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ABBREVIATIONS

ADB	–	Asian Development Bank
ADF	–	Asian Development Fund
CCF	–	Climate Change Fund
CIF	–	Climate Investment Fund
CPS	–	country partnership strategy
CTF	–	Clean Technology Fund
DMC	–	developing member country
ESCAP	–	Economic and Social Commission for Asia and the Pacific
GCF	–	Green Climate Fund
GEF	–	Global Environment Facility
GHG	–	greenhouse gas
GMS	–	Greater Mekong Subregion
Lao PDR	–	Lao People's Democratic Republic
MDG	–	Millennium Development Goal
NCCAS	–	National Climate Change Adaptation Strategy
OECD	–	Organisation for Economic Co-operation and Development
PRC	–	People's Republic of China
PPCR	–	Pilot Program for Climate Resilience
REDD	–	Reducing Emissions from Deforestation and Forest Degradation
SCCF	–	Special Climate Change Fund
SLR	–	sea-level rise
SPCR	–	Strategic Program for Climate Resilience
TA	–	technical assistance
UNDP	–	United Nations Development Programme
UNEP	–	United Nations Environment Programme
UNFCCC	–	United Nations Framework Convention on Climate Change

NOTE

In this report, "\$" refers to US dollars.

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CONTENTS

	Page
EXECUTIVE SUMMARY	i
I. INTRODUCTION	1
II. CLIMATE CHANGE IN ASIA AND THE PACIFIC: CHALLENGES FACING ASIAN DEVELOPMENT FUND COUNTRIES	1
III. ADB'S STRATEGIC PRIORITIES ON CLIMATE CHANGE	2
IV. ASIAN DEVELOPMENT FUND PROGRESS ON CLIMATE CHANGE	3
V. LOOKING AHEAD	11
APPENDIXES	
1. Examples of Integration of Climate Change in Asian Development Fund Countries' Country Partnership Strategies	25
2. Examples of ADB's Experience in Climate-Proofing Projects	27

EXECUTIVE SUMMARY

Asian Development Fund (ADF) countries are among the most vulnerable globally to the projected impacts of climate change, although they bear little responsibility for its causes. They face the additional challenge of establishing low carbon development trajectories that meet their development needs, without contributing further to the underlying causes of climate change.

In Strategy 2020, the Asian Development Bank (ADB) identified climate change as a substantial risk to environmentally sustainable and inclusive development within the region. Correspondingly, ADB has identified five strategic priorities on climate change: scaling up clean energy; promoting sustainable transport and urban development; managing land use and forests for carbon sequestration; building the climate resilience of developing member countries and the region; and strengthening related policies, governance, and institutions.

ADB has made significant progress in mainstreaming climate change adaptation and mitigation in its operations, with grants and loan financing to ADF countries for both mitigation and adaptation increasing markedly—each exceeding \$1 billion in 2010. New initiatives have been implemented in low carbon and renewable energy, sustainable transport and urban development, and forest and land use management. ADB has expanded activities to build resilience in ADF countries, including climate-proofing a wide range of projects. ADB has expanded its role in implementing multilateral climate funds, including the Global Environment Facility, the Adaptation Fund, and Climate Investment Funds; and is fully engaged in the design of the Green Climate Fund. Progress notwithstanding, critical deficits remain. Looking forward, ADB faces three critical challenges to deliver a climate-compatible ADF XI development agenda:

- (i) **Ensuring the Asian Development Fund investment portfolio is not adversely affected by the impacts of climate change.** This will involve embedding climate risk management within the investment project cycle and enhancing the capacity and experience of ADB staff and partners.
- (ii) **Building resilience within Asian Development Fund countries.** This will require investments in both physical and social infrastructure to ensure that ADF development objectives can be achieved over a wide range of potential climatic conditions, and adaptation activities are fully aligned with efforts to eliminate poverty in ADF countries.
- (iii) **Ensuring Asian Development Fund countries pursue low carbon growth strategies.** This is necessary to contribute to reduction in global emissions; to lock in a growth trajectory that is more sustainable, more competitive, less susceptible to external shocks (rising global energy prices in particular), and more conducive to equitable, inclusive growth.

The provision of additional financing is central to addressing these challenges. Multilateral adaptation funds are designed to address the incremental costs associated with climate change, and are in principle not available to support interventions or investment to enhance the underlying resilience of communities to current climate variability and extreme weather events, as this is perceived as a development issue. Nevertheless, the capacities of vulnerable communities and economic sectors to cope with contemporary climate variability are prerequisites to establishing resilience to long-term and uncertain climate change. Additional resources are required to reduce or remove the adaptation deficit. Correspondingly, ADB's role in facilitating, monitoring, and targeting climate funds will become increasingly essential; and ADF resources will provide important complementary baseline financing, which can be blended with incremental dedicated climate-related financing.

I. INTRODUCTION

1. The Asian Development Bank (ADB) and Asian Development Fund (ADF) donors have identified climate change as a priority topic for discussion toward the preparation for the ADF XI. This paper provides an overview of ADB climate change activities to date and outlines some directions for moving forward.

II. CLIMATE CHANGE IN ASIA AND THE PACIFIC: CHALLENGES FACING ASIAN DEVELOPMENT FUND COUNTRIES

2. Climate change is a global phenomenon, although the geographic distribution of both greenhouse gas (GHG) emissions and the specific impacts of climate change are highly uneven. While the developed world is overwhelmingly responsible for accumulated emissions to date,¹ the developing nations of Asia and the Pacific are among the most vulnerable to potentially adverse impacts of climate change. In addition, while seeking to build resilience to climate change, ADF countries face the challenge of establishing a low carbon climate-compatible development trajectory that meets development objectives in a manner that does not contribute further to the underlying causes of climate change.

3. The Intergovernmental Panel on Climate Change defines vulnerability to climate change as a function of exposure to climate-related hazards, sensitivity to the resulting impacts, and adaptive capacity, which strongly reflects development status. The recently updated *Climate Change Vulnerability Index* ranks six ADF countries among the 16 globally at extreme risk, with Bangladesh assigned the highest risk.² The vulnerability of specific ADF countries to climate change on the basis of exposure, sensitivity, and adaptive capacity is emphasized in Table 1.

4. **Exposure.** ADF countries encompass many of the climate change “hot spots”, including low-lying coastal areas (e.g., Pacific Islands); mega-deltas (Ganges–Brahmaputra; Mekong); and areas likely to be severely affected by retreating Himalayan glaciers (e.g., Nepal, Tajikistan). Increases in the frequency and severity of climate-related disasters will be among the earliest and most likely impacts of a changing climate, and Asian countries are particularly exposed to the impacts of such disasters, and have long experienced a disproportionate share of global flood events, fatalities, and economic damage. In 2009, the United Nations International Strategy for Disaster Reduction placed ADF countries—Afghanistan, Bangladesh, Cambodia, Pakistan, and Viet Nam—among the 10 countries with the highest estimated mortality risk from flooding; and Bangladesh and Vanuatu among the 10 countries with highest mortality risk from tropical cyclones.³ In Pakistan, the August 2010 floods caused about 1,700 deaths and \$9.7 billion in damage to infrastructure, farms, and homes, as well as other direct and indirect losses.⁴

5. **Sensitivity.** The high sensitivity of ADF countries to climate change impacts reflects, among other things, an extensive reliance on natural resources for livelihoods, including agriculture and fishing, and the resulting competition for water and land resources exposes

¹ Many rapidly developing Asian nations, including the People’s Republic of China and India, are now among the largest emitters of GHGs.

² Maplecroft. News. 21 October 2010. <http://maplecroft.com/about/news/ccvi.html>. ADF countries assessed as at extreme risk (ranking) include Bangladesh (1), Nepal (4), Afghanistan (8), Cambodia (12), Viet Nam (13) and Pakistan (16).

³ United Nations International Strategy for Disaster Reduction. 2009. *Global Assessment Report on Disaster Risk Reduction*. Geneva, Switzerland: United Nations.

