

A Strategic Approach to Climate Change in the Philippines

April 16, 2010

Sustainable Development Department
East Asia & Pacific Region
World Bank

Executive Summary

The *internal objective* of this Strategy Note is to outline directions for the World Bank's engagement in climate change (CC) in the Philippines, integrated with the new Country Assistance Strategy (CAS). The *external objective* is to raise awareness of the implications of climate change for the economy; to facilitate integration of CC actions into policies and programs, such as the *Medium-Term Philippine Development Plan*; and to support the government in articulating its own strategy for climate change.

Climate change is a development issue. The impacts of climate change--and the efforts to mitigate carbon emissions--permeate throughout society. The World Development Report 2010 (World Bank, 2009e, p. xx) notes that "Climate change threatens all countries, with developing countries the most vulnerable. Estimates are that they would bear some 75 to 80 percent of the costs of damages caused by the changing climate. Even a 2° C warming ... could result in permanent reduction in GDP of 4 to 5 percent for Africa and South Asia." While much about the long-term impacts of CC is uncertain, the Philippines is expected to be increasingly exposed to extreme weather events, temperature rise, shifting rainfall patterns, and sea level rise. Natural disasters already account for more than 0.5 percent of GDP annually, and climate change is expected to increase these losses further, making it a development issue rather than one confined to environmental concerns. The 2009 typhoons Ondoy and Pepeng alone inflicted damages and losses on the order of \$4 billion, or almost 3 percent of gross national product. Climate change will, however, also make new financing available for a more sustainable low-carbon economy and allow affected countries to take adaptation measures. This could have important benefits for the Philippines, such as in reducing the level of air pollution and reducing risks to unpredictable weather events.

The government has responded actively to climate change, creating relevant legislation and new institutional mandates. Currently six laws explicitly address climate change, and a recently approved Senate bill will create a Climate Change Commission to ensure coordination across a variety of relevant national agencies. Efforts to improve the framework for disaster management have been slower. But two important documents are currently under review: the Strategic National Action Plan for disaster risk reduction, which is in line with the Hyogo framework, and a revised Disaster Risk Management (DRM) law, which is under discussion in Congress and the Senate.

A growing number of donors support the government in addressing climate change, mostly in the areas of capacity building and mitigation. Forty projects are now registered with the Clean Development Mechanism Executive Board, but their volume is limited. There has also been a rise in the number of adaptation projects; so far, however, these have focused on disaster risk reduction as there is still significant uncertainty regarding the nature and scale of adaptation that will be required. Current projects include capacity building, hazard mapping, early warning systems, parametric insurance systems, and community-based DRM, often in collaboration with local government units.

To date the World Bank has supported several greenhouse gas (GHG) mitigation projects, and work in disaster mitigation has a long tradition. With respect to GHG mitigation, the total portfolio of nine active projects comprises about \$165 million. Implementation has usually been slow, and the scale thus far insufficient to significantly adapt to climate change or contribute to a low-carbon economy.

The World Bank's new Strategic Framework for Climate Change and the new Country Assistance Strategy (2010–2014) for the Philippines lay the groundwork for scaling up CC activities in the country. The World Bank can contribute through both analysis and operations, including tapping into new financial mechanisms. Importantly, an Investment Plan under the Clean Technology Fund (CTF) has been approved, entailing a CTF contribution of \$250 million to a total investment program of about \$2.5 billion. In line with these strategies, the World Bank has laid the groundwork for scaling up adaptation and carbon finance initiatives on several fronts.

A sectoral overview of opportunities in mitigation and adaptation results in a long list of possible interventions in energy, transport, agriculture, forestry, solid waste, wastewater and groundwater management, and urban development. With so many options on the table, there is a need to establish criteria for strategic choice. The Note suggests eight criteria for screening the current portfolio as well as new proposals: client buy-in, CAS alignment, scale of impact, comparative advantage, cost efficiency, staff resources, financial resources, and risks. It ends by providing general guidance for the World Bank's future work on climate change.

The Strategy Note recommends focus on the following actions:

A. Implement the Climate Change Act and Strengthen Institutions and Coordination

The Climate Change Act has been signed and the Climate Change Commission has been created recently, although it has yet to establish its Climate Change Office that will support the Commission. In addition, the implementing rules and regulations of the law have also been promulgated recently. In view of these recent developments, the following actions to effectively implement the law are urgently needed:

- *Strengthening the Climate Change Commission and creating the Climate Change Office with qualified staff and adequate funding;*
- *Developing the guidelines of the law's implementing rules and regulations;*
- *Articulating a national climate change strategy and developing an action plan;*
- *Strengthening Sector Agencies and Local Government Units as a pre-requisite to mainstreaming climate change mitigation and adaptation in sector and local policies, plans and programs;*
- *Improving donor coordination.*

B. Focus Government Resources and Attention on Adaptation and Preparedness

Given the country's vulnerability and experience on extreme climate-related events, the government should focus its resources and attention on adaptation and disaster preparedness. To this end, the following needs to be done:

- *Mainstreaming adaptation and disaster risk management in key national, subnational, and sectoral development policies, plans, and programs*
- *Improving disaster preparedness and response*
- *Protecting key infrastructure and livelihoods against climate change impacts*
- *Developing financing facilities for adaptation and disaster response.*

C. Undertake Selective Climate Change Mitigation Program in Key Sectors

Selective mitigation programs can be undertaken in the power, transport, and waste sectors, all of which show strong emission increases under the business-as-usual scenario.

Acknowledgements

This paper has been written by a team of World Bank staff consisting of Christopher Ancheta, Jan Bojö (Task Team Leader, TTL), Victor Dato, Johannes Heister, Mukami Kariuki (co-TTL), John Morton, Zoe Trohanis, Joe Tuyor, Maya Villaluz, Felizardo Virtucio, Sam Wedderburn, and Yabei Zhang.

The writing group has benefited from comments received from Carol Figueroa-Geron, Maryse Gautier, Bert Hofman, Florian Kitt, and Lada Strelkova and from detailed guidance from Mark Woodward. It has also benefited from comments received from the various stakeholders during the launching of the draft strategy on February 2, 2010 at Discovery Hotel, Ortigas Center, Pasig City. The team has been assisted by Pamela Gunio and Demilour Ignacio.

The following peer reviewers from the World Bank have also contributed: Sameer Akbar (Sr. Environment Specialist), Alexander Lotsch (Technical Specialist), and Gary Stuggins (Adviser). The text was edited by Linda Starke.

This version of the Strategy Note reflects the guidance given to the team at the Decision Meeting, December 22, 2009 and incorporates the comments received during the launching of the Strategy on February 2, 2010.

Disclaimer: This paper is a product of the staff of the International Bank for Reconstruction and Development/The World Bank. The findings, interpretations, and conclusions expressed herein are those of the authors and do not necessarily reflect the views of the Executive Directors of The World Bank or the governments they represent.

Table of Contents

1. Climate Change and the Philippines

- 1.1 Climate Change Impacts
- 1.2 The Philippines' Contributions to Climate Change
- 1.3 The Response to Climate Change

2. The World Bank and Climate Change in the Philippines

- 2.1 Portfolio Overview
- 2.2 New Framework Strategy, Financial Instruments, and Relevance for the Philippines
- 2.3 Sectoral Overview of Opportunities for Mitigation and Adaptation:
- 2.4 Strategic Choices, Costs, and the Way Forward

References

Annex. World Bank Climate Change Portfolio in the Philippines

1. Climate Change and the Philippines

This section deals with three aspects under the general heading of climate change (CC) and the Philippines: the impacts of climate change on the country, the contribution of the Philippines to CC (that is, greenhouse gas (GHG) emissions), and the responses to this issue so far by government and other agents.

1.1 Climate Change Impacts

Climate change is a development issue. The Philippines is highly exposed to hazards created by weather events, and climate change will exacerbate this through an increase in extreme weather events, changes in temperature, shifts in rainfall patterns, and sea level rise. Natural disasters already account for more than 0.5 percent of gross domestic product (GDP) annually, and climate change is expected to increase these losses further, making it a development issue rather than one confined to environmental concerns. Climate change will, however, also make new financing available for a more sustainable low-carbon economy and allow affected countries to take adaptation measures. This could have important benefits for the Philippines by reducing, for example, the level of air pollution and the risks of unpredictable weather events.

The Philippines is highly exposed to extreme weather, and it is expected that climate variability could lead to an increase in the number, severity, and unpredictability of events. In the past 10 years the Philippines has experienced the highest recorded rainfall and the strongest typhoons. On average, some 20 typhoons hit the country annually (NDCC 2008). Weather-related disasters accounted for 98 percent of lives affected by all disasters and 78 percent of lives lost between 2000 and 2008 (EMDAT 2009). As a result of these factors, the Philippines is ranked in the top 10 countries worldwide at risk for both climate change and disasters.

Temperatures will rise. The observed change since 1990 is 0.2°C per decade, and the Intergovernmental Panel on Climate Change (IPCC) scenarios give a projected range for the future of 0.1–0.6°C per decade (World Bank 2009e). Much will depend on how governments and private actors respond.

Rainfall will both increase and decrease, depending on the location. Agriculture represents over one-fifth of the country's GDP (Central Bank of the Philippines 2009). About one-third of the labor force depends on agriculture (NSO 2009) and, hence, on climate predictability for their economic survival. Furthermore, increased risks of flooding in urban centers will also affect industry and services, which are currently the fastest-growing segments of the economy. For a doubling of carbon dioxide (CO₂) in the atmosphere, the Department of Environment and Natural Resources (DENR) projects a 60–100 percent increase in annual rainfall in the Central Visayas and Southern Tagalog provinces, including Metro Manila (DENR 1999). And an increase of up to 50 percent is predicted in the areas of Luzon, Samar, and the central and western parts of Mindanao. On the other hand, a decrease in annual rainfall is expected in other sections of

the country, such as northern and eastern Mindanao and parts of western Luzon. Hulme and Sheard also predict average annual precipitation increases in the Philippines by the 2050s, with some seasonal differences (Hulme and Sheard 1999). The drier seasons are expected to become drier still, while the wetter seasons will become wetter.

Sea level rise and storm surges will become a greater threat to coastal communities. Globally, the IPCC estimates that sea levels will rise about 28–43 centimeters from the base level (1980–99) by 2100, depending on the temperature scenario (IPCC 2007). The Philippines is vulnerable to sea level rise and storm surges because about 60 percent of the country's 1,500 municipalities and 120 cities are along its extensive coastline (World Bank 2003). These coastal cities and municipalities, including 10 of the largest cities, are inhabited by about 60 percent of the population, a figure that is expected to grow to 75 percent by 2020 (UN 2007). Four Philippine cities are among the top 10 East Asian cities likely to be affected by sea level rise and storm surges (Dasgupta et al. 2009). Hulme and Sheard estimate that a 30-centimeter rise in sea level—which they assume may be reached by 2045—would regularly inundate over 2,000 hectares of the Manila Bay area and affect about half a million people (no baseline specified) (Hulme and Sheard 1999). A 100-centimeter rise in sea level (which under the most extreme scenario considered may be reached by about 2080) would threaten over 5,000 hectares of the Bay and affect more than 2.5 million people. These risks would be exacerbated if storm surges associated with intense storm activity were to increase. Overall, the impact of sea level rise and storm surge could affect more than half of coastal GDP (Dasgupta 2009). The Asian Development Bank (ADB) has recently added an estimate through its *Economics of Climate Change in Southeast Asia: A Regional Review* (ADB 2009a). Their projection is for a 70-centimeter rise by the end of this century, based on a 1990 baseline.

Climate change will affect economic development and lead to increased poverty.

Macroeconomic estimates for the Philippines alone are not available, but ADB has new estimates for Indonesia, the Philippines, Thailand, and Vietnam (ADB 2009a). The economic impact of CC for the four countries will amount to mean annual GDP losses of up to 2.2 percent by 2100 and could reach 6.7 percent of GDP if market impact and catastrophic risks are considered. About 85 percent of the Philippine GDP is produced in areas at risk to disasters (World Bank 2008b), and on average 0.5–1 percent of GDP is already lost annually due to natural disasters (ADB 2009a). Climate change therefore increases the risks and uncertainties in livelihoods of a significant portion of the Philippine population.

The fragmented nature of the Philippine land mass will contribute to higher costs of managing the impacts of climate variability and associated disasters. About half of the total land area and more than 80 percent of the population are considered vulnerable to natural disasters. Nearly a third of all households live below the poverty line, and a large portion of the population lacks the socioeconomic resilience to withstand climate-related stresses on their own. Families who are exposed to endemic risk associated with climatic variability are unlikely to be able to pull themselves out of poverty. The *Updated 2004–2010 Medium-Term Philippine Development Plan* (MTPDP) recognizes the grave threat that natural hazards, exacerbated by climate change, pose—especially to these vulnerable areas. It underscores the far-reaching adverse impact of

climate change on the country's critical resources and economic activities and calls for greater mitigation and adaptation efforts (NEDA 2008).

1.2 The Philippines' Contribution to Climate Change

According to the World Resources Institute, the Philippines emitted about 142 million tons (Mt) of CO₂ equivalent (CO₂e), excluding land use changes (WRI 2009). This was about 0.4 percent of global CO₂ emissions in 2005—the last year for which a comparative dataset is available. This implies an international rank of 39 in terms of absolute emissions, but a rank of 122 in terms of per capita emissions (1.7 tons/year).

What matters more than the global significance is the comparison between marginal costs of mitigation and marginal benefits. The latter can include both international transfers and domestic co-benefits. These include reduced levels of air pollution, which currently inflict significant damage (World Bank 2009c). As the Philippines is rapidly urbanizing—the United Nations projects 75 percent urbanization by 2020—mitigation of urban carbon emissions will increasingly be a priority. In addition, the increased disaster risks associated with climate change in both urban and rural areas are likely to create a greater economic burden on the economy. The new adaptation financing facilities currently being established will enable the Philippines to implement adaptation programs faster.

Sources differ considerably in their estimates of GHG emissions and their sectoral breakdown (DENR 1999; WRI 2009). The most glaring discrepancy concerns the contribution of land use change and forestry, which appears as a major emitter in the estimate used here. (See Table 1.) It is hoped that this knowledge gap will be resolved once the Second National Communication on Climate Change is issued, which was expected in December 2009.

Meanwhile a study of the power and transport sectors (Esquerra et al. 2010) commissioned in support of this Strategy Note shows that business as usual in these sectors would entail considerable increases in emissions. Figure 1 illustrates the estimated growth in emissions from the power sector of 26 Mt in 2007 to 140 Mt in 2030. The expansion of coal-fired generation dominates the emissions.

