiency commitments between fiscal years 2005 and 2009. The Bank met its Bonn Commitment during both fiscal years 2005 and 2006, committing more than \$1.14 billion dollars for new renewable energy and energy efficiency. That represents 32 percent of the Bank's total energy-related commitments, up from just 14 percent in 1990–94.

Overall, World Bank support for renewable energy and energy efficiency has exceeded \$10 billion—embracing more than 100 projects in some 28 countries (see figure 1, inside front cover). Partnering with the private sector is critical in such projects.

THE ROLE OF GEF The Global Environment Facility (GEF) is the largest source of multilateral grant financing for low-carbon technologies, and its work is vital. GEF's mission in this area is to develop and transform markets for energy in developing countries so that, over the long term, they will be able to grow and operate efficiently on a less carbon-intensive path. GEF has provided \$1 billion in project financing since 1992. However, for GEF to achieve significant and sustained placement of renewable-energy technologies at near-commercial levels of efficiency, its funding would have to be greatly increased. Even scaling up GEF's current focus on removing barriers for such technologies would require a tripling of its budget. Providing substantial support for capital investments in new, low-greenhouse-gas-emitting technologies would require an even more substantial commitment from the donor community.



I strongly believe that we need to build support . . . for a clear framework that accelerates a shift to low-carbon economies . . . to avoid dangerous climate change.

—TONY BLAIR, PRIME MINISTER OF THE UNITED KINGDOM

MANDATING RENEWABLE ENERGY ON A NATIONAL SCALE

The China Renewable Energy Scale-Up Project is a 10–12 year, three-phase, \$400 million initiative (including \$140 million in GEF grants) to support implementation of a national policy in which (a) a mandated share of electricity consumption must come from renewable sources or (b) electricity suppliers must buy renewable energy-based electricity at a set price. GEF financing for institutional development and capacity building in Phase I (\$40 million) will con-

tribute to an increase in renewable electricity from 35 TWh/year to 150 TWh/year and raise renewable capacity from 7 GW to 29.6 GW.

FINANCING SUSTAINABLE ENERGY

Russia consumes about 10 times more energy per unit of production than developed countries, implying a great potential for energy savings in its industrial sector. Since November 2005, the International Finance Corporation, the private sector arm of the World Bank, has been working with Russian financial intermediaries

to fund projects in companies that use outdated heating systems and antiquated production lines. As an example, Center-Invest Bank invested \$1.1 million in UNK Agroprodukt, a producer of sunflower oil, for a new boiler fueled by sunflower seed husks, resulting in 660,000 m³ of gas saved per month and \$1.1 million in savings over 10 months of operations.

The IFC offers long-term financing and guarantees to address financing barriers, along with capacity building for developers and companies.

Adaptation to Climatic Change and Variability

BETTING ON THE WEATHER

MEXICO'S CATASTROPHE BONDS

An international humanitarian relief effort may help with the immediate crisis that follows a natural disaster. However, governments are left to cope with shattered towns, uprooted farms, bankrupted businesses, and broken bridges. By issuing "catastrophe bonds," developing-country governments can purchase insurance from international investors willing to forfeit all or part of their investment when a natural disaster exceeds defined limits, while earning an above-average rate of interest at other times—the equivalent of an insurance premium.

Mexico has pioneered in this field by issuing \$160 million in three-year catastrophe bonds to insure against earthquake damage. Investors who bought the bonds are betting that a major earthquake will not hit Mexico in the next three years. If they are right, their bonds are repaid after three years. But if a quake hits, the government retains the full value of the bonds. In Mexico's case, the government collects the insurance payout if a quake measuring at least 7.5 on the Richter scale hits specific regions, regardless of the extent of damage.

Efforts to alleviate poverty are already threatened by increasingly severe weather patterns and climate variability, the economic effects of which are especially significant in developing countries. According to the Intergovernmental Panel on Climate Change, partial estimates of the economic impact of a temperature increase of 2.5°C (a mid-range value associated with a doubling of the atmospheric concentration of CO₂), without offsetting adaptive efforts, range from 0.5 to 2 percent of GDP, with higher losses in most developing countries.