⁴ ADB and the World Bank. 2010. *Pakistan Floods 2010: Preliminary Damage and Needs Assessment*. Islamabad, Pakistan.

them to significant risks from increased climatic variability and change, in particular floods and droughts. Higher temperature will expose crops in the region to temperature stress, with each 1°C increase in temperature likely to decrease wheat, rice, and corn yields by 10%. A recent ADB and International Food Policy Research Institute study examining the likely impacts of climate change on agriculture and food security in Asia and the Pacific projected declines by 2050 in irrigated rice yields of 14%–20% and irrigated wheat yields of 32%–44% relative to a no-climate change scenario.⁵ The study also projects a decrease in cultivable areas of most staple crops, leading to large decreases in production when combined with yield impacts. Loss of highly productive rice cultivation areas to sea-level rise (SLR) is among the greatest risks, with Bangladesh and Viet Nam among countries most extensively affected.

6. **Adaptive capacity.** ADF countries lack institutional capacity to adapt to climate change. Low adaptive capacity is strongly associated with low income and limited savings; and with low levels of education, health care, and inadequate or absent critical infrastructure, particularly water supply and sanitation. In 2010, ADF countries represented about 70%, or 16 of the 23 developing member countries (DMCs) that are not likely to meet the Millennium Development Goal (MDG) targets for access to safe drinking water and 19 of the 26 DMCs that are not likely to meet the targets for access to basic sanitation.⁶ Moreover, ADF countries are vulnerable to likely increases in the prices of energy and other imported commodities which would be exacerbated by weak export earnings, among other factors.

7. **Costs.** The costs of adaptation in ADF countries are likely to be significant. Very preliminary estimates of adaptation costs in the region, suggest that ADF countries may require resources of around \$10 billion annually. Costs of climate mitigation will also be considerable. The likely magnitude of the financial requirements for ADF countries to address climate change also highlights the need for enhanced capacity to mobilize and utilize climate resources effectively once they become available.

III. ADB'S STRATEGIC PRIORITIES ON CLIMATE CHANGE

8. ADB's long-term strategic framework, 2008–2020 (Strategy 2020)⁷ identifies environmentally sustainable growth as a strategic agenda for ADB; and the environment, including climate change, as one of the core areas of operations. Addressing climate change is also critical in promoting inclusive growth (another strategic agenda under Strategy 2020), as the adverse impacts are predicted to affect the poor and women disproportionately. Strategy 2020 recognizes that a timely and effective response to climate change requires ADB to make climate change mitigation and adaptation integral parts of development work in multiple sectors, activities, and themes. It foresees a need for ADB to assist DMCs to invest in sound environmental and natural resources management, to help move their economies onto low carbon growth paths, to reduce the carbon footprint of Asia's cities, and to adapt to the unavoidable impacts of climate change.

9. In May 2010, ADB Management approved a paper entitled *Addressing Climate Change in Asia and the Pacific: Priorities for Action*,⁸ which elaborates on the climate agenda laid out in Strategy 2020 and builds on ADB's ongoing efforts on climate change. It adopts an integrated

⁵ International Food Policy Research Institute and ADB. 2009. *Building Climate Resilience in the Agriculture and Food Sector of Asia and the Pacific*. Manila.

⁶ ADB staff estimates based on data compiled by the Economic and Social Commission for Asia and the Pacific (ESCAP) on behalf of the joint ADB–ESCAP–UNDP regional partnership on the MDGs.

⁷ ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank, 2008–2020*. Manila.

⁸ ADB. 2010. *Addressing Climate Change in Asia and the Pacific: Priorities for Action*. Manila.

approach, addressing both climate change mitigation and adaptation, and identifies five strategic priorities, reflecting the main challenges facing the region, ADB's comparative advantage in addressing these challenges, opportunities for generating cost-effective results, and the diversity of DMC needs and capabilities. The priorities comprise (i) scaling up clean energy; (ii) promoting sustainable transport and urban development; (iii) managing land use and forests for carbon sequestration; (iv) building the climate resilience of DMCs and the region; and (v) strengthening related policies, governance, and institutions. The paper also identifies three modalities for facilitating climate responses—financing, knowledge, and partnerships. These priorities continue to guide ADF operations.

IV. ASIAN DEVELOPMENT FUND PROGRESS ON CLIMATE CHANGE

10. The ADF X midterm review paper *ADB's Strategic Directions of ADF Operations for Promoting Climate Change Mitigation and Adaptation*⁹ described ADB's efforts to address climate change across the region, with emphasis on ADF countries. Since then, ADB has continued to expand efforts to mainstream climate change in its operations and make progress in implementing its strategic priorities (paras. 8–9).

A. Mainstreaming Climate Change in ADB operations

11. Climate change implementation plans formulated by each regional department in 2009 provided a foundation for mainstreaming climate change in the country partnership strategies (CPSs). Linking to the climate change implementation plans, all ADF countries that have prepared CPSs from 2009 to date have emphasized climate change as a development issue, although to varying degrees (Appendix 1).¹⁰ As indicated in Table 2, ADB's climate change-related assistance to ADF countries has been increasing. From 2005 to 2010, ADF loans, grants, and technical assistance (TA) for projects marked as relevant to climate change adaptation or deemed to have climate change adaptation components have grown from \$49.5 million to more than \$1.2 billion. Similarly, ADB loans, grants, and technical assistance (TA) for mitigation and low carbon development projects in ADF countries have increased since 2005, approaching \$1.4 billion in 2010. While low carbon development is a priority for ADF countries, more resources will be required for climate change adaptation given the urgency of building climate resilience.

12. ADB is also strengthening its internal capacity to mainstream climate change into its operations. ADB is creating and re-designating staff positions, initiating in-house training programs and evolving institutional arrangements such as the establishment of a Climate Change Program Coordination Unit. To date, 19 climate change-oriented staff positions have been created and 15 of these have been filled. The President's High Level Advisory Group on Climate Change and Sustainable Development continues to advise Management on issues facing the region. During its 4th meeting in April 2011 in Manila, the Group focused on forward-looking implications of the Cancun Agreements for ADB's work, and policy options for ADB to consider in its climate change-related assistance to DMCs, including the linked issues of food, water, and energy. The Communities of Practice on the environment, transport, energy, and water are working to create and to share knowledge on the integration of low carbon growth and climate change adaptation in ADB's programs and projects.

⁹ ADB. 2010. *ADB's Strategic Directions of ADF Operations for Promoting Climate Change Mitigation and Adaptation*. Manila.

¹⁰ These ADF countries are Afghanistan, Bangladesh, Bhutan, Cambodia, Kiribati, Lao People's Democratic Republic (Lao PDR), Nepal, Pakistan, Palau, Papua New Guinea, Solomon Islands, Tajikistan, Vanuatu, and Viet Nam.

B. Progress in Priority Areas

13. **Scaling up clean energy.** Under the Clean Energy Program (CEP), ADB continues to assist ADF countries in reducing emissions while meeting growing energy needs. In 2010, ADB clean energy loan investments to ADF countries reached \$631.5 million and TA to ADF countries amounted to \$17.4 million (Tables 3 and 4). ADB invested more than \$1.85 billion in access to energy from 2008 and 2010, connecting nearly 2.3 million households to electricity or modern fuels under its Energy for All Initiative (Box 1); \$1 billion of this was invested in ADF countries, of which \$433 million was financed through the ADF. Significant efforts are being made to increase clean energy access in remote island communities of the Pacific and in Southeast Asia under the CEP. The Climate Investment Fund (CIF) Scaling Up Renewable Energy in Low Income Countries program is also supporting the CEP; the Maldives and Nepal are initial pilot countries. Financing of \$25 million–\$30 million can be granted to each country via the program.

Box 1: Energy for All Initiative: Providing access to clean energy while reducing poverty

ADB's Energy for All Initiative develops and mainstreams approaches for scaling up access to affordable, modern and clean energy among the region's poor. This includes household access to electricity from renewable energy technologies such as micro-hydro, solar, biomass, and small wind power, as well as access to clean cooking fuel, such as LPG or biogas from livestock manure. Under the Initiative, a Japan Fund for Poverty Reduction grant of \$3 million will be used to increase income and livelihood opportunities for women in three ADB-financed clean energy projects in Bhutan, Nepal and Sri Lanka. It will fund the training of female technicians to support solar power systems in Bhutan, help strengthen community management of rural electrification in Nepal, and improve service delivery and women's access to electricity in Eastern Province in Sri Lanka.

Source: ADB. 2011. *Energy for All Newsletter*, May.