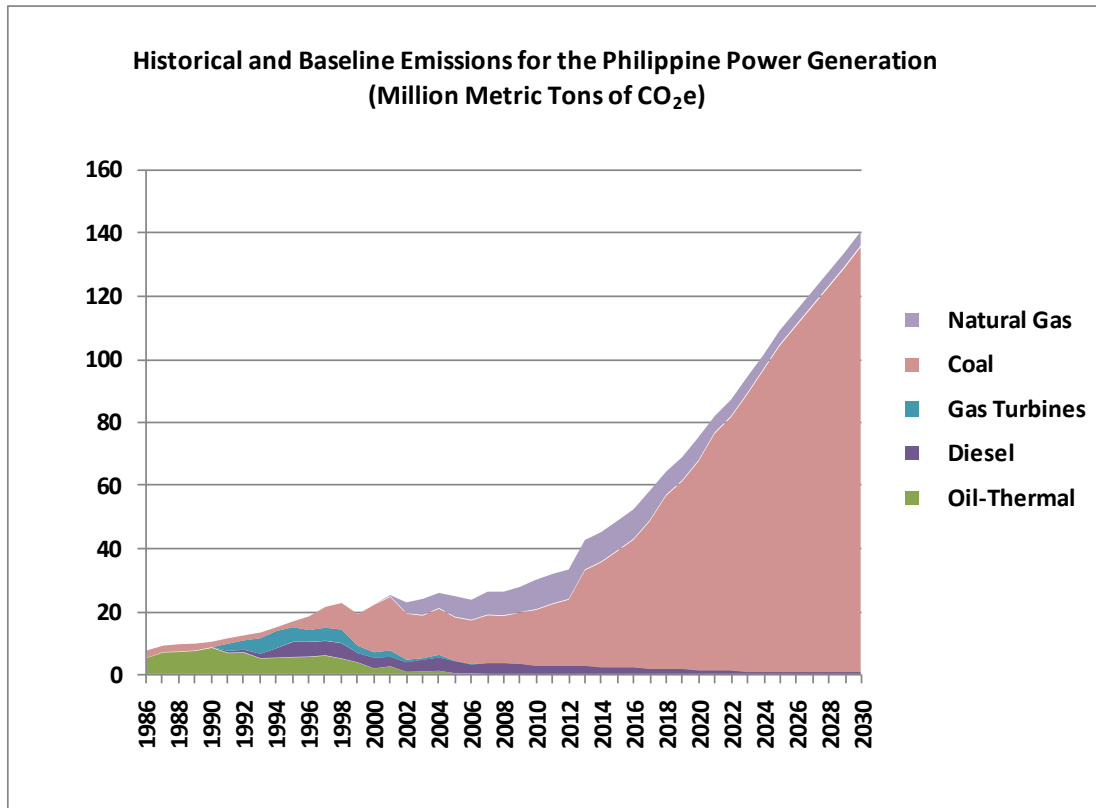
Table 1: Philippine GHG Emissions by Sector, 1990, 2000, and 2004

| Sector | 1990 | | 2000 | | 2004 | | Change | |
|--------------------------------|-------------------|------|-------------------|------|-------------------|------|------------|--------------|
| | MtCO ₂ | % | MtCO ₂ | % | MtCO ₂ | % | 1990–2000 | 2000–04 |
| Land use change and forestry* | 79.4 | 66.9 | 94.9 | 55.9 | N/A | N/A | 20% | N/A |
| Energy | 36.0 | 30.4 | 68.9 | 40.6 | 72.6 | 91.8 | 91% | 5.37% |
| Electricity and heat | 14.2 | 11.9 | 26.8 | 15.8 | 28.9 | 36.5 | 89% | 7.84% |
| Manufacturing and construction | 8.3 | 7 | 9.2 | 5.4 | 11.2 | 14.1 | 11% | 21.74% |
| Transportation | 6.2 | 5.2 | 23.5 | 13.9 | 25.4 | 32.1 | 279% | 8.09% |
| Other fuel combustion | 7.4 | 6.2 | 9.4 | 5.5 | 6.8 | 8.6 | 27% | -27.66% |
| Fugitive emissions | 0 | 0 | 0 | 0 | 0.3 | 0.4 | 0% | |
| Industrial processes | 3.2 | 2.7 | 6.0 | 3.5 | 6.5 | 8.2 | 88% | 8.33% |
| TOTAL | 118.6 | | 169.8 | | 79.1 | | 43% | 5.61% |

* Land use change and forestry data available every 10 years only. No data for 2004

Source: WRI 2008, quoted in Esguerra et al. 2010.

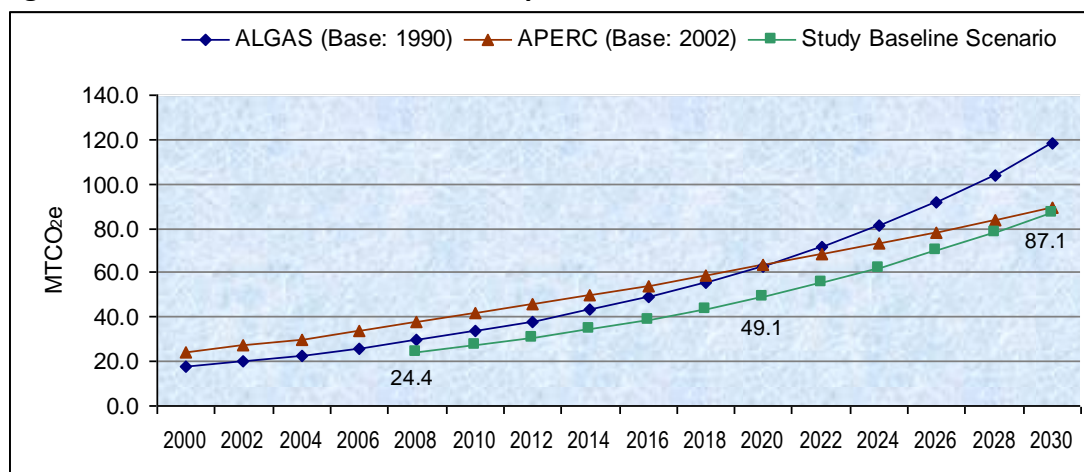
Figure 1. Historical and Baseline CO₂e Emissions from Power Generation



Source: Esguerra et al. 2010.

Similarly, for the transport sector the baseline scenario indicates a strong growth in emissions, as shown in Figure 2.

Figure 2. GHG Emissions from the Transport Sector



Source: Esguerra et al. 2010.

Given the rapid pace of urbanization in the Philippines, this growth in carbon emissions is not unexpected. While currently, due to the low carbon emission profile, the emphasis is on adaptation, these data underscore the need to ensure that adequate attention is paid to mitigation actions.

1.3 The Response to Climate Change

The challenges of climate change are formidable for the Philippines: more extreme weather events, changes in precipitation that affect agriculture and water supply, sea level rise—these will be the major ones. Given the long-term, uncertain, and cross-sectoral nature of the problem, institutions and policy makers will be pressed to adjust with flexibility and foresight and across traditional boundaries. New finance will have to be mobilized to meet the costs of necessary investments in adaptation and mitigation. New technologies need to be tested. Awareness needs to be raised, and the education curricula need to be adjusted to equip the growing population with the means to take on these challenges.

This section reviews the responses to climate change in terms of the policy and legal actions that have been taken, the institutional mandates that have been established, and the analysis, programs, and projects that have been launched. The list is not comprehensive, as information is highly fragmented, which indicates an overall coordination issue.¹

¹ ADB 2009a contains a detailed listing of national policies in the Philippines related to adaptation and mitigation (see pp. 189–90).

Policy and Legal Responses

The Philippine Constitution states that “it is the policy of the State to protect and advance the right of the Filipino people to a balanced and healthful ecology in accord with the rhythm and harmony of nature.” Six laws explicitly address climate change:

- the **Agriculture and Fisheries Modernization Act (1997)**, which directs the Department of Agriculture and other appropriate agencies to take into account climate change, weather disturbances, and annual productivity cycles in order to forecast and formulate appropriate agricultural and fisheries programs
- the **Philippine Clear Air Act (1999)**, which instructs the Department of Environment and Natural Resources, concerned agencies, and local government units (LGUs) to prepare and implement national plans in accordance with the United Nations Framework Convention on Climate Change (UNFCCC)
- the **Ecological Solid Waste Management Act (2000)**, which similarly instructs the DENR, concerned agencies, and LGUs to prepare and implement solid waste management plans
- the **Philippine Clean Water Act (2004)**, which aims to reduce water pollution through better management of sewerage and sanitation, industrial effluent, and agricultural, industrial, and residential waste
- the **Biofuels Act (2006)**, which pursues energy self-sufficiency
- the **Renewable Energy Bill (2008)**, which encourages the use of renewable energy.

The UNFCCC was ratified in the Philippines in August 1994. Under this convention, governments gather and share information on greenhouse gas emissions, national policies, and best practices; launch national strategies for addressing GHG emissions and adapting to expected impacts; and cooperate in preparing for adaptation to the impacts of climate change. The Philippines signed the Kyoto Protocol to the UNFCCC in 1998 and ratified it in 2003, enabling it to participate in the Clean Development Mechanism (CDM).

Climate change mitigation is identified as a priority in the *Updated 2004–2010 Medium-Term Philippine Development Plan* in connection with the CDM and the emerging carbon market. However, less attention is paid to climate change adaptation (CCA), which is only referred to in the context of disaster risk reduction. The recent update of the MTPDP shows additional progress in mainstreaming climate change into decision making.

Over the past 10 years the government has also introduced a number of Executive Orders in order to address shortcomings or gaps in existing laws and establish working institutional arrangements. These will be replaced by the recently approved (June 3, 2009) Senate Bill No. 2583, “Mainstreaming Climate Change into Government Policy Formulation, creating for this purpose a Climate Change commission and for other purposes.”

At the national level, several sector agencies, such as the Department of Energy (DOE), have elaborated plans for addressing climate change through improved energy efficiency and the promotion of renewable energy (RE) sources. The *Philippine Energy Plan 2004–2013* envisions sourcing 53 percent of the total energy supply from renewable energy by 2013.

At the local level, several LGUs have also been active in the promotion of climate change risk management. The National Conference on Climate Change Adaptation convened in 2007 by the provincial government of Albay prepared the Albay Declaration on Climate Change, which was subsequently submitted to President Arroyo. Albay is pursuing follow-through activities in the development of the national strategic framework on climate change adaptation. In 2009 a similar climate change conference was convened by the Governor of Cebu for the Visayas region.

Despite the potential synergies between disaster risk mitigation and climate change adaptation, so far there is inadequate convergence in policy, planning, and coordination across national government agencies. To date most resources have been focused on ensuring timely response to disasters due to the fact that the current disaster management legislation focuses on emergency response.

The National Disaster Coordinating Council (NDCC) has been evolving a national framework that strengthens actions in four priority areas: preparedness, mitigation, response, and reconstruction (NDCC 2009). This shift implies a greater need for integrating climate change and disaster risk management agendas. This is in line with the Climate Change Bill, which points to the need for more effectively integrating DRM and climate change agendas, particularly at local levels. (DRM is used here to denote both disaster risk reduction—meaning proactive measures to reduce risk from disasters—and post-disaster response and recovery.)

The Philippine legislature is also reviewing a bill that will introduce a more pro-active DRM policy framework, focusing more on disaster risk reduction. The bill calls for the rationalization of the DRM mandates of national government agencies and local governments. It advocates the establishment of a permanent national agency charged with overseeing disaster risk reduction. Vulnerable local governments are encouraged to establish permanent structures that will deal with DRM in a more comprehensive manner. Despite numerous efforts to reform existing DRM legislation, the bill has been pending for more than 10 years.

In line with the Hyogo Framework on disaster risk reduction, which the Philippine government has signed, efforts are under way to finalize the *Strategic National Action Plan for Strengthening Disaster Risk Reduction in the Philippines for 2009–2019*. In addition, NDCC is also implementing parts of the *Four Point Plan of Action for Preparedness*, which aims to strengthen capacity of LGUs in identified vulnerable areas. This is in part responsible for the shift in orientation from emergency response to disaster risk reduction.

Institutional Mandates

The Philippine Council for Sustainable Development (PCSD) was created in 1992 as a multi-stakeholder participatory body charged with sustainable development. The PCSD is chaired by the National Economic and Development Authority (NEDA) Director-General and vice-chaired by the DENR Secretary. The Council includes representatives from various national government

departments and civil society organizations. One of its main functions is to establish guidelines and mechanisms to put into operation the sustainable development principles embodied in the Rio Declaration of 1992 and incorporate them in the preparation of the MTPDP at national and local levels.

Climate change policy oversight and coordination is undertaken by a Presidential Task Force on Climate Change (PTFCC) created in 2007. The task force focuses on improving compliance with air emission standards and combating deforestation and environmental degradation. Executive Order 774, issued in December 2008, reorganized the PTFCC. The President and the Presidential Adviser on Climate Change are now respectively chair and vice-chair of the task force, which includes the whole Cabinet as well as two representatives from the private sector and civil society. Sixteen PTFCC task forces were also created. Executive Order 785, signed in February 2009, directs the PTFCC to also develop a national climate change framework and an information, education, and communication program and to coordinate and review government and donor-funded climate change projects. However, the recent passage of the Climate Change Bill (No. 2583) means that these structures are set to change in the near future.

Other supporting agencies include the Inter-Agency Committee on Climate Change (IACCC) and the Klima Climate Change Center (KCCC). The IACCC was created in 1991 to coordinate various climate change-related activities, propose climate change policies, and prepare the Philippine positions on UNFCCC negotiations. The KCCC disseminates information on climate change, raises awareness, conducts relevant research, and supports national capacity building.

Finally, local governments are also responsible for mitigating and adapting to climate change. In line with national policies, a number of LGUs are taking actions to reduce carbon emissions, and a few large LGUs have obtained carbon finance (e.g., in the Quezon City Landfill Gas Capture project).

The Philippines' Designated National Authority for the CDM is the DENR, which evaluates whether a project contributes to the country's sustainable development and whether the Philippine-based project participants have the legal capacity to participate.²

Disaster management is a natural entry point for work on climate change adaptation. At the national level, the key mandate for policy and overall coordination for DRM rests with the National Disaster Coordinating Council. As a coordinating body, the NDCC does not have its own regular budget. It operates through its member agencies, which include 14 Departments, and through its local networks, which consist of regional and local (provincial, city, municipal, and *barangay*) disaster coordinating councils. It is chaired by the Secretary of National Defense with 14 Department Secretaries, the Chief of Staff of the Armed Forces of the Philippines, and the Director-General of the Philippine Information Agency as members. The Administrator of the Office of Civil Defense is the NDCC Executive Officer, and that office serves as the secretariat and executive arm of the NDCC.

² DENR Administrative Order No. 2005-17 prescribes the national approval criteria for CDM (DENR 2005).

The four-pronged NDCC framework for DRM identifies four agencies to take the lead with respect to the following:

- *preparedness*: the Department of Interior and Local Government (DILG)
- *response*: the Department of Social Welfare and Development
- *rehabilitation*: the Department of Public Works and Highways (DPWH)
- *mitigation*: the Department Environment and Natural Resources.