To ensure an adequate response to growing climatic variability, major changes in both public and private investment strategies are needed. Recent analyses suggest that 20 to 40 percent of official development assistance and other public concessional finance for development (some \$20 to \$40 billion per year) is subject to climate risk, while only a small portion of aid projects take this risk into account in their planning. The incremental costs of activities to make projects more resilient to climate effects are estimated at 5 to 20 percent of the portfolio at risk. This would suggest that at least \$1 billion per year in additional funding will be required.

Adaptation to climate variability and change also needs to be integrated into sectoral and national economic planning. The initial challenge is to raise funds to significantly increase the knowledge base at the country level in order to design appropriate adaptation strategies. This would have to be followed by a large increase in funds to implement adaptation strategies, at a cost in excess of \$1 billion per year.

The international financial institutions can help by establishing a framework in which public and private investment projects in developing countries become more climate-resilient. Awareness raising, knowledge sharing, and capacity development are all important parts of that framework. Immediate tasks include (a) analyzing the institutional barriers that prevent climate-related conditions from being incorporated into development planning and (b) devising new standards for infrastructure.

New insurance instruments (such as weather-index insurance for farmers) and risk-pooling arrangements (such as the Global Index Insurance Facility) are likely to be key.



To make the Investment Framework for Clean Energy and Development a reality the World Bank will continue to strengthen its cooperation with governments, other international financial institutions, regional development banks, and the private sector with the goal of aligning our efforts for greater impact. The Bank will work closely with the International Energy Agency on a joint initiative to produce a relevant set of energy efficiency indicators that will contribute to the ongoing efforts being implemented by the G8+5 countries and other middle-income countries. In the months to come, the Bank will seek to mobilize donor assistance for the Africa Energy Access Action Plan, continue to work on financing options to support the transition to a low-carbon economy, and develop a strategy (including tools and finance) to meet the challenge of adaptation.

The goal is to achieve a convergence of private and public sector efforts to scale up investment in cleaner energy production, renewable energy, and energy efficiency.

This much is already abundantly clear: Now is the time to invest in clean energy for sustainable development.

TO LEARN MORE:

The World Bank's Investment Framework for Clean Energy and Development: [http://siteresources.worldbank.org/DEVCOMMINT/Documentation/21046509/DC2006-0012\(E\)-CleanEnergy.pdf](http://siteresources.worldbank.org/DEVCOMMINT/Documentation/21046509/DC2006-0012(E)-CleanEnergy.pdf)

The Stern Review on the Economics of Climate Change:
www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm

Intergovernmental Panel on Climate Change:
www.ipcc.ch/

International Energy Agency:
www.iea.org

Making the Investment Framework a Reality

We can build on the experience of the United Nations Framework Convention on Climate Change, creating frameworks for markets and incentives. Without incentives private investment and flows of international finance of the required magnitude will not happen.

—SIR NICHOLAS STERN, ADVISER TO THE BRITISH GOVERNMENT ON THE ECONOMICS OF CLIMATE CHANGE AND DEVELOPMENT

WEIGHING POLICY OPTIONS: PRACTICAL GUIDANCE FROM THE INTERNATIONAL ENERGY AGENCY
In its annual World Energy Outlook 2006, the International Energy Agency presented an "alternative policy scenario" to address energy security and environmental concerns. Developed in cooperation with the World Bank and other international financial institutions, the scenario offers practical guidance to policy makers about the effectiveness and economic consequences of policy options. The Agency also recently published "Energy Technology Perspectives," which shows how global CO₂ emissions could be reduced to close to their present level by 2050 through accelerated deployment of cleaner energy technology that is either already available or under development. The Agency has a major work program to identify "best practice" policies for promoting lower carbon technologies in all the key areas that have been identified, including energy efficiency.





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