14. The Asia Solar Energy Initiative was established in May 2010 with a target to develop 3,000 megawatts of solar power projects by mid-2013. Expanding solar energy capacity will catalyze private sector participation in innovation and research, induce economies of scale, and further reduce the price of technology. ADF countries currently reliant on imported energy will find solar energy competitive in the near future, improving energy supply sustainability. ADB also launched the Quantum Leap in Wind on June 2010 to develop country-specific road maps for large-scale deployment of wind power in priority countries within 5 years, including Mongolia, Sri Lanka, and Viet Nam. The Small Wind Initiative was created through TA¹¹ in 2009 to utilize indigenous renewable energy resources to supply electricity to remote communities, improving living standards. Pilot activities have begun in Nepal.

15. **Encouraging sustainable transport and urban development.** ADB is promoting investments in low carbon, safe, accessible, and affordable transport systems through its Sustainable Transport Initiative (STI). The STI Operational Plan (July 2010) builds on the strengths of ADB's existing transport operations to introduce effective models of support for new and emerging fields of sustainable transport. STI activities to date have enhanced existing urban transport in ADF countries, including systems in Dhaka, Hanoi, Ho Chi Minh City, Kathmandu, Tbilisi, Ulaanbaatar, and Vientiane. Case studies in Colombo, Dhaka, Kathmandu, and Vientiane identified important constraints and elements required for sustainable urban transport; and refined project selection criteria to improve sustainability. ADB is currently

¹¹ ADB. 2009. *Regional Technical Assistance on Effective Deployment of Distributed Small Wind Power Systems in Asian Rural Areas*. Manila.

developing the Asia Sustainable Transport and Urban Development Program for financing by the Global Environment Facility (GEF), ADB, and others. The program aims to support Asian cities in reducing GHG emissions and in generating local co-benefits through the integration of low carbon and climate resilient transit infrastructure and services with low carbon urban development. Participating ADF countries include Armenia, Bangladesh, Georgia, Mongolia, Sri Lanka, and Viet Nam.

16. The Cities Development Initiative for Asia was established in 2007 by ADB and partners to provide assistance to medium-sized Asian cities in linking broad development plans and specific infrastructure investments, emphasizing environmental sustainability, pro-poor development, good governance, and climate change mitigation and/or adaptation. The initiative has established partnerships with several city governments in ADF countries, including Battambang, Can Tho, Danang, Faisalabad, Kathmandu, Khulna, Pakse, Thanh Hoa, and Ulaanbaatar. It is also working with selected national organizations in Nepal, Pakistan, Sri Lanka, and Viet Nam to promote the toolkit on City Infrastructure Investment Programming and Prioritization.

17. **Managing land use and forest for carbon sequestration.** Seven out of 10 countries in the region with both high to moderate forest cover and high deforestation rates are ADF countries.¹² ADB is supporting activities at regional, national, sub-national, and local levels to build partnerships, exchange knowledge, and tap new financing opportunities and incentives for reducing GHG emissions from the forest sector. The Biodiversity Conservation Corridors Initiative in the Greater Mekong Subregion and the Heart of Borneo Initiative aim to reduce deforestation and support the livelihoods of indigenous peoples and other forest communities. Both are expected to serve as platforms for further Reducing Emissions from Deforestation and Forest Degradation (REDD+) support financed through the CIF Forest Investment Program, for which Indonesia and the Lao People's Democratic Republic (Lao PDR) are pilot countries.

18. Financial support for REDD activities includes \$6 million in funding from ADB's Climate Change Fund (CCF) as well as contributions from the GEF. Each of the pilot activities is meant to develop new approaches for using REDD and land use management to mitigate greenhouse gas emissions while conserving biodiversity and supporting the livelihoods of forest-based communities, in ADF countries such as the Cambodia, Lao PDR, Solomon Islands, and Viet Nam.

19. **Promoting climate resilient development.** ADB has been increasing activities to enhance resilience in vulnerable DMCs through mainstreaming of adaptation and disaster risk reduction into CPS and national planning frameworks; and by helping build the climate resilience of vulnerable sectors such as agriculture, water, energy, transport, and health, including preparation of climate resilient sector road maps. In Central and West Asia, for example, ADB assessed the impacts of accelerated glacial melt to seven ADF investment projects—four in Pakistan and three in Afghanistan. Climate change road maps have been developed for Armenia, Kazakhstan, Pakistan, and Uzbekistan to identify entry points for effective adaptation actions. ADB is also promoting integrated disaster risk management, which combines disaster risk reduction, climate change adaptation, and disaster risk financing to guide DMCs in strengthening their capacities for effective disaster risk management.

20. ADB is mobilizing additional concessional and innovative finance to support DMCs' adaptation efforts, including the climate proofing of projects. A range of climate-proofing activities has been designed and implemented for several ADB projects in ADF countries. No-

¹² ADB. 2010. *National REDD+ Strategies in Asia and the Pacific: Progress and Challenges*. Manila.

or low-regret climate-proofing investments, including green planting of embankments to protect roadways from rainfall erosion, were designed for the Cambodia Rural Roads Improvement Project.¹³ The Avatiu Port Development Project¹⁴ in the Cook Islands has received co-funding from ADB's CCF to ensure that the design of the port can accommodate future SLR (adaptation readiness): pilings will be strengthened to accommodate the additional load associated with raising the wharf level by up to 0.5 meters (m) when required. The Padma Multipurpose Bridge Project¹⁵ in Bangladesh was climate-proofed by raising the bridge deck by 0.63 m to factor in impacts of both SLR and projected increases in flooding caused by increased basin rainfall. Appendix 2 provides examples of ADB's experience in climate-proofing projects.

21. ADB is also stepping up its policy research, knowledge management, and capacity building, focusing on (i) climate risk screening, impact and vulnerability assessments; (ii) adaptation tools and methods (including technical guidance on climate-proofing projects by sector); (iii) complementary adaptation approaches, including ecosystem-based adaptation (e.g., coastal protection via mangroves) and community-based adaptation; (iv) economic analyses of climate impacts and adaptation options; and (v) documentation and dissemination of DMCs' adaptation knowledge and experience in partnership with the Asia Pacific Adaptation Network.

22. **Strengthening policies, governance, and capacities.** While most ADF countries have prepared national action plans and strategies on climate change, they need additional and ongoing support for policy, governance, and institutional work to mainstream these plans into the development process and translate them into action. Several recent TA projects are enabling strengthened policies and enhanced capacities (Box 2). In 2009, ADB, in collaboration with Japan, the Republic of Korea (Ministry of Foreign Affairs and Trade), and the United Nations Development Programme (UNDP), established the Capacity Development for Development Effectiveness Facility to help countries of Asia and the Pacific to improve the management of aid partnerships. Based on the experiences of Bangladesh, Cambodia, Indonesia, the Lao PDR, Nepal, the Philippines, and Viet Nam, the facility has begun work with the Organisation for Economic Co-operation and Development (OECD), Swedish International Development Cooperation Agency, and others to assess whether funding for climate change is being managed in the most effective manner. Under the Governance and Capacity Development Initiative TA,¹⁶ the program on Development Effectiveness of Public Finances for Climate Change is currently being implemented. This initiative expands and deepens country-led analysis and dialogue on the development effectiveness of climate change-related programming.

¹³ ADB. 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Loan Kingdom of Cambodia: Rural Roads Improvement Project*. Manila.

¹⁴ ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Proposed Supplementary Loan and Administration of Grant for Cook Islands: Avatiu Port Development Project*. Manila.

¹⁵ ADB. 2010. *Bangladesh: Padma Multi-purpose Bridge Project. Environmental Impact Assessment Report*. Manila.

¹⁶ ADB. 2009. *Regional Technical Assistance to Governance and Capacity Development Initiative (Phase 2)*. Manila.

Box 2: Promoting Climate Change Adaptation in Sri Lanka

Through technical assistance for Strengthening the Capacity for Climate Change Adaptation, Sri Lanka prepared its National Climate Change Adaptation Strategy (NCCAS), which outlines a comprehensive road map for climate change adaptation and provides a new framework to assist the country in coping with climate change impacts. The NCCAS lays out a prioritized strategy for action and investment for 2011–2016, supporting Sri Lanka’s national development agenda as articulated in the *Mahinda Chintana (Mahinda Vision)*. Thematic priorities identified in the NCCAS include (i) strengthening national level climate adaptation planning and implementation capacity; (ii) ensuring that future investments and economic plans are climate resilient; (iii) systematically researching climate change adaptation options and disseminating knowledge; (iv) increasing financing for climate change adaptation; and (v) informing and mobilizing stakeholders at multiple levels in support of climate adaptation impacts.