NDCC is also responsible for mobilizing civil and military resources for ground operations in times of calamities. Although each technical agency has competent staff, the link to policy and funding is weak. This fragmentation of responsibility also leads to poor communication with local stakeholders on the range of actions required to reduce risk, particularly when multiple hazards are faced.

As the Philippines is highly decentralized, local governments are expected to play a primary role in addressing disaster risk. Current policy requires LGUs to mirror the NDCC by establishing a Disaster Coordinating Council (DCC) at each local level, but there are many LGUs that do not have functional DCCs. In most cases, DCCs are only constituted in the immediate pre- and post-disaster phases, when dealing with relief and emergencies. The primary sources of financing for disaster risk management are the national and local calamity funds (around P2 billion and P12 billion respectively, the former constituting about 0.1 percent of the country's national budget of P1.4 trillion in 2009). These funds are primarily intended for post-disaster response, including to human-made calamities. However, in line with current efforts to focus on disaster risk reduction, the Department of Budget and Management and DILG have issued a joint circular allowing local authorities to use their calamity funds for preparedness and mitigation purposes.

Programs, Projects, and Donor Support

Various climate change programs and projects have been undertaken by the country, many with the support of international development agencies. Most of these initiatives are grant-funded and have focused on **capacity building and knowledge generation**. These include the ADB-funded Asia Least Cost Greenhouse Gas Abatement Project, which identified mitigation options; the formulation of the National Action Plan on Climate Change, which designed “no regrets” mitigation measures; and the Enabling Activity on Climate Change Project, which intends to build the capacity of various government institutions to prepare an initial national communication to the UNFCCC.

Most studies and projects funded by development partners have focused on **mitigation**, largely in the energy sector. Forty projects were registered with the CDM Executive Board as of November 2009 (CDM 2009). However, a number of environment programs also have climate change mitigation components. Examples include community-based forest management and air pollution abatement programs, such as ADB's Metro-Manila Air Quality Program. ADB is also sponsoring the Philippine Energy Efficiency Project, which is a \$46.5-million investment in

energy efficacy, including the purchase and distribution of 13 million compact fluorescent lamps (ADB 2009b).

Only recently have climate change **adaptation** interventions begun to receive attention. Activities include the GTZ and the German Environment Ministry–funded €4.25-million three-year Adaptation to Climate Change and Conservation of Biodiversity in the Philippines Project, which seeks to assist in the development of national adaptation and mitigation policies and strategies, the conservation and sustainable management of biodiversity, and preparation for gaining access to funds from international carbon trade. DENR is leading a team of national government agencies, LGUs, nongovernmental organizations, and civil society organizations in these projects.

With funding from the Spanish government, the United Nations is partnering with NEDA and selected national government agencies and LGUs to implement an \$8-million, 2008–10 project on Strengthening the Philippines’ Institutional Capacity to Adapt to Climate Change. This will determine the vulnerability of critical sectors to climate change, strengthen the capacities of key stakeholders in adapting to climate change, and pilot adaptation demonstration projects. In addition, the Coral Triangle Initiative, a new multilateral partnership to help safeguard the marine and coastal resources of the eastern Pacific, has also been launched.

A recent initiative on mainstreaming climate change adaptation is the NEDA project on Integrating Disaster Risk Reduction and Climate Change Adaptation in Local Development Planning and Decision-making Processes, which was launched on October 22, 2009. This is jointly funded by the U.N. Development Programme (UNDP) and AusAID. The project seeks to mainstream the integrated concerns of disaster risk reduction and climate change adaptation into local decision-making and planning processes.

At the LGU level, the U.N. International Strategy for Disaster Reduction—together with CITYNET, the World Bank, the Cities Alliance, UN Habitat, and the Global Facility for Disaster Reduction and Recovery (GFDRR)—is developing a program of support for cities based on the World Bank–developed *Practitioner’s Handbook for Reducing Vulnerability to Climate Change Impacts and Related Natural Disasters in East Asia*. In addition, there is a joint ADB–World Bank–Japan Bank for International Cooperation initiative on Climate Impact and Adaptation in Asian Coastal Cities, which supports the analysis of future climate conditions and assists local governments to adapt their investment plans. Several coastal mega-cities have been identified for analysis, including Bangkok, Ho Chi Minh, Jakarta, Karachi, Kolkata, and Manila.

Ongoing programs for DRM include hazard mapping, early warning systems, parametric insurance, community-based DRM, capacity building, and many others being undertaken by various government agencies, such as NEDA, NDCC, and DILG. These projects are supported by a number of development partner agencies, including AusAID, ADB, the European Union and its DIPECHO, UNDP, GTZ, and Spanish Aid. A number of these programs combine DRM and climate change adaptation measures, and many operate through national agencies. In addition, there

are a significant number of civil society DRM programs, most of which are at local and grassroots levels.

The government of Japan is planning future support to climate change activities and has undertaken a comprehensive review of climate change policies, institutions, and activities. Definitive proposals are not yet available, but preliminary recommendations include support to the Philippine government's work to develop a climate change strategy and efforts to strengthen its capacity for implementation. A program loan from Japan is under discussion (IC and CTI 2009).

2. The World Bank and Climate Change in the Philippines

This section provides an overview of the World Bank’s current activities in the area of climate change in the Philippines. It also spells out key lessons for the future and identifies opportunities in mitigation and adaptation across a number of sectors. Finally, it discusses how the World Bank can make strategic choices among competing proposals.

2.1 Portfolio Overview

Climate change mitigation has been the main focus of efforts to date, and climate change adaptation efforts have largely been focused on disaster risk management. There has been a long-standing engagement on the DRM agenda with respect to both analytical advisory and assistance (AAA) programs and lending—the Philippines is among the top 20 recipients of emergency lending from the World Bank. With respect to non-DRM adaptation programs, a number of ongoing activities in the environment and rural development sector are strongly aligned with the CCA program and could be adapted to include more-explicit CCA activities. The climate change adaptation agenda is severely handicapped by the limited availability of grant funding, and governments do not find it attractive to borrow specifically for such activities (as described later).

The definition of a “climate change project” can be debated. Here it includes any project with a contribution from carbon financing or Global Environment Facility (GEF) financing under the climate change operational program. Other projects may well be relevant for climate change, but the line has to be clearly drawn somewhere. Using this definition, the World Bank has nine climate change projects under implementation, with all but one being on mitigation. The total portfolio cost is about \$165 million, of which carbon finance contributes about \$14 million and GEF \$30 million. The volume of CO₂ covered by Emission Reduction Purchase Agreements is currently about 2 Mt.

The pipeline of projects being considered includes five projects with a total cost of \$105 million, of which carbon finance is expected to contribute about \$44 million and GEF about \$8 million. As funding for climate change adaptation is only just being established, currently no projects can be defined as CC operations. This is expected to change in the near future, and it is therefore likely that funding for specific climate change adaptation projects will become available during the remaining Country Assistance Strategy (CAS) period.

A number of ongoing projects have climate change adaptation elements but were not designed explicitly to tackle adaptation. These projects have the potential to be strengthened to allow more direct support for the CCA agenda. The Bank is also undertaking a number of AAA activities intended to inform the Bank and its clients about CC-related policy reforms and development actions (e.g., Climate Change in Coastal areas, Philippines Climate Change Adaptation Program, Climate Change and Cities). The Bank also has a number of disaster risk

management AAA activities that incorporate related CCA elements (e.g., Local Government Capacity for Disaster Risk Reduction Program funded by GFDRR).

Climate Change—Greenhouse Gas Mitigation

On the climate change mitigation side, the Bank has been active in the sectors of energy, transport, waste management, and community sustainable development.

The **energy** sector has a particularly strong portfolio in both renewable energy and efficiency. There are five active RE projects with a total cost of about \$100 million, including both grid-connected renewable power plants and decentralized rural electrification projects. The former include one wind farm and two geothermal power plants. Two rural power projects have been developed to provide affordable and reliable electricity to rural communities through decentralized renewable technologies such as photovoltaic systems and mini-hydro. The energy efficiency portfolio has two projects with a total cost of \$116 million, addressing both supply-side and demand-side energy efficiency management. One project aims to reduce distribution losses in the electric cooperatives system. The other project aims to improve energy efficiency in chillers used in retail stores.

Other sector activities are much smaller. In the **transport** sector, the Manila bus dispatch and tracking system will be improved by installing radio frequency identification technology to optimize bus-trip-hours. In **waste management**, the Bank has two projects with a total of \$30 million, one to recover methane from wastewater and landfills and another to undertake municipal composting operations. In **forestry**, the Bank has one small-scale demonstration project. This is likely to be dropped because of difficulties in registering the project with the CDM Executive Board.

Climate Change Adaptation and Disaster Risk Management

On the climate change **adaptation** side, the Bank has one project under implementation and another one in the pipeline, with a total cost of about \$10 million. One is Climate Change Adaptation in Coastal Areas—a community-based approach that aims to help local communities reduce their vulnerabilities to climate change impacts and strengthen disaster risk management in coastal areas. The other is the Philippine Climate Change Adaptation Project (PhilCCAP), still in the pipeline for GEF funding. It seeks to develop and demonstrate the systematic diagnosis of climate-related problems and the design of cost-effective adaptation measures, while integrating climate risk awareness and responsiveness into economic and operational planning, particularly in agriculture and natural resources management. The project will also pilot a weather-based crop insurance. More detailed information for each project is presented in the Annex. Closely related to PhilCCAP is the ProVention Consortium grant-funded Agriculture Climate Risk Assessment Project, which provided technical assistance to inform and support the development of appropriate DRM practices for the rice sector in the Philippines.

In addition, the Bank is also undertaking a \$1-million GFDRR-funded local-government-focused project on **disaster risk management** that aims to improve the capacity to assess and manage disaster risk and to address overlaps between DRM and climate change adaptation. The first component of the project has identified 23 provinces at high risk for disasters and will work with a subset of five provinces and a select number of component municipalities or cities to conduct risk identification assessments and develop DRM strategies. A second component of the project will support a study on possible risk finance and transfer options for the government. A follow-up to the current GFDRR program (\$2–4 million) has also been proposed to scale up support to local governments, improve data management, and focus in more detail on improving DRM in Metro Manila.

As noted, a number of ongoing projects or components of projects are also strongly aligned with a climate change adaptation agenda. They include the Mindanao Rural Development Project Phase II (MRDP II), the Participatory Irrigation Development Project (PIDP), the Environment and Natural Resources Management Program, and the Laguna de Bay Institutional Strengthening and Community Participation.

- The GEF grant-funded Coastal and Marine Ecosystem/ Biodiversity Conservation Component of MRDP II seeks to conserve marine and coastal biodiversity while supporting sustainable livelihoods in 11 out of about 206 coastal municipalities in Mindanao, most of which require immediate coastal and marine resource management intervention. It identifies strategies and activities in each of its five subcomponents to address climate change mitigation and adaptation concerns in two GEF programs: biodiversity conservation and land degradation. These include rezoning of agriculture, changing tillage practices, and carbon sequestration.
- The PIDP seeks to improve irrigation service delivery in the Philippines on a financially and technically sustainable basis. The project will ensure that the planning, design, and establishment of this rehabilitated and modernized infrastructure will minimize susceptibility to climate risks. Moreover, the operation and maintenance systems will take weather information and climate change into account. This mainstreaming of climate risk management in the planning, design, and operation of the National Irrigation System and the climate-proofing of irrigation investments will be piloted in the project by PhilCCAP. If successful, these pilots will be replicated and upscaled by the PIDP itself so that climate risk information and considerations are fully integrated in the National Irrigation Agency's decision-making processes.

2.2 New Framework Strategy, Financial Instruments, and Relevance for the Philippines

This section presents the new directions for climate change work within the World Bank Group (WBG) as a background to the launch of new financing instruments, knowledge management, and technology products. In the end, the issue is how the Philippines can best make use of these resources to address climate change in a sustainable manner.

The World Bank's New Strategic Framework

The World Bank Group has adopted a new strategic framework to guide and support its operational response to development challenges posed by global climate change.³

Development and Climate Change: A Strategic Framework for the World Bank Group, issued in October 2008, lays down six action areas for the WBG's work to support both mitigation and adaptation activities for its clients:

1. Support climate actions in country-led development processes
2. Mobilize additional concessional and innovative finance
3. Facilitate the development of market-based financing mechanisms
4. Leverage private sector resources
5. Support accelerated development and deployment of new technologies
6. Step up policy research, knowledge, and capacity building.

The *Framework* is intended to facilitate both growth objectives and poverty reduction goals while recognizing the added costs and risks of climate change. It will also facilitate new financial opportunities that will arise from the development of global climate policies. The *Framework* will guide the specific strategies and business plans of the WBG in climate-sensitive sectors, such as agriculture and natural resources, water, energy, and health.

The *Framework* stresses the need for a set of new financial instruments to tackle climate change for both mitigation and adaptation. Several such instruments are currently being piloted, as explained in the next section. It also emphasizes the importance of Bank involvement in knowledge management and the transfer of new technology (e.g., through projects introducing Bus Rapid Transit (BRT) systems, renewable energy, and landfill gas capture).

Financial Instruments for Mitigation

The **Climate Investment Funds** (CIFs) are an important new source of interim funding through which the multilateral development banks (MDBs) will provide additional funding to developing countries to address urgent climate change challenges. The CIFs were approved in July 2008 with over \$6 billion in pledges. The two CIFs are the Clean Technology Fund (CTF) and the Strategic Climate Fund.

The Clean Technology Fund seeks to scale up financing to contribute to demonstration, deployment, and transfer of low-carbon technologies with a significant potential for long-term greenhouse gas emissions savings. It includes programs in the power sector (renewable energy and highly efficient technologies to reduce carbon intensity), the transport sector (efficiency and modal shifts), and energy efficiency (buildings, industry, and agriculture). It uses a range of concessional financing instruments, such as grants and concessional loans, as well as risk

³ The new framework was presented to the WBG and International Monetary Fund Development Committee on October 12, 2008.

mitigation instruments, such as guarantees and equity. When a country expresses interest in CTF financing, the MDBs concerned will conduct a joint mission, involving other relevant development partners, to discuss with the government, private industry, and other stakeholders how the CTF may help finance scaled-up low-carbon activities. The outcome of the joint mission will be an investment plan, developed under the leadership of the recipient country, for the use of CTF resources in major sectors of the economy through projects with one or several of the participating MDBs. Investment plans will be submitted to the CTF Trust Fund Committee to endorse further development of activities for later approval of CTF financing and to facilitate prioritization of the pipeline projects.

The Strategic Climate Fund provides financing through several pilot programs for new development approaches or to scale up activities aimed at a specific climate change challenge or sectoral response through targeted programs.⁴

- The Forest Investment Program, which supports the investments needed to reduce deforestation and forest degradation and promote sustainable forest management, is under design. An important objective is to maximize co-benefits of sustainable development, particularly in relation to the conservation of biodiversity, natural resources ecosystem services, and ecological processes.
- Another program under consideration would support energy-efficient and renewable energy technologies to increase energy access in low-income countries.

Separate from the CIFs, the **Carbon Partnership Facility** (CPF) is designed to target investment programs that have the potential to contribute significantly to a transformation of emission-intensive sectors in WBG client countries. The CPF makes a market for long-term GHG reductions (at least 10 years beyond 2012). It purchases certified emission reductions under the CDM or other market schemes and offers a platform for systematic collaboration of public and private sector partners from industrial and developing countries. The partnership has two trust funds: the Carbon Asset Development Fund to prepare emission-reduction programs and the Carbon Fund to purchase carbon credits from the pool of emission reduction programs.

The CPF is open for all types of activities that reduce GHG, are suitable for scaling up (i.e., can be replicated as part of a program), and where World Bank involvement would enable or add value to the proposed programs. Examples of the types of programs that can be included in the CPF portfolio include power sector development, energy efficiency, gas flaring, the transport sector, and urban development programs.

The **Forest Carbon Partnership Facility** (FCPF) assists developing countries in their efforts to reduce emissions from deforestation and forest degradation (REDD, see Box 1) by providing value to standing forests. The FCPF has the dual objectives of building capacity for REDD in developing countries and testing a program of performance-based incentive payments in some

⁴ The first program—the Pilot Program for Climate Resilience—would pilot national-level actions for climate resilience in several highly vulnerable countries. Pilot countries have been selected, and the Philippines is not included.

pilot countries, on a relatively small scale, in order to set the stage for a much larger system of positive incentives and financing flows in the future. The FCPF has two separate mechanisms: the Readiness Mechanism to provide technical assistance to interested developing countries, such as estimating carbon stocks and defining reference scenarios, and the Carbon Finance Mechanism to implement and evaluate pilot incentive programs for REDD. Through the latter mechanism, payments will be made to countries that achieve measurable and verifiable emission reductions.

Box 1. Reduced emissions from deforestation and forest degradation (REDD)

Net global deforestation averaged more than 7 million hectares a year during 2000-2005, contributing about 5 gigatons of CO₂ in emissions. The aim of REDD is to lower emissions by paying countries for reducing deforestation and forest degradation. Payments could come from a market-based mechanism, such as the Clean Development Mechanism, or from new financial mechanisms. REDD could make significant contributions not only to carbon sequestration, but also to biodiversity conservation. The main challenge of REDD lies in its implementation, e.g. in measuring changes in emissions with some precision, and agreeing on rules for compensation.

Source: World Bank, 2009e

Financial Instruments for Adaptation⁵

The **Global Environment Facility** has been the main source of grants and concessional funding for adaptation projects, and three funding sources are relevant to the Philippines. GEF is expecting its fifth replenishment during 2010, which may entail additional resources specifically for adaptation.

The **Special Climate Change Fund** under the UNFCCC was established to support activities in adaptation; technology transfer; energy, transport, industry, agriculture, forestry, and waste management; and economic diversification. An initial amount of \$90 million has been pledged, most of which has been allocated to adaptation, plus some to technology transfer. PhilCCAP is an example of a project that is expected to draw on the support of this fund.

The **Adaptation Fund** under the UNFCCC finances adaptation projects and programs driven by and based on the needs of an eligible developing country. Funding comes from a 2 percent “tax” on certified emission reductions issued under the Kyoto Protocol’s CDM. This fund is not yet operational.

⁵ The Strategic Priority to Pilot an Operational Approach to Adaptation funds pilot and demonstration projects that address local adaptation needs and generate global benefits. An initial \$50-million pilot is ongoing, and several projects are under preparation. The assessment here is that this fund is already committed and unlikely to be replenished.

The **Global Facility for Disaster Reduction and Recovery** aims at mainstreaming disaster reduction and climate change adaptation measures in developing countries to reduce vulnerabilities to natural hazards. GFDRR funds disaster risk assessments, risk mitigation policies and strategies, disaster prevention preparation projects, and recovery. The program has three tracks that support global, regional, and country-specific activities.

Knowledge Management for Climate Change

The World Bank is investing heavily in improving the analytical basis for its climate change work. These global knowledge products are shaping the thinking at the regional and country level with respect to how best to address climate change challenges. Several prominent examples can be mentioned.

The *World Development Report 2010* was launched on September 15, 2009 (World Bank 2009e). The report:

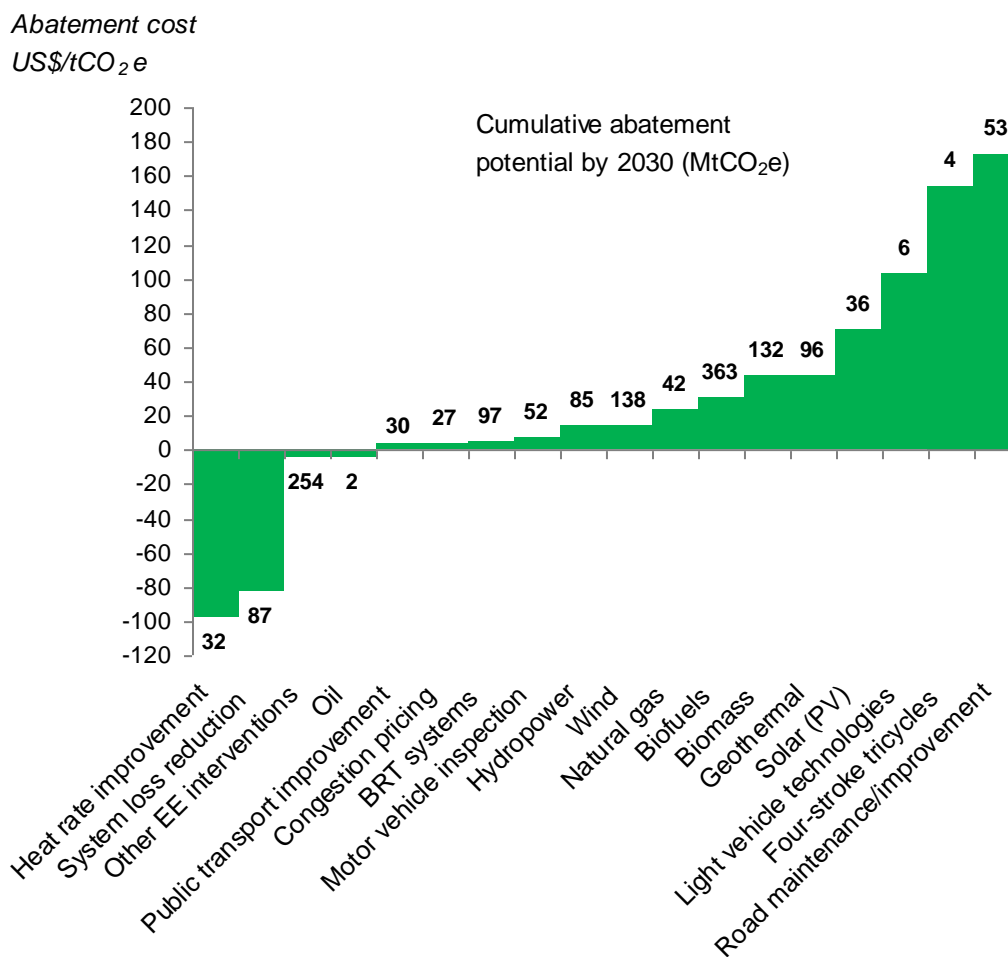
- Makes the case for global action, reviewing the evidence on climate risk and development and discussing how climate change is threatening sustainable development
- Focuses on what climate-wise development policy could look like, taking an integrated look at mitigation and adaptation challenges
- Analyzes options for a supporting international architecture for mitigation, adaptation, and innovation
- Looks at the political economy of climate-wise decision making.

The global *Economics of Adaptation Study*, launched in 2008, aims to promote an understanding of adaptation options and their costs and benefits, including institutional and policy changes. These estimates of the overall budget implications of “climate-resilient development” are essential to enable developing countries to implement their national strategies and address implications for international assistance. The study is based on a partnership between the World Bank and the governments of the Netherlands and the United Kingdom. The “global track” of this study was presented in September 2009 (World Bank 2009d). Seven country case studies are being pursued, although the Philippines is not included. Nevertheless, the results—expected well into 2010—should be of interest to the Philippines in documenting adaptation options and costs.

Low-carbon and energy studies have been undertaken in Brazil, China, India, Indonesia, Mexico, and South Africa, which in different formats lay out options for sustainable growth while reducing GHG emissions. In this general format, a short-term study entitled *An Assessment of Low-Carbon Interventions in the Transport and Power Sectors in the Philippines* was initiated in support of this Strategy Note (Esquerra et al, 2010). This study evaluated the business-as-usual scenario (BAU) and two alternative scenarios referred to as the medium and low-carbon scenarios (Esquerra et al, 2010). The analysis indicates that substantial GHG reductions are possible. In the low-carbon scenario, power sector emissions are just 30 percent and transport sector emissions are 38 percent of the BAU level in 2030. For the power sector, energy

efficiency programs present a huge potential for mitigation, some with negative costs. On the supply side, switching from coal to natural gas, hydro, and wind present a large mitigation potential at a cost of less than \$50/tCO₂e. The cost-effective low-carbon strategy for the transport sector includes diverse measures that promote biofuels, low-cost fuel efficiency improvements, and transport demand management, including Bus Rapid Transit development and urban rail expansion. The high co-benefits associated with the transport mitigation options offset the associated positive investment costs. (See Figure 3.)

Figure 3. Abatement Cost and Cumulative Abatement Potential for the Power and Transport Sectors, 2008-2030^{*,}**



* When co-benefits of transport sector abatement options are taken into account, most of these costs are negative.

** Based on investment costs without co-benefits except heat rate improvements and system loss reduction.

Source: Esquerra et al, 2010.

At the regional and local level, a number of knowledge management initiatives are also under way. For example, the East Asia Region's primer on *Climate Resilient Cities* has become the reference document for cities. In the Philippines, the Climate Change Adaptation Project has carried out analysis of vulnerability to climate risk in the rice sector (RMSI 2008; Tadross 2008)

and options for crop insurance systems (Dick 2008). As part of an ADB–Japan International Cooperation Agency (JICA)–World Bank collaboration, JICA is undertaking a study of climate change impacts for Manila by 2050. The study is not yet completed, but it is expected to estimate climate change–induced damage from flooding, storm surges, and sea level rise. As part of the GFDRR-funded support to the Philippines, the World Bank is also preparing a Disaster Risk Finance Strategy that will highlight options for addressing key risks faced by the country.

Strategic Relevance for the Philippines

The *Country Assistance Strategy for the Republic of the Philippines for the Period FY 2010–2012* (World Bank 2009b) is the first CAS in that country to put climate change and disaster risk management firmly on the agenda. The CAS aims to address disaster risks and related climate change issues through an operational risk management and financing strategy and through the initiation and expansion of climate change adaptation programs in key sectors and at the local government level. Under the disaster risk management and climate change results area, the CAS identifies two outcomes: “disaster and climate change-related risks reduced” and “greenhouse gas emissions reduced through expansion of mitigation program in key sector and LGUs” (World Bank 2009b:24). Based on the issues identified in the CAS, it is proposed that the focus of the climate change strategy builds on three key platforms: financing, access to knowledge, and technology.

Financing. The Philippines has requested the support of ADB and the World Bank to develop an investment plan under the CTF, and this was delivered and approved in December 2009. As there is still some way to go in the development of adaptation funds (e.g., in the outcome of the Copenhagen negotiations of December 2009), the World Bank could help the country tap new adaptation funds by helping to prepare the analytical foundation for getting access to new (adaptation) funds as and when they become available. The World Bank could also help the government strategize how best to tap existing financing instruments, such as by strengthening the Land Bank Carbon Pooling Mechanism as well as by reviewing options for risk finance and transfer (linked to ongoing disaster risk finance work).

Knowledge. The Philippines is currently hindered by poor access to the scientific knowledge required to shape climate change adaptation strategies at the national and local level. Efforts should focus on identifying and quantifying future climate scenarios and on proposing and designing alternative solutions along the lines of the study on weather-based insurance carried out under PhilCCAP. Knowledge on best practices with regard to strengthening predictive capacity in the country (e.g., rainfall gauges), risk modeling at local level, and expanding varieties and species for agriculture and biodiversity purposes is needed as well. The World Bank can also help develop and use tools for raising awareness at the local level, such as the proposed module on climate change to be prepared jointly with U.N. Habitat and the Cities Alliance, with support of the World Bank, drawing on the *Climate Resilient Cities: A Primer on Reducing Vulnerabilities to Disasters* developed by the East Asia Region. A JICA-sponsored study

on climate change impacts in the Manila area by 2050 is still under way, and the World Bank can facilitate its dissemination as part of its coastal cities study program.

Technology. The government has identified access to technological innovation as essential for implementing both the mitigation and the adaptation agenda. For example, the Department of Energy’s action plan outlines a strategy for focusing on renewable energy (including geothermal, wind, biomass, solar, and ocean power), converting coal and oil use to gas, and improving energy efficiency and conservation and energy standards and labeling. Each of these actions would require access to new technology that is economically and financially viable. The Bank can assist by developing projects that take advantage of or help government gain access to cutting-edge technology (e.g., through public-private partnerships) or that finance improvements in infrastructure that are required to reduce risk—including new or innovative technical solutions (e.g., flood-resistant rice or GHG-friendly street lighting), structural or engineering solutions (e.g., BRT for Cebu or new housing designs), and the retrofitting of existing facilities (e.g., drainage or flood structures).

2.3 Sectoral Overview of Opportunities for Mitigation and Adaptation

This section describes how the combination of financing, knowledge, and technological options can be relevant to the mitigation and adaptation agenda.

Mitigation

Although the Philippines is not a major contributor to global GHG emissions, the country’s economy is on a growth path that is likely to lead to much higher emissions in the future, as noted earlier. The financial instruments for mitigation that are now becoming available are designed to allow the country to participate in the global effort to defend itself against climate change and at the same time modernize its economy. If used well, funding and assistance for nationally appropriate GHG mitigation programs can have significant co-benefits: investments that reduce GHG emissions will also help to reduce the country’s dependence on imported fossil fuels, reduce local environmental pollution, and stimulate economic development.

The fact that mitigation programs are optional for the Philippines also means that the country can be selective and strategic in the use of financing instruments. With their help, the country can, for instance, avoid future power shortages and local pollution along with reducing GHG emissions through a modernization of the country’s expanding power generation sector and through demand-side energy efficiency measures. For this to happen, it may be necessary to concentrate the available resources in one or a few sectors and support identified mitigation investments through appropriate planning, policies, and regulatory interventions. A focus on the expansion of total power generation and distribution hand-in-hand with a shift toward renewable energy and energy efficiency improvements on the demand side could have a positive impact on economic and social development goals. And such a “transformational” plan

would likely be the approach that international funding sources would find attractive to support, compared with a more random exploitation of short-term opportunities to supply credits to emission reductions markets.