Source: ADB. 2010. *National Climate Change Adaptation Strategy for Sri Lanka* (Final Draft). <http://www.adb.org/Documents/Produced-Under-TA/43173/43173-01-sri-dpta-07.pdf>

C. Progress on Modalities to Deliver Results

23. **Mobilizing and innovating to meet financing needs.** ADB continues to expand its efforts to mobilize grant finance to support DMCs’ efforts to address climate change via its access to multilateral and bilateral funds including the Adaptation Fund, CIF, GEF, and Nordic Development Fund; and via ADB’s internal funds including the recently replenished CCF and TA programs. As examples, ADB in partnership with UNDP is implementing the Climate Resilient Infrastructure Development in the Northern Mountain Provinces of Viet Nam using \$3.4 million in grant finance from the GEF Special Climate Change Fund. In January 2011, ADB approved \$800,000 in CCF grant financing to climate-proof the Avatiu Port Development Project in the Cook Islands.

24. ADB, the World Bank, and partners have been providing extensive financial and technical support to Bangladesh, Cambodia, Nepal, Tajikistan, and the Pacific region through the CIF Pilot Program for Climate Resilience (PPCR), designed to provide incentives for scaled-up action and transformational change by integrating climate resilience in national development planning and investment programs. Strategic Programs for Climate Resilience (SPCRs) for Bangladesh, Cambodia, Nepal, Tajikistan, and Samoa have been approved and project preparations for SPCR investments are under way. Investment projects proposed under the SPCR involve the blending of PPCR and ADB resources to integrate climate risk and resilience considerations during their design and implementation (Box 3).

25. The Clean Energy Financing Partnership Facility and ADB’s CCF promote low carbon knowledge products and projects in all DMCs. From 2008 to 2010, ADF countries received \$15 million in grant finance for various innovative projects aimed at lowering carbon emissions. The ADB Carbon Market Program, launched in 2006, is an innovative financing scheme that supports the development of GHG mitigation projects in developing countries in Asia and the Pacific through the Asia Pacific Carbon Fund, the Future Carbon Fund, and the Technical Support Facility. The Carbon Market Program has assisted 23 projects in various stages of the Clean Development Mechanism cycle across 13 ADF countries. The cumulative certified emissions reductions to be generated from these projects for a 10-year crediting period are estimated at 4 million certified emissions reductions, potentially generating carbon revenues of \$40 million. Through the CIF Clean Technology Fund (CTF), ADB is helping Viet Nam promote low carbon technologies. The country’s investment plan targets a reduction in national energy

consumption of 5%–8% by 2015 relative to business as usual, via \$250 million support under the CTF. CTF investments are expected to mobilize financing of about \$3.2 billion from government, multilateral financiers, carbon finance, and the private sector.

Box 3: Blending Pilot Program for Climate Resilience and ADB Financing

Bangladesh and Cambodia, in their Strategic Programs for Climate Resilience, have embarked on a program of blending Pilot Program for Climate Resilience (PPCR) funding with programmed investments in climate resilient infrastructure in the most vulnerable locations. In Bangladesh, \$71 million in PPCR funding will be integrated with \$215 million of ADB funding for Coastal Climate Resilient Water Supply, Sanitation, and Infrastructure Improvement projects. Cambodia has requested \$105 million to provide cofinancing to enhance the climate resilience of ADB-funded projects, leveraging about \$300 million in ADB funding. The blended projects include (i) the Water Resources Management Sector Development Program, (ii) the Greater Mekong Subregion (GMS) Flood and Drought Management Project, (iii) the GMS Biodiversity Conservation Corridors Project, (iv) the Agriculture Commercialization and Resource Conservation Project, (v) the Provincial Roads Improvement Project, (vi) the GMS Corridor Towns Development Project, and (vii) the Sustainable Urban Development in the Tonle Sap Basin Project.

Source: Bangladesh: Strategic Program for Climate Resilience, and Cambodia: Strategic Program for Climate Resilience SPCR. <http://www.climateinvestmentfunds.org/cif/ppcr>

26. Increasing engagement of the private sector is needed on clean energy in ADF countries and this is reflected in the pipeline for 2011 and 2012 (Table 5). In May 2011, the GEF Council and Special Climate Change Fund (SCCF) Council approved the ADB–United Nations Environment Programme (UNEP) concept proposal for a Pilot Asia-Pacific Climate Technology Network and Finance Center with a \$10 million allocation from the GEF Trust Fund and \$2 million from the SCCF. Practical experience acquired through this project will inform United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties discussions on technology transfer and finance, and provide valuable opportunities for south–south collaboration.

27. To nurture new climate technologies that promote clean energy and sustainable technologies, ADB is investing up to \$60 million to establish three venture capital funds. They are expected to leverage an additional \$600 million–\$700 million in private sector investment. The funds will invest in early-stage technology companies innovating in climate change mitigation and adaptation or environmental protection. In 2010, two private sector loans for clean energy were approved for ADF countries: the Sungas Liquefied Petroleum Gas Distribution Development Project in Afghanistan and the Zorlu Enerji Power Project in Pakistan (Box 4).

Box 4: Pakistan's First Privately-Owned Wind Farm

In February 2011, ADB approved a loan in the amount of \$36.8 million for the Zorlu Enerji Power Project in Pakistan. It is the first privately owned and financed wind farm in Pakistan with a total capacity of 56.4 megawatts. The project will be constructed in Southern Sindh, about 100 kilometers northeast of Karachi, by Zorlu Enerji Elektrik Uretim. The output from the plant will provide much-needed additional power for Pakistan, improve the country's energy security, and lower reliance on fossil fuels. This project should provide a bankable basis for future privately funded wind projects, and send a signal that Pakistan's wind sector is attractive for private sector investment and financing.

Source: ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Zorlu Enerji Power Project (Pakistan)*. Manila.

28. **Generating and disseminating knowledge.** ADB has produced flagship studies examining the impacts of climate change on agriculture and food security, energy, and migration. Most recently, it produced a report on Accounting for Health Impacts of Climate Change, to improve understanding of the health dimensions of climate change and to guide other sectors in accounting explicitly for the health impacts of their projects and interventions. Countries involved include Nepal, the Philippines, and Tajikistan. A joint ADB and Asian Development Bank Institute study on climate change and green growth examines how emerging economies of Asia can operate amid changing demands for low carbon development. Studies of the regional economics of climate change are also being prepared for Central and West Asia, South Asia, Northeast Asia, and the Pacific; and a second phase is being prepared for Southeast Asia. Table 6 lists the key knowledge products on climate change published by ADB.

29. **Cultivating and fostering partnerships.** ADB has intensified collaboration with development partners to mobilize further resources and knowledge. In addition to longstanding partners such as the GEF, recently established finance partnerships include the CIFs (including the PPCR) administered by the World Bank and implemented jointly with ADB and other regional development banks. ADB is continuing to work closely with other international and bilateral partners, government, the private sector, and civil society to expand its capacities and outreach in achieving its climate change objectives. For example, ADB, UNEP, and other partners established the Asia Pacific Adaptation Network, through which the first Asia Pacific Adaptation Forum was held on 21–22 October 2010 in Bangkok. The forum, which was attended by over 550 participants, provides a venue for sharing knowledge and experience on mainstreaming adaptation into development planning in the region.

D. Emerging Lessons

30. **Poverty reduction and climate resilience.** There is growing recognition that the promotion of inclusive growth and poverty reduction is a necessary and effective way to build resilience and help people adapt to changes brought about by climate change. For example, investments that strengthen education, health, and gender equity for the poor will strengthen the resilience of poor people to deal with climate impacts. Social protection policies can also address the multiple risk and vulnerabilities faced by the poor effectively. ADF operations in poverty reduction, health, and education will increasingly be recognized as a critical part of the climate response.

31. **Climate change adaptation and disaster risk management.** Recent experience has demonstrated that the most visible link between existing conditions and a future altered by climate change is via climate-related disasters. Many recent events (including the devastating floods in Pakistan and the People's Republic of China in 2010) have focused the attention of the

public—and of policy makers—on the need to act decisively on climate change. Disaster risk management activities can be made responsive to the risks associated with climate change by (i) developing suitable models of risk that are robust to bounded levels of uncertainty regarding future climate; (ii) improving the accuracy and coverage of disaster early warning systems; and (iii) strengthening local capacity to prepare for and manage such disasters. In addition, the extensive resources now allocated for post-disaster relief and reconstruction can be better used to reduce and to manage risks in advance by building resilience in ADF countries.