According to ADB, the Philippines would have a fairly large CO₂ reduction potential at a relatively low cost (ADB 2009a). The marginal abatement cost curve for 2020 shows net negative intervention options amounting to 68 MtCO₂e, or 37 percent of the baseline emissions scenario for that year. Most of this comes from energy savings in the power sector. Another 38 MtCO₂e could be abated by investment costs of up to \$10/ton, according to ADB.

The CTF Investment Plan (World Bank 2009a) adds a significant program on activities in energy efficiency, renewable energy, and urban transport, if approved. The proposal (October 28, 2009) identifies \$500 million of IBRD projects, with an additional CTF funding of \$250 million, within a total package of \$2.5 billion. The priorities include both supply-side and demand-side energy efficiency (including smart grid optimization), renewable energy (biomass, hydropower, solar, geothermal, and wind), and urban transport (BRT corridors, vehicle inspections, urban rail, and biofuels). The Investment Plan was approved by the CTF Trust Fund Committee in December 2009.

Adaptation

As described earlier, the Philippines is at significant threat from the risks associated with climate change. The CC scenarios that are currently being developed imply that the country will face higher adaptation and disaster recovery costs. It is therefore of strategic interest for the country to evaluate its adaptation needs, begin building identified activities into its development and financing plans, and create the capacity to use existing and potentially much larger future funding opportunities for adaptation. The World Bank has started to work with the government to assess disaster risk at the provincial and subprovincial level as a tool for designing specific local strategies. These risk profiles are based on historical data and cannot forecast events associated with climate change. Further work to strengthen the scientific basis for CC risk modeling is therefore required. The outputs of such assessments would complement existing disaster risk profiles by providing further clarity on climate change adaptation implications.

In order to protect development gains and ensure that investments are not destroyed during a disaster or as a result of related climate change impacts, the Bank will need to undertake a more systematic review of its active and pipeline portfolio to determine entry points for climate and disaster-proofing investments. The PhilCCAP program aims to climate-proof key agriculture and rural sector programs, while the human development team is focusing on safe schools and health facilities and the DRM team aims to equip LGUs with the necessary capacity to identify risk reduction priorities, including retrofitting infrastructure, relocating high-risk communities, and building flood control infrastructure. Other infrastructure sector projects for urban development, transport, energy, and water supply and sanitation will also be reviewed for optimal entry points.

Box 2. Climate Change Adaptation Practices in the Philippines

While climate change adaptation is a new or a foreign terminology to most Filipinos, the Philippines, because of its archipelagic geography and location along the Asia-Pacific Ring of Fire, has a long history of adapting to extreme weather events such as typhoons and long droughts. In the agriculture sector for example, farmers have long been planting drought- and pest-resistant crop varieties and have also been practicing crop rotation to manage soil fertility and pest infestation, among others. In disaster-prone areas like the Province of Albay in the Bicol Region, early warning systems have been devised and implemented among communities, especially in high risk areas. In coastal areas, apart from constructing dikes the use of mangroves as tidal and wave barriers are also being practiced. In some islands where water supply is scarce or not available, rainwater collection/harvesting is a common practice.

The remainder of this section outlines opportunities for mitigation and adaptation actions in key sectors.

Energy and Transport

The MTPDP for 2004–10 provides an overview of the transport and energy sectors and the goals, strategies, and action plan for the period. A new plan will be prepared starting in 2010, but the strategies for transport and energy are expected to be maintained. There is also a Philippine Energy Plan prepared by the Department of Energy that is regularly updated and that provides significant inputs to the MTPDP. By contrast, there is no single document that contains the policies and plans for all modes of transport. However, a number of studies were recently undertaken for different transport modes, which provide the basis for transport programs, projects, and activities. The Comprehensive and Integrated Infrastructure Program (CIIP) of the government contains a long list of projects, including transport and power projects. These projects are not clearly aligned with the Philippines' Initial National Communication on Climate Change (PINCC) agenda.

The MTPDP espouses **energy** independence and power sector reforms. To achieve higher energy self-sufficiency, the strategy covers developing renewable energy, including geothermal, wind, solar, hydro, and biomass; expanding the use of natural gas; and increasing the use of alternative fuels such as biodiesel, ethanol, compressed natural gas, and autogas. Energy efficiency and conservation measures include fuel efficiency labeling for motor vehicles, energy labeling for appliances and equipment, energy conservation in government offices, energy management programs and audits to assist industrial and commercial establishments, and heat rate improvement of power plants.

The Electric Power Industry Reform Act of 2001 mandates unbundling the sector into generation, transmission, distribution, and supply; privatization of generation and transmission assets; the operation of a wholesale electricity spot market; retail competition and open access; and continuation of rural electrification. In this setting, private investors will be making the

decision to build generation projects, including size, technology, fuel, and location. Reduction of system losses in transmission and distribution will be the responsibility of the National Transmission Corporation (Transco) concessionaire, private distribution utilities, and electric cooperatives.

For the main grids, total power generation in 2008 was at 31,810 GWh and the generation mix was as follows: hydro, 21 percent; geothermal, 24 percent; gas combined cycle, 21 percent; coal, 28 percent; and diesel/oil, 6 percent. As such, the contribution of hydro and geothermal in the generation mix at 45 percent is relatively high compared with many countries. In off-grid areas, DOE is supporting projects using solar energy to reach un-electrified households in remote and isolated areas.

Recent policy developments include the passage of the Biofuels Act of 2006 and the Renewable Energy Act of 2008. The former mandated the graduated use of biodiesel and bioethanol nationwide and created the National Biofuels Board to oversee implementation of the law and to monitor the supply and utilization of biofuels. The latter act aims to accelerate renewable energy development and increase RE utilization through various mechanisms and the provision of incentives for RE investments.

Existing energy policies and programs in the Philippines embody a number of mitigation opportunities. Their implementation, however, will require consistent follow-through. As the government has allowed an increasing role of the private sector over the years, stronger coordination among players and stakeholders in the energy market becomes all the more important. Issues like cost and financing from the investor's perspective, affordability to consumers, and overall sustainability should come to the fore. The Bank is currently undertaking analytical work to establish opportunities for focusing more effort on renewables.

The **transport** system in the Philippines is dominated by roads. The National Transport Policy and Planning Study estimated that in 2006 roads accounted for 98 percent of passenger traffic. Urban rail use for passenger movement, even in Metro Manila, was minimal, at 2 percent. Motor vehicle registration in the Philippines was growing at an average annual rate of about 6 percent over the period 2000–07, from 3.7 million to 5.5 million.

In line with the MTPDP, the government aims to provide easier access to markets at home and abroad to alleviate poverty in the countryside, to make movement of people faster, cheaper, and safer, and to facilitate decongestion of Metro Manila. The government aims to give priority to infrastructure projects in support of the nautical highways that will stimulate trade and investment as well as tourism and that are affirmative action projects for impoverished and conflict-affected areas. It has established targets that expect the quantity of good-quality roads to increase and that rail-based mass transport and commuter services will be developed in and around Metro Manila. While there is no mention of BRT, the World Bank has been working with Metro Manila authorities and Cebu City to explore the viability of this option.

The opportunities therefore for mitigation in the transport sector that may be evaluated include efficient engine technologies for motor vehicles, a shift to cleaner fuels and stricter vehicle standards and inspection, a shift to more-efficient modes of public transport, and non-motorized transport options.

In the transport and energy sections of the MTPDP, specific strategies on adaptation appear to be lacking. Similarly, the DPWH Medium-Term Public Investment Program for 2005–10, the draft National Land Transport Policy Framework and Strategies led by the Department of Transportation and Communications, and the Philippine Energy Plan 2006 Update of the DOE do not seem to provide strategic guidance on adaptation.

In the MTPDP, an explicit reference to nonstructural and structural measures to mitigate the occurrence of natural disasters is included under Environment and Natural Resources. Nonstructural measures include geo-hazard mapping, soil-stability measures for landslide-vulnerable areas, and integration of disaster preparedness and management in the development planning process at all levels. Structural measures refer to maintaining the conveyance capacities of floodways, canals, and estuaries through riverbank protection, dredging/de-silting, relocation, proper garbage disposal, etc.; they also include large capital investments in flood control and drainage facilities in various areas across the country. Many of these measures can have multi-sector impact and coverage, even for transport and energy, but evidently they do not yet constitute an integrated effort to address the climate change agenda on adaptation. There are opportunities for the Bank to help the government strengthen infrastructures by designing them to withstand heavier rainfall and higher wind speeds, under a climate change scenario in a particular area.

In the Second National Roads Improvement Project, one component of Business Process Improvements is the updating of the DPWH Design Guidelines, Criteria and Specification, which may be adapted to explicitly meet the requirements of a climate change scenario. At the same time, the road information management system of DPWH may be adapted to incorporate more-extensive data on disaster-prone areas, in order to enable DPWH to recommend more-appropriate structural or nonstructural measures. Incidentally, DPWH has formed a technical working group on climate change that now aims to strengthen the adaptive capacity in DPWH by enhancing its planning, programming, and implementation capacities.

The Bicol Power Restoration Project involved the installation of steel transmission towers using a design accommodating higher wind speeds after more than 100 towers succumbed to a typhoon in 2006. This initiative was started by Transco and is expected to be continued by the new private concessionaire, the National Grid Corporation of the Philippines. It may be important to determine whether similar programs are being carried out by distribution utilities and electric cooperatives and to provide funding support for such projects.

Over time, the Bank's environmental and social safeguards can be adapted to account for climate change scenarios, with a view to better identification of CC critical areas and more-appropriate responses on resettlement and relocation. In the short run, climate-sensitive

projects can be reviewed selectively. The Bank can also assist NEDA and the DPWH in reforming relevant standards, improving selectivity in the projects submitted in the CIIP, and strengthening the regulatory functions to ensure that private investments address government priorities.

Agriculture and Forestry

Agriculture also emits GHGs, mainly methane and nitrous oxide from rice cultivation (40 percent of emissions from the sector), soils (tillage, fertilizers), livestock production, and slash-and-burn practices. For the Philippines, agriculture accounts for about one-third of total emissions. Land use change and forestry are also important, but there is still some question regarding the extent of the contribution. Data provided in the PINCC show a small net carbon uptake (DENR 1999). However, data from the authoritative World Resource Institute's Climate Analysis Indicators Tool show a significantly higher starting point and net contribution to GHGs (WRI 2009). Consequently, reducing emissions from agriculture and enhancing the carbon sinks of forests should be an important focus for the climate change mitigation agenda.

Combating land degradation and practicing sustainable forest management and better agricultural land management such as conservation tillage and rehabilitation of degraded cropland are examples of win-win options for carbon sequestration and for achieving more productive and sustainable farming systems.

Livelihood models and payment for environmental services approaches could incorporate carbon finance as a possible source of funding for sustaining the carbon stock. As carbon markets expand, this could be an opportunity for poor smallholder farmers to gain access to new income-earning opportunities. These approaches would make up for the present limitations in CDM coverage for afforestation and reforestation (pending the post-2012 regime).

For forestry itself, the opportunities for projects under the CDM in the Philippines are limited by the small size of individual reforestation projects (which makes them of questionable financial viability for processing), the lack of land considered eligible under the CDM and the difficulty in proving it, the lack of carbon finance as the Bank has no open facility for purchasing credits, and the limited market for buyers relative to other CDM projects. The Philippines has also not asked to be part of the Forest Carbon Partnership Fund and has limited national capacity for the monitoring needed for this program. The main opportunity for the Bank's engagement is with regard to the investment through Bank lending and the Forest Investment Fund. This could leverage current programs to scale up reforestation activities in the country. In terms of carbon finance, exploring the voluntary market for reforestation activities and subnational avoided deforestation may be a way to garner cofinancing for the Bank's national and regional initiatives.

In order to find synergies with the mitigation and environmental management agenda, it is important to strengthen resilience in agriculture and forestry through a programmatic

approach to integrated ecosystem management to protect vital watershed functions and services (which include carbon storage) and secure livelihoods; payments for environmental services and carbon finance should also be included. If incentives are provided in a post-2012 agreement, given the prevalence of land degradation in the Philippines, there is potential for shifting to more-sustainable land uses that increase carbon storage in soils, avoid deforestation, and also increase resilience to climate change. For example, moving farmers away from *kaingin* (slash-and-burn) to conservation tillage and expanding agroforestry practices reduces deforestation and land degradation, while the use of sustainable land management practices can promote greater resilience. Deforestation is extensive in the Philippines, providing scope for greater efforts in afforestation and reforestation programs through various carbon finance options, for example.

With respect to climate change adaptation, the agriculture sector is a key priority. Agriculture is a major contributor to development in the Philippines, as a provider of livelihoods and environmental services and as an economic activity. The environmental services created in particular by watershed management and forest protection include carbon sequestration, for which providers are increasingly being paid and getting access to markets.

Already there is some evidence that rising temperatures and extreme weather events have reduced agricultural yields, though there are mixed results when factoring in future projections. The IPCC *Fourth Assessment Report* states that the production of rice, maize, and wheat in recent decades has declined in many parts of Asia due to increasing water stress partially as a result of increasing temperatures, the increasing frequency of El Niño events, and a reduction in the number of rainy days (IPCC 2007). The same report also refers to a study at the International Rice Research Institute in the Philippines, which observed that the yield of rice decreased by 10 percent for every 1°C increase in growing-season minimum temperature. At the same time, studies by the U.S. Global Change Research Information show that temperature increases of up to 2°C coupled with greater CO₂ concentrations could increase the yields of rice, maize, and soybeans but that beyond a 2°C rise, yields would decline (U.S. Global Change Research Information 2009).

Building on the Philippines Climate Change Adaptation Project, a risk reduction approach could be adopted to address these risks. The following are options for achieving this:

- Climate-proof agricultural infrastructure such as irrigation systems, farm-to-market roads, and trading posts
- Diversify and move into higher-value crops, so as to help smallholders break out of the poverty-environmental degradation cycle
- Provide weather index or parametric agricultural insurance—scaling up the pilot activities to be implemented under PhilCCAP to improve coverage and affordability of risk financing instruments in the agricultural sector
- Reduce farm-level risks—incorporate in existing agricultural programs measures to reduce risks, such as changing cropping sequences; alter cropping patterns and crop mix; improve soil and water conservation; provide access to good seeds and suitable planting materials; strengthen extension services.

Wastewater and Solid Waste Management

The main water polluters by volume are households (33 percent), livestock (29 percent), and industries (27 percent). Over 90 percent of the domestic wastewater is not treated, and 25 million people do not have access to basic sanitation. Treatment systems for industries and livestock are more common, but compliance is still considered low. The Clean Water Act was passed in 2004 and is expected to increase wastewater treatment over the next five years. The World Bank has several projects supporting the implementation of this act at the national regulatory level, in local government infrastructure, and with the private sector.

As the country begins to modernize and improve its wastewater treatment technologies, the CDM could play a crucial role in the adoption of low GHG-emitting technologies, including aerobic systems and anaerobic biogas capture systems. Currently, the common practice is no treatment or adoption of anaerobic open systems (septic tanks, lagoons, ponds, open tanks, etc.). As enforcement and maintenance are weak, the CDM provides a performance-based transparent monitoring framework that could complement regulation and encourage effective operation.

Table 2 provides estimates of the potential emission reductions for each subsector. Data from the International Institute for Energy Conservation and its partners have been used for alcohol distilleries, coconut processing, slaughterhouses, and swine farming (IIEC et al. 2009). Estimates for urban waste and household sanitation were completed by World Bank staff based on data on coverage of different technologies in the country and calculated based on IPCC approaches. Estimates for swine farming and coconut processing include only the main producing regions. The total for this sector is about 8 million tons a year.

Table 2: GHG Mitigation Potential in Wastewater Sector

| Subsector | Million tCO ₂ e/year |
|--|---------------------------------|
| Alcohol distillery | 0.6 |
| Coconut processing (Regions IV, X, XI) | 0.2 |
| Slaughterhouse | 0.01 |
| Swine farming (Regions III, IVA, and VI) | 1.8 |
| Urban wastewater | 3.5 |
| Household sanitation | 2.1 |

Source: IIEC et al. 2009 and World Bank staff estimates.

In response to the Supreme Court ruling to clean up Manila Bay, Manila Water Company Incorporated (MWCI) has looked at feasible ways to accelerate the sewerage service provision in its service area. The government has set targets for MWCI for increasing the scale of wastewater treatment to 100 percent by 2015. In view of this, MWCI and the World Bank are currently holding a dialogue to expand the wastewater treatment facilities and opportunities for scaling up carbon capture programs, with support from the existing financing facilities.

Less than half of the solid waste generated in urban areas is collected. Open burning and dumping are therefore common practices. In response to the Ecological Solid Waste Management Act of 2000, local governments are beginning to close open dump sites and convert them to more modern facilities. Currently, there are 693 open dumpsites in municipalities nationwide. Two sanitary landfills have been constructed and 109 sanitary landfill site proposals are at various stages of development. The law permits these sites to be developed without technologies to abate or avoid the emission of methane. The World Bank has several projects (including the Methane Waste Recovery Project) supporting implementation of the Ecological Solid Waste Management Act at the national regulatory level, in local government infrastructure, and with public-private arrangements.

The government has emphasized the need to convert all open dumpsites to sanitary landfills over the next five years. These dumpsites and the new landfills that will be developed are potential methane capture sites. However, the opportunity to incorporate landfill gas facilities into closed dumpsites and new landfills may be lost due to delays in the second commitment period for CDM. Currently 4 sites could accommodate large facilities, 15 sites have the potential for medium-sized facilities, and 14 sites are marginal in terms of waste but may accommodate small facilities. Regional/shared, LGU-shared facilities may also have potential, and composting could be implemented in smaller disposal sites. The overall potential for these sites is estimated in Table 3. The estimates are based on waste projections in Philippine cities and are calculated in cities with enough waste to support a facility using IPCC methodologies. The total for the sector is about 2–6 million tons a year.

Table 3: GHG Mitigation Potential in Solid Waste Management Sector

| Subsector | Million tCO₂e potential/year |
|----------------------------------|--|
| Closed dumps | 0.75–1.5 |
| New sanitary landfills | 1.0–2.0 |
| Composting, small disposal sites | 0.5–2.0 |

Source: World Bank staff estimates.

The Bank has supported the Land Bank of the Philippines to expand its capacity for carbon finance pooling by developing tools for clustering small LGU projects under a single operation. The first Project Idea Note has been developed, and it is hoped that this will be the starting point for an expanded program of support to other LGUs and small projects around the country. The ongoing Strategic Support for Local Development and Improvement Project has three subprojects under development.

The Bank is also working with the government to pilot a Design-Build-Operate instrument for sanitary landfills. The first one built under this facility is operational (in San Fernando City), and it is expected that several others will be built. Currently, the city of General Santos is processing bids for a similar landfill. Both landfills will be fitted with gas capture systems.

Finally, the Bank is working with the government to establish a grant facility for support to LGU sanitary landfill construction that will provide LGUs with the financial incentive to establish sanitary landfills and related methane capture facilities.

Groundwater Resources Management

Groundwater and surface water have equal importance as sources of water supply in the Philippines. Irrigation is the largest user of water from all sources, accounting for 80 percent of the total utilization. While surface water is still the main source for urban water supply, meeting 60 percent of the total demand in the Philippines, its quality and availability is under threat due to catchment degradation (siltation of reservoirs) and pollution, making the investment costs of treatment and operation extremely high.

Groundwater is increasingly becoming an important source of drinking water. It currently meets 40 percent of total demand in the country and is relied upon by 75 percent of utilities (most small utilities rely on groundwater). It is the cheapest source of water in most parts of the Philippines and, given that small towns and cities account for the bulk of urban population growth, will continue to play an important role in future. The management of groundwater resources is therefore a priority.

Based on the water rights granted by the National Water Resources Board (NWRB) since 2002, 49 percent of groundwater is consumed by the domestic sector and the remainder is shared by agriculture (32 percent), industry (15 percent), and other sectors (4 percent). About 60 percent of groundwater extraction is without water right permits, resulting in indiscriminate withdrawal. A high percentage (86 percent) of piped-water supply systems uses groundwater as a source. In terms of sectoral demand, agriculture has a high demand of 85 percent, while industry and the domestic sector have a combined demand of only 15 percent.

The 1998 master plan identified nine groundwater-constrained or critical areas in the country, and this number is expected to have increased since then. Two of the largest urban areas (Metro Manila and Metro Cebu) were subjected to in-depth water resources assessment. The study shows that water resources in Metro Manila are rapidly being depleted, leading to subsidence, saltwater intrusion, and contamination from sewage and industrial pollutants. (See Box 3.)

Box 3: Water Resources Assessments

In Metropolitan Manila and its immediate suburbs, groundwater mining (when the withdrawal rate is greater than recharge) is rampant (NWRB 2004). At the present withdrawal rate, the Metro Manila aquifers have been depleted at a rate of 6,195 cum per day. There were 2,206 registered wells recorded in the 2,212 km² study area. An additional 456 wells were registered after the study as of 2008, a yearly average increase of 4.8 percent.

NWRB's study indicated that groundwater mining has resulted in a lowering of the groundwater level and seawater intrusion. The groundwater level in Metro Manila was above mean sea level in the early 1980s and had fallen to as much as 60 meters below mean sea level by 2004. Only in San Juan City is groundwater still above the mean sea level. Critical areas (where groundwater level is at its lowest) are found in Muntinlupa, Paranaque, Pasig, Quezon City, and Caloocan. In fact, there is currently a moratorium on the issuance of water permits in these areas, particularly those covered by the existing service of the Manila Waterworks and Sewerage System (under concession agreement with private sector, Manila Water and Maynilad).

Land subsidence in Muntinlupa City has also been observed and is attributed to overabstraction of groundwater. The subsidence extends up to the adjoining town of San Pedro, Laguna. The same is also suspected in Malabon-Navotas area, which is always submerged in water. The study also noted that seawater is advancing toward the land. Salty groundwater is now a problem in Paranaque, Pasay, Manila, Malabon, and Navotas.

Source: NWRB 2004.

More than 40 million people who live in coastal regions will be threatened with seawater intrusion/flooding, groundwater salinity, and other effects of rising sea levels. The effects of global warming, such as the lowering or depletion of groundwater table, seawater intrusion, and land subsidence, need to be mitigated. Hence, there is a need to expand the assessment of groundwater nationwide and come up with a groundwater management plan that outlines appropriate actions and strategies suitable in different parts of the country.

In view of the worsening situation, in April 2008 the Bank invited the Groundwater Management Advisory Team (GWMATE) under the Water Anchor's Expert Support Team to conduct a scoping mission. The mission confirmed the risks of global warming on groundwater and its impact on water utilities. GWMATE proposed the development of a comprehensive groundwater management system that will lay out strategies to mitigate exposure to changes in precipitation, increases in temperature, and sea level rise.

Urban Development

With an annual growth in urban population of 5.1 percent between 1960 and 1995, the Philippines had one of the highest rates of urban growth in the developing world. About 60 percent of the population currently lives in urban areas, and this is set to reach 75 percent by 2020. Demographic growth and rapid urbanization have also affected the provision of basic services in many cities that now face difficulties meeting demands for services such as water supply and sanitation, health care, and solid waste management. These conditions are expected to continue to deteriorate over time if steps are not taken to better manage natural disaster and climate change risks.

Rising urban poverty and the proliferation of unplanned, informal, and overcrowded settlements—often located in hazard-prone areas—is a growing problem. As of 2002, the Philippines had categorized about 1.2 million informal settlers as vulnerable to the impacts of typhoons and flooding, which are hydro-meteorological events likely to be exacerbated by climate change. In addition, four of the top six cities worldwide at risk of intensification of storm surges are in the Philippines: Manila, San Jose, Roxas, and Cotabato (Dasgupta et al. 2009). The Philippines is expected to experience a substantial rise in sea levels and storm surges, triggering losses of up to 52 percent of the GDP produced in coastal areas that contain agricultural croplands, urban extent, and wetlands. It is expected that sea level rise will affect 46 percent of the population in coastal areas, with 43 percent of coastal urban areas affected (Dasgupta et al. 2009).

The Bank has been working with the government over the past several years to build up a comprehensive program focusing on disaster risk management. With the imminent threat of climate change, the 2009 CAS includes DRM and CCA as a joint results area under the umbrella of the vulnerability reduction pillar. As per the CAS, the Bank commits to work with the government to reduce poverty and increase welfare, sustainably manage the environment and natural resources, reduce disaster and climate risks, and improve recovery management. In support of the CAS, the Bank is supporting the following series of urban-focused initiatives to help the government enhance its resilience to future disasters and climate changes impacts across a range of sectors—city planning and management, energy efficiency, and transport.

Building Capacity of LGUs to Address DRM and CC. The Bank is working with DILG and NDCC to identify vulnerable local governments based on historical hazard incidence, exposure, and capacity and to develop a program for building local government capacities to address DRM and CCA. As a result of the initial risk mapping exercise, 23 provinces at high risk to impacts of natural disasters have been identified. Five of these provinces and select component municipalities or cities will initially be supported to conduct risk identification assessments and develop strategic DRM and climate change adaptation strategies to reduce their risk over time. This program will likely be expanded based on demand and the availability of future funding (an additional \$2–4 million has been requested).

Integrating DRM and CC into City Development Strategies. As convergence of action on DRM and CCA occurs at the local level, the Bank is planning to develop a module for the city development strategy program to ensure that a city’s hazard exposure, vulnerability, capacity to deal with risks, and resources for investment planning and budgeting are factored into the comprehensive development plans and corresponding budgets. The outcome would be the development of a climate- and disaster-sensitive investment plan that could be funded through local budgets by donors and other development partners, the private sector, or the national government. The methodology for the module would be based on the *Climate Resilient Cities* primer (World Bank 2008a), which is a tool to help city officials determine a city typology based on existing socioeconomic and hazard data and which provides practical tools for cities to reduce vulnerabilities to climate change as well as curb GHG emissions without sacrificing growth potential and investment opportunities. An additional entry point for this integration is

the recently launched UNDP/AusAID–supported NEDA project on Integrating Disaster Risk Reduction and Climate Change Adaptation in Local Development Planning and Decision-making Processes.

Ecological and Economic Development Strategy Program. The Bank is piloting several climate change activities in Quezon City that will focus on upgrading building design, standards, and regulations to take CC implications into account. The Bank is currently supporting the preparation of an Economic Development Strategy that takes into account ecology. As part of this effort, the Cities Alliance/Energy Sector Management Assistance Program’s Energy Efficient Cities Initiative will pilot a Rapid Assessment Framework that will identify innovative ways to improve energy efficiency. Information gathered from this effort will be used to inform the revision of building codes and standards, zoning ordinances, and other local legislation in order to scale up lessons for city-wide application.

For coastal areas, a proactive approach is needed to enhance the resilience of built environments to the effects of climate change. People living along the coastlines have adapted to variations in climate, but their ability to adapt is highly determined by their level of development and their access to resources and information. The joint World Bank–JICA study on climate change impact in Metro Manila will provide an important knowledge base on which to build more forward-looking infrastructure investment programs. In addition to this, efforts to strengthen community-based adaptation are ongoing.

The Community-based Adaptation Project in Coastal Areas, funded by a Norwegian Trust Fund, helps the national and local governments finance and mainstream climate adaptation solutions in their local government policies, plans, and programs. The project aims to ensure the delivery of drought and flood protection measures, preparedness systems, climate information, and effective conflict-mitigation mechanisms. The LGUs have also extended their steady support to civil society and local communities to build strong and representative organizations. Other areas that the project is focusing on are the rehabilitation of natural systems to withstand the effects of climate change and the creation of alternative livelihoods and safe settlements.

2.4 Strategic Choices, Costs, and the Way Forward

This final section sets out some criteria for strategic choices, gives some indications of what adaptation and mitigation might cost, and concludes with a set of recommendations for the way forward.

Criteria for Strategic Choices

The previous section has outlined a large number of opportunities. How can the World Bank make strategic choices among them? As in other sectors, there can be no mechanical formula for setting priorities in climate change operations. However, some rigor can be imposed in

“filtering” the many ideas for activities that are presented or are developed internally. A driving force behind this CC strategy is the sense that there is inadequate strategic focus in the efforts to date. A “checklist” of considerations can provide some insurance against that risk by improving selectivity and impact. The checklist should be used by the Country Team members involved in Strategic Objective 4 to filter activities that are supported over the duration of the CAS. The overriding considerations and key questions to ask before embarking on an activity are the following:

- **Client buy-in:** Is there alignment with government strategy? For the time being, this will have no clear answer as the government is developing one, but this will change over time. Is there an institutional champion? Is there sufficient counterpart capacity?
- **CAS alignment:** Is the activity well in line with the outcomes and result indicators agreed to in the CAS?
- **Scale of impact:** Given scarce resources of manpower and finance, the impact needs to be maximized.
- **Comparative advantage:** Is the Bank well placed to help the government address the issue? What can the Bank offer in a timely and effective manner? What are other donors doing that would compete with this effort? Where can partnerships be developed to add value or strengthen impact?
- **Cost efficiency:** For mitigation, what is the cost per tCO₂e abated or sequestered? In principle, interventions in energy, transport, agriculture, and so on can be compared with respect to the marginal cost per tCO₂e. For adaptation, the issue is not that simple, but it is possible to ask how the activity is related to the relevant vulnerability assessments. The emerging vulnerability assessment done by the World Bank does have an ordinal ranking scale to determine vulnerability, which can serve as a priority-setting guide.
- **Staff resources:** This is often a major constraint, as staff are already stretched thin. Does the necessary management capacity exist? What is the opportunity cost for taking on the new activity?
- **Financial resources:** The supply of finance constrains the feasible set of options significantly. How does the proposed activity fit with the objectives of the relevant CC instruments? What is the scale of financing required? Is the required overhead expenditure reasonable given the scale of the final operation?
- **Risks:** This is a standard feature of World Bank project preparation, and in principle the same for climate change projects. What is the likelihood and impact of failure? Can the risks be mitigated?