32. **Food security, water security, energy, and climate change.** Since climate impacts in Asia are largely associated with water as the principal medium, special attention will be needed to improve ADF countries' capacities to address water security and to promote climate resilient water management in urban, rural, and river basin settings, and water and energy issues through policy dialogue, investments, and TA. There is also a need to understand and respond to long-term food security risks from climate change threats to agricultural production and food prices, potentially including support for more resilient cropping systems and climate-related agriculture research efforts. ADB's existing programs can play important roles in the context of integrated water resources management, energy, and food security.

33. **Closing knowledge gaps.** Effective adaptation will depend critically on informed decision making, and in particular an understanding of the specific nature of the hazards and risks posed by climate change. The absence of scientifically credible projections of future climatic and hydrologic conditions at suitable levels of resolution, and clear guidelines for their interpretation and use, have been identified as active impediments to climate risk assessments, and the design and implementation of effective adaptation and/or development projects. Improved climate projections, including characterizations of climate-related hazards such as floods, droughts, and tropical cyclones, are urgently needed to guide adaptation activities within ADF countries.

34. **Capacity development for policy and planning.** Many ADF countries have requested ADB assistance in refining their climate change strategies, developing the relevant capacities, and identifying project and program interventions. Special attention is needed to develop adaptive capacity at various levels, including among communities exposed to climate risks, and in particular women, children, and the poor. It will also be necessary to address the issue of absorptive capacity for additional climate financing, particularly given expectations for the Green Climate Fund (GCF).

35. **Technology.** Technology development and transfer is clearly essential for low carbon growth. In addition, new technologies are needed to assist ADF countries in adapting to the adverse impacts of climate change, including expanded water treatment and supply technology options, improved crop varieties and agricultural water management technologies, architectural design standards, flood protection, and disaster early warning systems. The public sectors of ADF countries have limited capacity to provide many of these technologies at affordable costs, and will need assistance.

36. **Adaptation financing needs.** Adaptation costs to developing Asia have been estimated to be about \$40 billion per year over 2010–2050, with about \$10 billion incurred in ADF countries under various scenarios. While these estimates are indicative, it is clear that the financial resources needed to ensure that development in ADF countries is climate resilient greatly exceed resources currently available. While new financing opportunities are arising that will assist ADF countries to address climate change—including the CIF, GEF, Adaptation Fund, and prospectively, the GCF—the need to assist DMCs to access such climate funds effectively has increased correspondingly. ADB's role in facilitating, monitoring, and targeting climate funds

will become increasingly essential. Furthermore, ADF resources are likely to provide important complementary baseline financing, which can be blended with incremental dedicated climate-related financing.

V. LOOKING AHEAD

A. Keeping Inclusive, Sustainable, and Climate-Compatible Development on Track

37. ADB will continue to implement its strategic priorities on climate change and harness partnerships, knowledge, and finance as outlined above. Against this backdrop, ADB faces three critical challenges in pursuing a climate-compatible ADF development agenda.¹⁷ The first is to ensure that the ADF investment portfolio is not adversely affected by the impacts of climate change. This will entail the embedding (mainstreaming) of climate risk management within the project cycle (applicable for all ADB investments), which in turn will require the development of specialized tools, knowledge, and financial resources; and enhancements in the capacity and experience of ADB staff and partners to understand and respond to the novel risks posed by climate change.

38. The second and broader challenge is to build resilience within ADF countries, where resilience is understood as “...the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.”¹⁸ Climate change involves, above all, an increase in the inherent uncertainty around future conditions, and targeted responses to each climate change-related risk may not be possible to identify in advance. By helping to build the overall resilience of societies, ADB can help ensure that the ADF development objectives can be achieved over a wide range of potential climatic conditions, and adaptation activities are fully aligned with efforts to eliminate poverty in ADF countries. This will require investments in both “hard” (water supply, sanitation, flood protection) and “soft” (education, health, nutrition, governance) sectors. As well as support for building institutional capacity and mainstreaming climate resilience across development sectors.

39. The third challenge is to ensure that the pursuit of ADF development follows a low carbon trajectory—that development objectives are achieved in a manner that does not contribute further to the underlying causes of climate change. By following growth paths that emphasize clean energy, sustainable transport, and urban development; and land use and management that support a range of environmental services (including carbon sequestration), ADF countries will simultaneously contribute to global efforts to reduce GHG emissions, manage future risks to security in energy and other critical resources, build skilled and competitive workforces, and create opportunities to reduce poverty.

B. Managing Climate Risks to Asian Development Fund Investments Projects

40. ADB must ensure that the investments of its ADF clients are not compromised by climate change. Climate-related disasters of enhanced intensity present particular risks to built infrastructure. During the ADF XI, ADB will need to continue to ensure that climate considerations are properly addressed in regional and country partnership strategies. It will

¹⁷ Climate Compatible Development has been defined informally as development that successfully combines mitigation (low carbon growth), adaptation (climate resilient development), and economic development objectives.

¹⁸ IPCC Fourth Assessment Report. 2007. Working Group II (Impacts), Appendix I: Glossary. Resilience encompasses adaptive capacity, and in addition, capacity to rebound from crises and disturbances, including those associated with the present climate variability; and the ability to anticipate, plan for, and potentially benefit from change.

need to manage climate-related risks to all ADF projects, especially infrastructure and other vulnerable investments. In this regard, ADB is actively developing technical resource services—an adaptation toolkit—to support and facilitate each stage of the project climate risk management process. All ADF projects will be screened for climate risks, and if significant risks are identified, climate impact, vulnerability, and adaptation assessments will be conducted. If warranted, adaptation interventions and monitoring and evaluation will be established. The nature and extent of climate risks is highly context-specific, and no single risk management approach is likely to be optimal in all settings. A wide range of tools and technologies will be required, including sectoral response models and relevant methods of cost–benefit analysis.

41. Indicative costs of managing climate-related risks to infrastructure can be estimated on the basis of pilot climate-proofing activities to date by ADB and other multilateral development entities. The incremental costs needed to maintain an investment’s net benefits at design levels without climate change (climate-proofing coefficient) have been found to range from under 1% to over 20% of baseline investment costs. Using a range of climate-proofing coefficients of 6%–10%,¹⁹ the estimated costs of climate-proofing investment projects in ADF countries would amount to about \$300 million–\$500 million per year over the period 2011–2013.

C. Building Resilience within Asian Development Fund Countries

42. Adaptation to climate change and development are closely linked. Key adaptation challenges, including managing the risks of climate-related disasters and ensuring food security, are well established development objectives, although climate change has both introduced novel risks outside of human experience (e.g., SLR and glacial retreat) and increased the urgency with which adaptive actions are required. At the same time, the new international institutions created to address climate change risks and the principles that govern the allocation of adaptation resources (e.g., additionality) have sometimes contributed to a divergence between the adaptation and development agendas. However, adaptation cannot succeed in the absence of development since resilience (adaptive capacity) is strongly affected by development status.

43. The factors that confer societal resilience to climate variability and natural disasters are closely associated with the MDGs, and include fundamental development objectives such as food security and sound nutrition, education, health, and freedom from poverty. Recent studies provide evidence that the impacts of current climate extremes and disasters are more severe on poor people—and poor countries—than on the middle income and wealthy. Targeted investments in soft resilience-building sectors (including education, health, nutrition, and governance) will generate a wide range of immediate benefits, while improving resilience. ADB and partners will need to explore options for the use of dedicated adaptation finance streams and other sources, including ADF finance, to support and enhance the building of societal resilience. Two promising areas for attention include disaster risk reduction and food security.

44. ADB must also help address the regional deficit in critical infrastructure, which would enhance overall resilience to climate change. Such infrastructure encompasses water supply and sanitation (critical to public health), irrigation and related rural water infrastructure (food security), flood protection measures (including disaster-resilient architecture), and clean energy. A recent study by ADB and the Asian Development Bank Institute estimates the region’s

¹⁹ Following a review of ADB’s portfolio at risk, it was determined that approximately 90% of the total value of loans was categorized as being at medium to high risk. IDA (2007) estimated that the increase in IDA credits that would be required to maintain the net level of benefits to IDA clients at their ‘without climate change’ level for each of the Stern climate damage scenarios range from 6%–21% of total FY06 IDA credits. A conservative range of 6%–10% is used here.

investment needs in water supply and sanitation alone at over \$380 billion through 2020: \$155 billion (40%) for new capacity and \$225 billion (60%) to maintain and replace existing infrastructure.²⁰ Overall Asian infrastructure investment needs from 2010 and 2020 (encompassing water, energy, telecommunications, and transport) are estimated at \$8 trillion, or about \$730 billion per year. These estimates do not reflect incremental costs of climate proofing this infrastructure.

45. ADB will also need to support through capacity development and TA policy, governance, and institutional development to mainstream climate change into the development process and to translate action plans into action. Many DMCs have requested ADB assistance in refining their climate strategies as well as developing relevant capacities and identifying project and program interventions needed to implement them. Special attention is needed on developing adaptive capacity at various levels, including among communities exposed to climate risks. It will be important to mainstream gender design features and women's meaningful engagement in these efforts. ADB will need to place emphasis on policy and institutional capacity development, and governance, to strengthen climate programs at country level. In doing so, transformational programmatic approaches, using lessons from the PPCR and other efforts at regional level, might have a greater impact than individual project-by-project approaches.

46. Developing the scientific and technical products that facilitate effective adaptation, including climate projections and disaster early warning systems, requires specialized technical expertise and infrastructure, which is absent in most ADF countries. Improvements in the resolution, skill, availability, and documentation of climate projections will assist ADB, ADF countries, and a wide range of development partners in improving the quality, effectiveness, and scientific integrity of their adaptation efforts. Through TA financing, ADB will facilitate the development of a regional climate scenarios library as part of a broader set of technical resources. It will include scenarios at regional, national, sub-national, and site-specific scales—reflecting the diverse contexts within which they are applied. A regional projection library will also fill the need for multi-model ensembles that provide a more credible basis for impact and adaptation assessments than single-projection scenarios. The availability of multiple projections supports the assessment of variability and uncertainty, and allows worst case scenarios to be identified. Ensemble regional projections will also support and enable the modeling and evaluation of risks associated with climate-related hazards. The absence of such risk models is an impediment to the development of regional risk-sharing approaches, including property and crop insurance products.

D. Promoting Low Carbon Development in Asian Development Fund Countries

47. ADF countries are not among the most significant GHG emitters, although they are among the most exposed and most sensitive to the impacts of climate change. It will nevertheless be important for ADF countries to pursue low carbon growth strategies, not only to contribute to the collective task of reducing emissions globally, but to lock in a growth trajectory that is more sustainable, more competitive, less susceptible to external shocks (rising global energy prices in particular), and more conducive to equitable, inclusive growth.

48. **Mitigation and low carbon development.** ADB recognizes the crucial importance of supporting a multipronged clean energy agenda in the region. Utilizing energy efficiently to meet growing demand will be an important part of that agenda. ADB's Clean Energy Program will (i) expand ADB's clean energy investments, including loans, grants, and TA in ADF countries;

²⁰ ADB and Asian Development Bank Institute. 2009. *Infrastructure for a Seamless Asia*. Tokyo: Asian Development Bank Institute.

(ii) increase assistance to demand-side clean energy components in water supply and sanitation, transport, urban, agriculture, and other sectors; and (iii) track the pipeline of clean energy projects, including TA, and monitor achievements. The Energy for All Initiative will target those in the region without access to electricity by supporting innovative approaches to providing reliable, affordable, and climate friendly modern energy sources and bringing them to scale. Sustainable transport and urban development will also have a growing role to play in supporting the transition to low carbon development

49. **Managing forests and land use.** ADB will selectively support sustainable forest management and conservation, as well as agricultural land use improvements, to promote soil carbon sequestration. This will help targeted ADF countries prepare for and gain access to this potentially significant new source of concessionary and carbon market financing for their development and improved environmental management. Loan, grant, and TA support will be programmed in coordination with other multilateral and bilateral programs, such as the World Bank's Forest Carbon Partnership Facility, the United Nations-REDD Program, the CIF's Forest Investment Program, and the GEF's Sustainable Forest Management Program.

50. **Enhancing capacity to promote technology advance, transfer, and deployment.** Technology innovation and deployment will play key roles in achieving the dual goals of economic and social development and mitigation of climate change, particularly in ADF countries. ADB will support ADF countries through, among others, the implementation of the cluster TA for Establishing a Pilot Center to Facilitate Climate Technology Investments in Asia and the Pacific (currently under processing) to enhance their capacity to mainstream advanced climate technologies into their development and financing priorities, to scale up investments in advanced climate technologies that are suitable to the requirements and circumstances of ADF countries, and to enhance their capacity to explore the potential of available climate financial resources, to promote advanced climate technology investment.

E. Financing the Delivery of a Climate Compatible Agenda

51. Financial arrangements for climate change in ADF countries continue to evolve. Under the 2010 UNFCCC Cancun Agreements, developed countries reiterated their collective commitment to provide \$30 billion over 2010-2012 and to mobilize \$100 billion per year in climate financing by 2020, with a balanced allocation between adaptation and mitigation. Parties to the UNFCCC also agreed to establish the GCF, which will channel some of these funds to developing countries through a variety of thematic funding windows. Such financing provisions are important elements of the post-2012 climate regime under negotiation via the UNFCCC, and the multilateral development banks, including ADB, will play key roles in channeling these funds to developing countries.

52. As ADF economies continue to develop, ramp up modern energy use and invest in new technologies and infrastructure, the financing gap for low carbon development is also widening. In this context, an increase in the allocation of ADF resources is crucial to build capacities and institutions for mitigation and catalyze both public and private sector investments towards low carbon development. In addition, there is a need for increased flows of private capital considering that public finance alone will not be sufficient. To this end, ADB will support expansion of the carbon markets and make use of innovative instruments such as private capital seed funds, and risk mitigation products, including economic and political risk guarantees. The experience of ADB's Private Sector Operations Department with private equity funds to promote clean energy investment is a good base to build on.

53. With regard to climate adaptation, this paper has identified at least five areas in which significant finance is required in the context of ADF XI. These are (i) costs to ADB and/or ADF countries to conduct risk screening, impact, vulnerability and adaptation assessments on infrastructure and related investment projects as first steps toward managing climate-related risks; (ii) the incremental costs of climate-proofing vulnerable investment projects as required; (iii) the costs of investing in needed infrastructure that in itself will help build resilience to current and future climate variability and investment in sectors such as health and education that will enhance adaptive capacity, (iv) the costs of enhancing policies, plans and institutional capacity to promote transitions to climate resilient development, and finally (v) the costs of providing regional public goods, including climate projections and early warning systems.

54. ADF countries will have access to new sources of finance to address climate change (Table 7). These include the GCF if it comes on stream by 2020, as well as CIF, GEF, and other sources of grant and concessional climate financing, which are being programmed through ADB's operations and those of partner agencies. The PPCR of the CIF is particularly relevant to ADF countries, which are highly vulnerable to climate risks and need to enhance their climate resilience. ADB is working closely with other partners to formulate and implement PPCR-financed transformational programs that will increase climate resilience across sectors and integrate climate resilience through country-driven planning and budgeting processes. The PPCR will finance only some of the additional costs incurred to address climate risks and is therefore contingent on complementary financing from bilateral and multilateral sources. This includes ADF financing, which can help to upscale and replicate the approaches that are pilot tested and found effective.

55. In addition to PPCR, and as noted, ADB is actively working with its DMCs to help identify and channel available climate change financing for both mitigation and adaptation activities. This includes utilizing ADB's GEF access as one of its executing agencies. Funding for mitigation is available to DMCs through the GEF Trust Fund, and GEF also administers two adaptation funds—the LDCF and the SCCF—that finance activities to increase resilience to climate change at national, sector, project, and community levels. Of the ADF countries, 14 are eligible and have received LDCF financing, used primarily for the preparation and implementation of National Adaptation Programs of Action. The GEF is seeking to mobilize at least a further \$500 million over the next 4 years to help finance the costs of National Adaptation Programs of Action implementation. ADB is actively expanding its pipeline of SCCF and LDCF proposals to cofinance ADB projects.