How Much Will It Cost?

Before advancing detailed proposals, it may be instructive to reflect briefly on the costs involved. No precise estimates can be done due to the uncertainty of the impacts of climate change, but rough orders of magnitude can be provided. The main conclusion is that much can be achieved at costs that are small in comparison with the overall size of the economy or the size of baseline investments.

The costs of **adaptation** will depend greatly on the degree of climate change, but some estimates are possible. A recent study estimated the global costs for adaptation (2010–50) in several forms (World Bank 2009d). The three most costly areas are coastal zones, infrastructure, and water supply and flood protection. The study is global; no country-specific estimates were done. For coastal zone adaptation, the increased costs of adaptation were estimated for different categories of countries. Using the estimates for “deltaic and small island states,” the average annual cost is on the order of 0.01 percent of GDP.⁶ For infrastructure, the costs are calculated by region and in relation to the baseline investment scenario. The increase in costs for adaptation in East Asia is less than 2 percent of the baseline infrastructure investment. The water supply and flood protection costs for East Asia are about 10–20 percent of the increased costs for infrastructure.

For **mitigation**, a 25-percent reduction in cumulative GHG emissions from the power sector until 2030 would cost about 5 percent more than the baseline. A 50-percent reduction would increase the cost by about 15 percent. Comparative figures for the transport sector are not available. But a reduction of those cumulative emissions of 25 percent would cost about \$11 billion (more than 500 billion pesos) in cumulative investments until 2030, and a 50-percent reduction would cost about \$26 billion (1,200 billion pesos) (Esguerra et al. 2010).

The Way Forward

The Climate Change Act of 2009 provides the foundation and legal basis for pursuing the climate change agenda of the country. It is an excellent step toward addressing institutional issues and formulating a coherent strategy that can be used to develop and implement action plans that are well coordinated, fully funded, and with measurable outcomes.

With support from development partners and international agencies, it is critical for the government of the Philippines to seize the momentum and take certain actions.

Implement the Climate Change Act and Strengthen Institutions and Coordination. The Climate Change Act has been signed and the Climate Change Commission has been created recently, although it has yet to establish its Climate Change Office to support the work of the new Commission. In addition, the implementing rules and regulations of the law have also been promulgated recently. With these positive developments, the following actions need to be undertaken to keep the momentum going such as:

Strengthening the Climate Change Commission and Creating the Climate Change Office, with

⁶ Using GNP data (2008) from the Central Bank of the Philippines, this would correspond to about 825 million pesos, or some \$18 million per year.

qualified staff and adequate funding. The Climate Change Commission has recently been formed but not the Climate Change Office that will support the Commission in implementing the law. The law's implementing rules and regulation (IRR) that provides the legal procedures and processes to effectively implement the law have also recently been promulgated. With these positive developments, it is critical for the Commission to establish the Climate Change Office with adequate funding and staffed by qualified personnel. Training and capacity building for the Office will need to be done.

Developing the guidelines of the law's implementing rules and regulations (IRR). While the IRR has already been promulgated, this needs to be supported by clear guidelines to effectively implement the law and to also delineate functions and responsibilities of the Commission vis-à-vis sector agencies, including NEDA. In developing the guidelines, it is critical to consult various stakeholders.

Articulating a national climate change strategy and developing an action plan. The Philippines is very active in the climate change agenda in both the local and the international arena. However, the country lacks a clear and coherent government strategy on climate change. The new law recognizes this shortcoming and calls for the formulation of the strategy, which will be the basis for developing the priority action plan for a well-coordinated and fully funded implementation.

Improving donor coordination. With the new Commission leading and coordinating the climate change agenda in the country and guided by the CC framework and action plan, it can also direct donor agencies and international organizations to closely coordinate and align their work and assistance with the Government's action plan. The Philippine Development Forum is a good venue to improve donor coordination.

Increasing awareness of Sector Agencies and Local Government Units on climate change and strengthening their capacity on mitigation and adaptation. There is also a need to increase the awareness of sector agencies and LGUs on climate change and strengthen their capacity on mitigation and adaptation in line with the recommendation to mainstream climate change in sector and local government policies, plans and programs.

Focus Government Resources and Attention on Adaptation and Preparedness. Given the country's vulnerability and experience on extreme climate-related events in the past 10 years, the government should focus its resources and attention on adaptation and disaster preparedness. To this end, the following needs to be done.

Mainstreaming adaptation and disaster risk management in key national, subnational, and sectoral development policies, plans, and programs. At present, climate risk concerns are still not mainstreamed at the national, subnational, and sectoral levels, although a number of sectors and a few LGUs (e.g., Province of Albay, Makati City) have started doing this. The government can use the existing review and approval process of sector programs and projects by the National Economic Development Authority–Interagency Coordination Committee to mainstream climate change in programs and projects. This group's review guidelines can be

amended to include mainstreaming of climate change into any programs and projects proposed by sector agencies. In line with this, NEDA should also revisit the formula of computing a project's financial internal rate of return to take into consideration the additional cost and benefits involved in protecting investments from the impacts of climate change. For example, designing climate-resilient irrigation systems and farm-to-market roads may entail reduction in the project's overall financial internal rate of return under the current formula used by NEDA because of the additional investment cost. The long-term gains, however, of protecting investment from climate change impacts may outweigh the initial cost.

NEDA will also soon start preparing for the successor of MTPDP, which will start in earnest after the national elections in May 2010. This presents a good opportunity to mainstream CC and DRM into key decision-making processes by providing the government with the results of relevant studies and by offering further technical assistance, such as the establishment of CC scenarios for development planning, programming, and project evaluation purposes, expert support, and aid for stakeholder consultations.

At the LGU level, mainstreaming can take place in many different ways. One is through the LGU's comprehensive land use plan required under the Local Government Code. Another is through the five-year development plan and the annual investment plan of the LGU. The government and funding institutions may require mainstreaming before agreeing to finance any investment at the local level.

Improving and building capacity for disaster preparedness, response, post-recovery, rehabilitation, and long-term reconstruction. The government's focus is on strengthening the capacities of institutions, especially at the local level, to reduce vulnerabilities to the impacts of natural disasters and to better manage disaster risks. Government programs should also include post-recovery, rehabilitation, and long-term reconstruction to ensure that displaced individuals will be able to reestablish their normal way of life in a timely manner. The country's disaster management system is mostly reactive, and natural hazard risk management is not well integrated into development planning. A few local initiatives exist, such as those in the province of Albay, which is taking a strong initiative to promote climate risk management and disaster preparedness. This is the first LGU to work on disaster- and climate-proof adaptation measures, including strengthening and improving evacuation sites, introducing climate change into school curricula, and training local officials. The country's poor preparedness to respond to natural disasters was exposed by the recent strong typhoons Ondoy and Pepeng, which inflicted damages and losses on the order of \$4 billion, or almost 3 percent of GNP (Philippines 2009).

Protecting key infrastructure and livelihoods against climate change impacts. Despite the country's vulnerability, past and current interventions have focused largely on mitigation, and only recently has adaptation received attention. The Philippine Climate Change Adaptation Project is a key step toward helping the agriculture and natural resource management sectors be more climate-resilient. What this means is identifying risks (hazard, exposure, vulnerability) to specific assets as a result of climate variability and change and making sure that those risks are lowered through modifications of investment in a manner that is technically and

environmentally sound, economically viable, and socially acceptable. For example, in the design for repair or construction of irrigation systems rather than business as usual, climate risks can be included to make the systems more resilient. This may mean an upfront investment cost but savings over the long term because of the resilience of the system and the potential reduction in future rehabilitation and maintenance costs. The approaches developed could then be replicated elsewhere in the Philippines. Currently, infrastructure is designed based on historical climatic records. But future infrastructures will need to be designed based on predicted temperature changes and concomitant impact, and existing ones will need to be protected against the impacts of climate change.

Developing financing facilities for adaptation and disaster response. There is still some way to go in the development of significant international adaptation funds. The climate change negotiations in December 2009 resulted in the Copenhagen Accord, which takes note of the collective commitments by industrial countries to provide new and additional resources “approaching USD 30 billion for the period 2010-2012 with balanced allocation between adaptation and mitigation” (UNFCCC 2009).

While the details of the Accord are being worked out, the government can explore innovative mechanisms to finance adaptation and disaster response. One mechanism is taxation of GHG-emitting or -polluting sources, such as coal-fired power plants, based on every kilowatt of power produced, or a “green tax” on gasoline. The funds collected could be earmarked for adaptation programs. The principle is very similar to the Royalty Tax imposed under Energy Regulation 1-94 of the Department of Energy, which requires energy projects to set aside a small percentage of the proceeds based on per kilowatt generated to electrification and reforestation programs. Another mechanism is the taxation of CDM projects to finance adaptation activities. An example of this is the HFC-23 project in China, where the government established regulations that set aside 65 percent of the revenues of HFC-23 CDM transactions to constitute a CDM fund. Other innovative financing that can be explored include allowing individuals and firms to allocate up to a certain percentage of their income tax to adaptation activities and programs. A law could be passed to support this mechanism. This was done in Guayaquil area in Ecuador for environmental cleanup work. Another option is for companies, as part of corporate social responsibility, to implement adaptation programs or set aside a certain percentage of their revenues to support adaptation activities.

Undertake Selective Climate Change Mitigation Programs in Key Sectors. Despite the Philippines being a minor emitter of GHGs, selective mitigation programs can be undertaken in sectors where emissions are on the rise. These include energy, transport, and waste sectors, which show a strong emission increase under the business-as-usual scenario. The implementation of mitigation programs—albeit selectively—will help the country sustain growth via a low-carbon pathway while attaining local environmental benefits through improved environmental quality. New mitigation financing instruments are available, particularly the Clean Technology Fund and the Carbon Partnership Facility (as described earlier, and see Annex). The Philippines already has an approved Investment Plan under CTF (World Bank 2009a). This plan entails CTF cofinancing of \$250 million to support scaled-up

distributed generation with renewable energy resources and to address transmission constraints through demand-side management. The Investment Plan will also implement the government's National Environmentally Sustainable Transport Strategy, which aims to reduce energy consumption in the transport sector. The CTF investments will mobilize financing of about \$2.5 billion from the government, MDBs, carbon finance, and the private sector.

Sustainable transport and renewable energy are among the programs identified under the Philippine Investment Plan to be financed by the CTF, which is blended with concessional financing from multilateral agencies like the World Bank Group and ADB. The BRT projects in Metro Manila and Metro Cebu are good candidates for the CTF. Energy-efficient building and street lighting planned for in big cities like Quezon City and Marikina City can also be supported by the CTF, as well as the development of renewable energy sources such as geothermal and wind.

Waste management is another candidate for CPF assistance. There is potential to develop the programs of activities for treatment systems for distillery waste, slaughterhouse waste, and domestic wastewater. The biggest challenge is to find a managing and coordinating entity that could develop the programs. Institutions such as the Development Bank of the Philippines and the Land Bank of the Philippines are good candidates for this because of their role in providing financing to project developers. The financing package they offer could include gaining access to carbon credits for eligible projects through enrolment under the CPF's program of activities.

A programmatic/wholesale approach to developing the program would be key, as opposed to developing and processing individual projects. The approach is more efficient and allows small-scale interventions to participate and benefit from the carbon market. An example of this approach is the program of activities for pig waste treatment system and for sanitary landfill developed by the Land Bank of the Philippines.

References

- ADB (Asian Development Bank). 2009a. *The Economics of Climate Change in Southeast Asia: A Regional Review*. Manila.
- . 2009b. *Proposed Loan and Administration of Grant. Republic of the Philippines: Philippine Energy Efficiency Project*. Manila.
- Central Bank of the Philippines. 2009. GNP/GSP by Industrial Origin. Accessed July 12. http://www.bsp.gov.ph/statistics/spei_new/tab44.htm.
- CDM (Clean Development Mechanism). 2009. Accessed June 10. <http://cdm.unfccc.int/Projects/projsearch.html>.
- Dasgupta, S., B. Laplante, S. Murray, and D. Wheeler. 2009. *Sea-Level Rise and Storm Surges: A Comparative Analysis of Impacts in Developing Countries*. World Bank. Washington, DC.
- DENR (Department of Environment and Natural Resources). 1999. *The Philippines' Initial National Communication on Climate Change*. Manila.
- . 2005. Administrative Order No. 2005-17. Manila.
- Dick, W. 2008. *Review of Risk Financing (Insurance) and Development of an Action Plan for Improved Risk Management. Philippines Climate Change Adaptation Project*. World Bank and ProVention Consortium. Processed.
- EMDAT (Emergency Events Database). 2009. Centre for Research on Epidemiology. Accessed June. <http://www.emdat.be>.
- Esguerra, G., C. Tiangco, S. Custodio, and N. Gabiola. 2010. *A Strategic Approach to Climate Change in the Philippines: An Assessment of Low-Carbon Interventions in the Transport and Power Sectors*. Manila.
- Hulme, M., and N. Sheard. 1999. *Climate Change Scenarios for the Philippines*. Climatic Research Unit, Norwich, UK.
- IC Net Ltd and CTI Engineering International Co. Ltd. 2009. *Preparatory Study for Projects on Measures against Climate Change. The Republic of the Philippines. Progress Report*. Study team for JICA. Manila. Processed.
- IIEC (International Institute for Energy Conservation), Eastern Research Group Inc., and PA Consulting Group. 2009. *Resource Assessment for Livestock and Agro-industrial Wastes—Philippines*. Prepared for the US EPA Methane to Markets Program.

- IPCC (Intergovernmental Panel on Climate Change). 2007. *Fourth Assessment Report*. Cambridge University Press. Cambridge, UK.
- NDCC (National Disaster Coordinating Council). 2008. *National Assessment on the State of Disaster Risk Management of the Philippines. Final Report*. Manila.
- . 2009. Accessed June. <http://ndcc.gov.ph>.
- NEDA (National Economic and Development Authority). 2008. *The Updated 2004-2010 Medium-term Philippine Development Plan (MTPDP)*. Manila.
- NSO (National Statistics Office). 2009. Employment by Major Industry Group. Accessed July 12. <http://www.census.gov.ph/data/sectordata/datalfs.html>.
- NWRB (National Water Resources Board). 2004. *Water Resources Assessment for Prioritized Critical Areas. Phase 1: Metro Manila and Metro Cebu*. Manila.
- Philippines. 2009. *Typhoons Ondoy and Pepeng: Post-Disaster Needs Assessment*. November 26. Processed.
- RMSI. 2008. *Mainstreaming Climate Risk Management for the Agricultural Sector in the Philippines: Hydro-Meteorological Risk Assessment and Climate Analysis*. Noida, India. Processed.
- Tadross, M. 2008. *Climate Analysis and Technical Assistance for Climate Modeling*. Processed.
- U.S. Global Change Research Information. 2009. Accessed June. <http://www.gcrio.org>.
- United Nations Secretariat. 2007. Population Division of the Department of Economic and Social Affairs. *World Population Prospects: The 2006 Revision and World Urbanization Prospects and the 2007 Revision*. New York.
- UFCCC (United Nations Framework Convention on Climate Change). 2009. *Copenhagen Accord. Decision -/CP.15. Advance unedited version*. Copenhagen. <http://unfccc.int/2860.php>. Accessed December 28.
- World Bank. 2003. *Environment Monitor*. Washington, DC.
- . 2008a. *Climate Resilient Cities: A Primer on Reducing Vulnerabilities to Disasters*. Washington, DC.
- . 2008b. *Development and Climate Change: A Strategic Framework for the World Bank Group*. Washington, DC.