56. Financing is also available for adaptation programs through the Kyoto Protocol Adaptation Fund, and ADB became eligible to access these funds for DMCs by becoming a Multilateral Implementing Entity of the Fund. It draws its resources primarily from a 2% levy on proceeds from transactions under the Clean Development Mechanism operating under the current Kyoto Protocol regime, which have been estimated to reach between \$300 million–\$500 million by 2015. With ADB's designation in 2010 as a Multilateral Implementing Entity, new opportunities will arise to assist DMCs to access Adaptation Fund resources to cover incremental costs of climate proofing vulnerable infrastructure and enhancing climate resilience.

57. While specialized adaptation funds will play a critical role, they will not be able to fully address the climate financing needs of ADF countries. One reason is that the dedicated adaptation funds are designed specifically to address the incremental costs associated with climate change. Therefore, these funds would in principle not be available to support broader interventions to enhance the underlying resilience of development sectors and communities to current climate variability and extreme weather events, as this is perceived as a development issue which should not consume the limited funds resulting from long and hard negotiations

under the UNFCCC. Nevertheless, enhanced capacities of vulnerable communities and economic sectors to cope with contemporary climate variability and extremes are prerequisites to establishing resilience to long-term and uncertain climate change. Another reason why these specialized funds will not be sufficient is that the resources available for climate adaptation are actually quite limited in relation to the financing needs (see Table 7). In addition, some have short time spans and others are still being developed to come on stream by 2020. Additional resources, assumed to come from development finance, are therefore required to reduce or remove the “adaptation deficit” in the short to medium term.

58. In addition to meeting the challenge of adaptation, low-carbon development strategies represent both opportunities and challenges for ADF countries which must be addressed. ADF resources provide important complementary baseline financing, which can be blended with incremental dedicated climate-related financing. In addition, ADF resources are also highly relevant for mitigation and adaptation interventions on their own even without incremental climate-related finance. For example, in the case of adaptation, ADF resources can be instrumental to increase the climate resilience of ADF countries in vulnerable sectors.

Table 1: Components of Vulnerability to Climate Change in Asia and the Pacific

High Exposure ^a	Low Adaptive Capacity ^b	High Sensitivity ^c
<i>Afghanistan</i>	<i>Afghanistan</i>	<i>Afghanistan</i>
Armenia	Bangladesh	Bangladesh
Azerbaijan	<i>Cambodia</i>	<i>Bhutan</i>
Bangladesh	India	<i>Cambodia</i>
<i>Bhutan</i>	<i>Lao PDR</i>	PRC
<i>Cambodia</i>	Myanmar	India
PRC	<i>Nepal</i>	Indonesia
Georgia	<i>Timor-Leste</i>	<i>Lao PDR</i>
India	<i>Uzbekistan</i>	Myanmar
Indonesia		<i>Nepal</i>
Kazakhstan		<i>Pakistan</i>
Korea, Republic of		<i>Papua New Guinea</i>
<i>Kyrgyz Republic</i>		<i>Sri Lanka</i>
<i>Lao PDR</i>		Thailand
<i>Mongolia</i>		<i>Timor-Leste</i>
Myanmar		<i>Viet Nam</i>
<i>Nepal</i>		
<i>Pakistan</i>		
<i>Papua New Guinea</i>		
Philippines		
<i>Sri Lanka</i>		
<i>Tajikistan</i>		
Thailand		
Turkmenistan		
<i>Uzbekistan</i>		
<i>Viet Nam</i>		

ADB = Asian Development Bank, ADF = Asian Development Fund, PRC = People's Republic of China, Lao PDR = Lao People's Democratic Republic.

Notes:

- Key to countries: **Group A: ADF-only countries (bold, italic); Group B: Blend countries (bold);** non-ADF countries.
 - Table excludes many Pacific island countries, for which data was not available.
- ^a Exposure reflects delta change in both temperature and annual precipitation in 2050 compared with current climate (1950–2000). Countries are classified as highly exposed if temperature increases by at least 2°C or if annual precipitation levels increase or decrease by at least 20%.
- ^b Adaptive capacity is represented by poverty level: a poverty level of more than 30% is interpreted as low adaptive capacity.
- ^c Sensitivity is represented by the share of labor employed in agriculture (Food and Agriculture Organization, 2004). Countries with agricultural employment above 40% are considered to be highly sensitive.

Source: International Food Policy Research Institute and ADB. 2009. *Building Climate Resilience in the Agriculture and Food Sector of Asia and the Pacific*. Manila.

**Table 2: Climate Change-Related Loans, Grants, and Technical Assistance
in Asian Development Fund Countries, 2005–2010**
(\$ million)

Year	Loans			Grants			TA			Total
	Adaptation	Mitigation	Mitigation and Adaptation	Adaptation	Mitigation	Mitigation and Adaptation	Adaptation	Mitigation	Mitigation and Adaptation	
2005	49.5	833.8	0.0	0.0	0.0	0.0	0.0	0.8	0.0	884.1
2006	103.0	431.2	0.0	0.0	0.0	0.0	0.0	2.6	0.0	536.8
2007	114.9	1,152.4	0.0	9.2	25.4	0.0	2.4	12.4	0.0	1,316.7
2008	222.8	767.0	87.0	26.5	260.6	0.0	11.2	20.3	0.1	1,395.5
2009	673.5	819.5	0.0	327.7	123.9	0.0	11.6	15.7	1.4	1,973.3
2010	1,096.9	1,325.5	177.3	148.4	61.5	0.0	5.2	12.6	3.6	2,831.0

ADB = Asian Development Bank, OECD = Organisation for Economic Co-operation and Development, TA = technical assistance.

Notes:

1. Data are as of June 2011.

2. For 2005–2009, projects were categorized as climate change mitigation, climate change adaptation, or both based on the information contained in the ADB database of clean energy projects and the regional climate change implementation plans. Starting in 2010, projects are classified climate change-related based on a classification system embedded in the ADB database wherein projects that address adaptation and/or mitigation are identified and OECD guidance in classifying mitigation and/or adaptation projects.

Source: ADB database.

Table 3: ADB Clean Energy Loans to Asian Development Fund Countries since the Launch of the Energy Efficiency Initiative, 2005–2010

Country	Number of Loans						Amount (\$ million)					
	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
Afghanistan	1					1	26.5					2.8
Armenia			1						36.0			
Bangladesh	1		2			2	230.0		665.0			174.2
Bhutan				1						80.0		
Cambodia		1	1		1			20.0	8.0		42.0	
Georgia												
Kyrgyz Republic					1	2					16.5	4
Lao PDR	2						120.0					
Maldives												
Marshall Islands												1.1
Nepal					1	1					65.0	1.8
Pakistan	2	2	3	2	1	3	97.3	351.0	416.8	258.0	60.0	267.8
Palau						1						0.9
Papua New Guinea						1						57.3
Samoa			1						26.6			
Sri Lanka					2						260.0	
Uzbekistan		1		1	1	2		60.2		30.0	60.0	121.6
Viet Nam	1			1	2		360.0			196.0	246.0	
Total	7	4	8	5	9	14	833.8	431.2	1,152.4	564.0	749.5	631.5

ADB = Asian Development Bank, Lao PDR = Lao People's Democratic Republic.

Source: <http://www.adb.org/Clean-Energy/default.asp>

Table 4: ADB Clean Energy Technical Assistance to Asian Development Fund Countries since the Launch of the Energy Efficiency Initiative, 2005–2010

Country	No. of TA Projects						Amount (\$ million)					
	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
Afghanistan	3	1	1	1	1	1	2.5	1.2	2.0	0.2	0.2	0.7
Bangladesh	1	1	2		3	3	0.8	0.6	1.2		3.9	1.9
Bhutan	1	1	1	1	1		0.4	0.7	1.6	1.5	0.9	
Cambodia		1						1.0				
Georgia						2						1.2
Lao PDR		1	2	1	1	2		0.8	1.7		1.0	3.7
Mongolia						1						1.5
Nauru	1						0.4					
Nepal			2	2		6			0.9	0.3		4.8
Pakistan	2	4	1	2		1	0.7	2.8	2.0	0.8		1.5
Papua New Guinea	1		1	1			1.0		0.5	1.2		
Samoa		1	1	1				0.75	1.9	1.2		
Sri Lanka			1		3				0.6	0.4	3.8	
Tajikistan	1	1	1			1	0.5	1.5	0.1			0.8
Tonga						1						0.2
Uzbekistan	1						0.3					
Viet Nam	6	2	4	5	2	2	4.6	2.2	3.5	1.7	4.0	0.9
Regional (for Pacific island countries) ^a						1						0.2
Total	17	13	17	14	11	21	11.1	11.6	16.0	7.2	13.8	17.4

ADB = Asian Development Bank, ADF = Asian Development Fund, Lao PDR = Lao People's Democratic Republic, TA = technical assistance.