———. 2009a. *Clean Technology Fund: Investment Plan for the Philippines*. Draft, October 28. Washington, DC.

———. 2009b. *Country Assistance Strategy for the Republic of the Philippines for the Period FY 2010–2012*. Washington, DC.

———. 2009c. *Country Environmental Analysis*. Washington, DC.

———. 2009d. *The Costs to Developing Countries of Adapting to Climate Change: New Methods and Estimates*. Global Report of the Economics of Adaptation to Climate Change Study. Consultation Draft. Washington, DC.

———. 2009e. *World Development Report 2010: Development and Climate Change*. Washington, DC.

WRI (World Resources Institute). 2009. *CAIT Yearly Emissions. Climate Analysis Indicators Tool (CAIT) Version 6.0*. Accessed November 7. <http://cait.wri.org/cait>.

Annex. World Bank Climate Change Portfolio

Climate Change Mitigation

Renewable Energy

- *PH Northwind Banguì Bay Project*

Objective: To enhance both the quantity and reliability of power supply in the region through the insertion of power at the end of a long power transmission line where voltages are now weak. In addition, as the first wind farm project in the Philippines, the project will have a significant demonstration effect in accelerating the commercialization of wind power. It will also contribute to greenhouse gas (GHG) emission reductions through the avoidance of thermal power generation.

Main Activities: (1) Build 15 wind turbines of 1,650 kilowatt-hours (kW) rated capacity each, totaling 24.75 megawatts (MW). Annual energy production is estimated to be 74.48 gigawatt-hours (GWh). (2) Construct a 50-kilometer (km) 69-kilovolt (kV) overhead transmission line to deliver the power to the switchyard of the offtaker in Laoag City. All power produced will be sold to the Ilocos Norte Electric Cooperative through an electricity sales agreement signed in 2002.

Financing: The total project cost is \$31.4 million, of which \$1.4 million is from carbon finance.

Time: The project became effective in 2004 and the expected closing date is 2012.

Task Manager: Dato, Victor

- *PH Nasulo Geothermal Power Project*

Objective: To help commercialize renewable energy applications and markets at the grid-connected level to reduce GHG emissions while responding to increasing energy demand and the need for energy diversification through developing a 20-MW geothermal energy project.

Main Activities: (1) Development of a 20-MW geothermal field, including the drilling of 1 production well and the construction of the corresponding fluid collection and reinjection system. (2) Construction, installation, and commissioning of a 20-MW geothermal power plant with gas abatement facility. (3) Construction of a switching station at Nasulo to interconnect with Transco's 138-kW transmission lines.

Financing: The total project cost is \$25 million, of which \$4 million is from carbon finance.

Time: The project became effective in 2005 and the expected closing date is 2012.

Task Manager: Dato, Victor

- *PH-PCF-Northern Negros Geothermal Power*

Objective: To help commercialize renewable energy applications and markets at the grid-connected level to reduce GHG emissions while responding to increasing energy demand and the need for energy diversification through developing a 40-MW geothermal energy project.

Main Activities: (1) Drilling of 15 production and 3 reinjection wells. (2) Construction of a fluid collection and disposal system. (3) Construction of a geothermal power plant with nominal

capacity of about 40 MW and a switchyard and 24 km of 138-kV transmission lines to connect to the Bacolod substation of the National Transmission Company (Transco).

Financing: The total project cost is \$6.76 million, all from carbon finance.

Time: The project was expected to be effective in 2009.

Task Manager: Dato, Victor

- *PH-GEF-Rural Power Project*

Objective: To mitigate global climate change caused by GHG emissions through wider user of clean energy technologies.

Main Activities: (1) Judicious investment support to provide selected rural areas with reliable electricity supply in a sustainable manner. (2) Technical assistance and training for capacity building to improve the sector performance and to support an enabling environment to promote private sector participation.

Financing: The total project cost is \$10 million, of which \$9 million is from the Global Environment Facility (GEF).

Time: The project became effective in 2004 and the expected closing date was 2009.

Task Manager: Rivera, Arturo

- *PH-Rural Power Project*

Objective: To help the Philippines make affordable, reliable, and adequate electricity available to rural communities. In addition, the project will contribute to GHG emission reductions through wider use of clean, renewable energy technologies in power generation.

Main Activities: (1) Rural electrification subprojects: decentralized electrification (e.g., small-scale energy generation, mini-grids, and stand-alone renewable energy systems) and EC grid subcomponents. (2) Partial credit guarantee fund. (3) Capacity building.

Financing: The total project cost is \$26.7 million, of which \$9 million is from GEF.

Time: The project became effective in 2004 and the expected closing date was 2009.

Task Manager: Rivera, Arturo

Energy Efficiency

- *Philippines Electric Cooperatives System Loss Reduction*

Objective: To reduce GHG emissions through the removal of barriers to energy efficiency investments in the rural power distribution subsector. This will be achieved through the pilot use of innovative contractual mechanisms and GEF-funded Partial Credit Guarantee Program to promote private investment and financing.

Main Activities: (1) Establishment of a GEF-funded partial loan guarantee facility for pilot contracts for selected type B electric cooperatives (ECs) (not fully creditworthy but large size with big potential efficiency gains) and for commercial loans to qualifying-type C ECs (marginal viability, unable to attract private financing at present). (2) Technical assistance to develop both financing mechanisms.

Financing: The total project cost is \$62.5 million, of which \$12 million is from GEF.

Time: The project became effective in 2004 and the expected closing date is 2011.

Task Manager: Rivera, Arturo

- *Philippines Chiller Energy Efficiency*

Objective: To stimulate accelerated conversion of chlorofluorocarbon-based chillers to new and more energy-efficient technology through the provision of financial incentives and a robust policy framework, thereby addressing well-documented techno-economic barriers and overcoming market barriers to improved energy efficiency. National capacity for carbon finance intermediation will be built through the project to enable a permanent transformation of the chiller market. Thus the breadth of transformation and the sustainability of project outcomes will be augmented with carbon finance revenues.

Main Activities: (1) Incentive scheme for investment in energy-efficient chillers including upfront incentive of 20 percent of the chiller cost and annual payments with CDM revenue. (2) Measurement, monitoring, and validation. (3) Technical assistance through technical workshops and promotion of public awareness.

Financing: The total project cost is \$53.9 million, of which \$2.6 million is from GEF and \$7.8 million is from carbon finance.

Time: The project was expected to be effective in 2009.

Task Manager: Villaluz, Maya

Waste Management

- *PH Methane Recovery from Waste Management*

Objective: To increase the adoption of non-mandatory low GHG-emitting waste management technologies as part of the modernizing of the sector undertaken as part of the increase in compliance with wastewater (Clean Water Act) and solid waste management (Ecological Solid Waste Management Act) regulations expected over the next several years.

Main Activities: The project will take a programmatic approach to recover methane from wastewater and landfills under the Clean Development Mechanism framework.

Financing: The total project cost is \$10 million, all from carbon finance.

Time: The project was expected to be effective in 2009.

Task Manager: Morton, John

- *Philippines Ethanol Plant Wastewater Biogas Project*

Objective: To reduce GHG emissions through the avoidance of methane emissions from the ethanol plant's wastewater treatment system and through the displacement of bunker fuel with the combination of the collected methane–bagasse–concentrated vinasse.

Main Activities: The project involves the construction and operation of a 100,000 liters/day ethanol plant in Negros Occidental. The wastewater from the ethanol plant will be treated through a thermophilic anaerobic digester that uses a continuously stirred reactor. The methane from the treated wastewater will be collected/recovered and used as fuel for the plant's boiler, in combination with bagasse and concentrated vinasse. The project is expected to generate 68,151 tons of carbon dioxide (tCO₂) equivalent per year, and the Bank, through the Community Development Carbon Fund (CDCF), has committed to purchase a total of 200,000 tCO₂ until 2013.

Financing: The total project cost is \$34 million, with \$3.2 million worth of the certified emission reductions to be purchased by the Bank through the CDCF until 2013.

Time: The project is expected to be effective in January 2010 and the expected closing of the Emission Reduction Purchase Agreement (signed on January 14, 2009) is December 31, 2013.

Task Manager: Tuyor, Joe

Community Sustainable Development

- *PH Laguna de Bay Community Carbon Finance*

Objective: To support the participation of local governments and other stakeholders in global and national efforts to reduce GHG emissions under the Kyoto Protocol while contributing to sustainable development in the Laguna de Bay region.

Main Activities: The main activity of the project will be to implement a set of small-scale projects that both have environmental benefits to the watershed and reduce GHG emissions. Potentially eligible projects include livestock manure management (biogas methane capture), waste management (small landfill gas, composting facilities, and wastewater treatment), and land use change and forestry (agroforestry, urban forestry, and riparian revegetation). The Laguna Lake Development Authority will act as the intermediary to undertake carbon trading for the aggregated projects. The project will also establish a mechanism in which the money from the carbon credits could be used for operational costs or for new environmental and social investments in the localities implementing these projects.

Financing: The total project cost is \$1 million, all from carbon finance.

Time: The project became effective in 2006 and the expected closing date is 2018(?).

Task Manager: Morton, John

- *PH Laguna de Bay Community Watershed Rehabilitation Project*

Objective: To support the participation of local governments and other stakeholders in the global and national efforts to reduce greenhouse gas emissions under the Kyoto protocol while contributing to sustainable development in the Laguna de Bay region.

Main Activities: The project will finance the purchase of emission reduction credits produced from a series of small-scale environmental improvement projects implemented by local government and private sector entities in the Laguna de Bay region. The purchase will be done under a framework agreement with the Laguna Lake Development Authority, which will act as an intermediary in the process of project identification, qualification, and monitoring and will manage the carbon finance revenues.

Financing: The total project cost is \$ 0.3 million, all from carbon finance.

Time: The project became effective in 2006.

Task Manager: Morton, John

Transportation

- *PH-Manila Bus Dispatch and Tracking System*

Objective: To improve passenger load in buses along the Epifanio De Los Santos Avenue (EDSA) Corridor from 35 percent to 70 percent. This will decrease the number of buses on the EDSA as well as decongest vehicular traffic, which will result in a decrease of total bus-hours per day. This bus-trip-hours optimization will be made by appropriately pacing bus dispatch at each end using a radio frequency identification (RFID) technology.

Main Activities: The project will involve installing on the buses tamperproof RFID tags and transponders that will be tracked through 20 stationary and mobile detectors. The Bank will only purchase the carbon emission credits to be generated from the project.

Financing: The total project cost is \$6 million, all from carbon finance.

Time: The project was expected to be effective in 2009.

Task Manager: Tuyor, Joe

Climate Change Adaptation

- *PH - Climate Change in Coastal Areas*

Objective: To help local communities in the Philippines reduce vulnerabilities to climate change impacts and strengthen disaster risk management in coastal areas. The projects aims to help local people plan and implement cost-effective climate change adaptation and disaster management measures using development planning and community-driven development processes to establish sustainable adaptation measures that will protect existing utilities, facilities, and biodiversity as well as encourage infrastructure investments that are climate-resilient. Furthermore, it will support awareness raising, the generation and sharing of climate change–related information, and building the capacity to pilot biophysical adaptation measures that will form part of local development plans and investment strategies.

Main Activities: (1) A vulnerability assessment will be conducted to select demonstration sites in coastal communities and pilot climate change / disaster risk management adaptation measures for infrastructure and biodiversity protection. (2) A set of education and communication materials will be produced to be used in an information campaign that will be conducted to raise awareness, share knowledge, and build capacity of local communities to establish information and advisory systems as well as select sustainable adaptation measures that are appropriate, doable, and cost-effective to meet their needs.

Financing: The total project cost is \$0.35 million.

Time: The project became effective in 2008 and the expected closing date is 2011.

Task Manager: Villaluz, Maya

- *Philippines: Climate Change Adaptation Phase I*

Objective: To develop and demonstrate the systematic diagnosis of climate-related problems and the design and development of cost-effective adaptation measures in agriculture and natural resources management.

Main Activities: (1) Improve coordination of adaptation policy by the Department of Environment and Natural Resources. (2) Implement climate risk reduction in key productive sectors. (3) Strengthen proactive disaster management within the National Disaster Coordinating Council. (4). Enhance provision of scientific information for climate risk management.

Financing: The total project cost is \$15 million, of which \$5 million is from GEF.

Time: The project was expected to be effective in 2009.

Task Manager: Wedderburn, Samuel

Annex Table: World Bank Carbon Finance Projects Overview

| Project | Project operator | Number of proponents | Geo-graphic coverage | Sector technology | WB engagement | Other Carbon Buyers | Status |
|-----------------------------|--|----------------------|----------------------|-------------------|---------------------|---------------------|----------------|
| Northwind | Private Sector | 1 | Single project | Energy | Carbon Fund | None | Implementation |
| Northern Negros | Private Sector | 1 | Single project | Energy | Carbon Fund | None | Implementation |
| Nasulo | Private Sector | 1 | Single project | Energy | Carbon Fund | None | Implementation |
| Manila Bus | Public sector-regional authority | 1 | Regional | Transport | Carbon Fund | None | Implementation |
| Laguna composting | local governments | 18 | Regional | Waste | Carbon Fund IBRD | None | Implementation |
| Laguna reforestation | Regional authority, national agency, local governments communities | 4 | Regional | Forestry | Carbon Fund IBRD | None | Implementation |
| Roxol | Private Sector | 1 | Single Project | Waste | Carbon Fund | None | Implementation |
| Methane Recovery | Private Sector Local Government | >5 | National | Waste | Carbon Fund IBRD | None | Implementation |
| Chillers | Private Sector | >10 | National | Refrigerant | GEF | KFW | Preparation |
| CF assist | NGO, communities | 1 | National | Forestry | TA | Commercial market | Preparation |
| | Private Sector | 2 | 2 Single projects | Waste/energy | TA | Commercial market | Preparation |
| | Private sector | >>1 | National | Energy | TA IBRD | Commercial market | Preparation |
| | Private Sector | >>1 | National | Waste | TA Carbon Fund | None | Preparation |