^a Participating countries include Papua New Guinea, Samoa, Tonga, and Vanuatu (ADF countries); and the Cook Islands (non-ADF countries)

Source: <http://www.adb.org/Clean-Energy/default.asp>

Table 5: Private Sector Projects with Clean Energy Components in Asian Development Fund Countries, 2010–2012

DMC	Project Name	Total Amount (\$ million)	% Clean Energy Loan	Projected Clean Energy Investment (\$ million)	Project Type
Approved	2010				
AFG	Sungas LLC	8.0	35%	2.8	Clean Fuel
PAK	Zoelu Enerji Power Project	36.8	100%	36.8	Renewable
	Total for 2010				
Pipeline	2011				
BAN	Bibyana I Gas Fired Power Plant	96.00	35%	33.6	Clean Fuel
LAO	Nam Ngum 3 Hydropower Project	400	100%	400	Renewable
					Energy
PAK	JDW Co-GEN Power Plant	30.00	65%	19.5	Efficiency
PAK	Fauji Wind Project	70.00	100%	70	Renewable
PAK	Patrind Hydropower	97.00	100%	97	Renewable
	Total for 2011	693		620	
Pipeline	2012				
UZB	Surgil Natural Gas Energy and Gas Chemicals	400	35%	140	Clean Fuel
UZB	Kandym Gas Field Development Project	300.00	35%	105	Clean Fuel
	Total for 2012	700		245	

AFG = Afghanistan, BAN = Bangladesh, DMC = developing member country, LAO = Lao People's Democratic Republic, PAK = Pakistan, UZB = Uzbekistan

Source: <http://www.adb.org/Clean-Energy/default.asp>

Table 6: ADB's Key Climate Change-Related Publications

No.	Title	Year of Publication
1.	Building Climate Resilience in the Agriculture Sector of Asia and the Pacific	2009
2.	Improving Energy Security and Reducing Carbon Intensity in Asia and the Pacific	2009
3.	Understanding and Responding to Climate Change in Developing Asia	2009
4.	The Economics of Climate Change in Southeast Asia: A Regional Review	2009
5.	Promoting Sustainable, Low Carbon Transport in Asia	2009
6.	Powering the Poor: Projects to Increase Access to Clean Energy for All	2009
7.	Under the Weather and the Rising Tide: Adapting to a Changing Climate in Asia and the Pacific	2009
8.	Key Messages for Policy Makers: Climate Change in Asia and the Pacific—Implications for Food, Fuel, and People	2010
9.	Climate Risks and Adaptation in Asian Coastal Megacities: A Synthesis Report	2010
10.	Ho Chi Minh City Adaptation to Climate Change: Summary Report	2010
11.	Climate Change in Central and West Asia: Routes to a More Secure, Low-Carbon Future	2010
12.	Climate Change in East Asia: Staying on Track for a More Sustainable Future	2010
13.	Climate Change in the Pacific: Stepping Up Responses in the Face of Rising Impacts	2010
14.	Climate Change in South Asia: Strong Responses for Building a Sustainable Future	2010
15.	Climate Change in Southeast Asia: Focused Actions on the Frontlines of Climate Change	2010
16.	Clean Energy in Asia: Case Studies of ADB Investments in Low Carbon Growth	2010
17.	Accounting for Health Impacts of Climate Change	2011
18.	National REDD+ Strategies in Asia and the Pacific: Progress and Challenges	2011
19.	Adapting to Climate Change: Strengthening the Climate Resilience of Water Sector infrastructure in Khulna, Bangladesh	2011
20.	Power for the Future: Clean Energy Projects of the Asian Development Bank	2011

ADB = Asian Development Bank; REDD = reducing emissions from deforestation and forest degradation.

Source: <http://adb.org/Climate-Change/publication.asp>

Table 7: Overview of Multilateral Climate Change Financing

Name of Fund	Proposed Life of Fund	Program Objective	Eligibility Criteria /Eligible Sectors/Activities	Total Deposited/ Total Pledged (\$ million)
Adaptation				
Least Developed Countries Fund (LDCF)	Administration of GEF ongoing under UNFCCC	To address the special needs of the Least Developed Country Parties (LDCs) to the UNFCCC, through the preparation and implementation of National Adaptation Programmes of Action (NAPAs)	Eligible activities: <ul style="list-style-type: none"> • Participatory impacts and vulnerability assessments; • Identification and prioritization of adaptation measures; • Integration of adaptation into national development strategies, plans and policies; • Design and implementation of adaptation projects on the ground 	254/400 (As of 1 August 2011, funding available is \$100 million)
Special Climate Change Fund (SCCF)	Administration of GEF ongoing under UNFCCC	To implement long-term adaptation measures through the strengthening of resilience of vulnerable sectors in non-Annex I Parties to the UNFCCC	Eligible activities including adaptation actions in: <ul style="list-style-type: none"> • Water resources management; • Land management; • Agriculture; • Health; • Infrastructure development; • Fragile ecosystems (including mountain ecosystems); • Integrated coastal zone management; and • Climatic disaster risk management 	143/200 (As of 1 August 2011, funding available is \$22.4 million)
Kyoto Protocol Adaptation Fund (AF)	Continuation is dependent on UNFCCC decision on post 2012 Kyoto Protocol arrangements	To finance concrete adaptation projects and programs in developing countries that are Parties to the Kyoto Protocol	Eligible activities: <ul style="list-style-type: none"> • Adaptation projects in vulnerable sectors; • Disease control and prevention; • Capacity building for prevention/risk reduction, planning, preparedness and management of disasters relating to climate change; • Information generation and dissemination 	220/240 (As of April 2011 funding available is \$183 million)
Pilot Program for Climate Resilience (PPCR) under the Climate Investment Funds (CIF) ^a	To conclude operation once a new UNFCCC financial architecture becomes effective	To integrate climate risk and resilience in national development policies and planning	Eligible activities: <ul style="list-style-type: none"> • Facilitation of a cross-sectoral dialogue process to formulate a strategic approach for climate resilience and preparation of an investment program, Strategic Program for Climate Resilience (SPCR); • Implementation of the SPCR through, among others, support to policy reform, institutional capacity building, and scaling-up other investments in key 	647/986

Name of Fund	Proposed Life of Fund	Program Objective	Eligibility Criteria /Eligible Sectors/Activities	Total Deposited/ Total Pledged (\$ million)
			sectors	
Mitigation				
Clean Technology Fund (CTF) under CIF	(same as for PPCR)	To support the rapid deployment of low-carbon technologies on a significant scale	Activity eligibility criterion: Potential of a “transformative” effect through supporting programs that would not have been viable without concessional finance	2,560/4,340
Scaling-Up Renewable Energy Program for Low Income Countries (SREP) under CIF	(same as for PPCR)	To support investments in a small number of low income countries for energy efficiency, renewable energy and access to modern sustainable energy	Activity eligibility criteria: <ul style="list-style-type: none"> • Strong focus on poverty alleviation; • Economic and social development as well as environmental benefits; • With potential for scaling-up and replication, particularly the potential for removing barriers in the enabling environment beyond the immediate project boundary so as to facilitate scaling up through private sector investments 	205/327
Global Energy Efficiency and Renewable Energy Fund	15 years after the initial closing date: 6 November 2008	To invest in private equity funds (sub-funds) that specialize in providing finance to small and medium-sized project developers and enterprises (SMEs)	Country and activity eligibility criteria: <ul style="list-style-type: none"> • Developing countries and economies in transition; • With private sector engagement in national policies; • Projects under EUR10 million to be prioritized 	60/170
Forest Carbon Partnership Facility	Readiness Fund component is set to exist from 2008-2012; the Carbon Finance Mechanism, likely to go until 2015	To build capacity for REDD in developing countries and test a program of performance-based incentive payments in pilot countries	Country eligibility criteria: <ul style="list-style-type: none"> • All borrowing member countries of the IBRD or IDA that are located in subtropical or tropical areas; • Priority given to countries with substantial forest areas and forest carbon stocks, and to those where forests that are important for the livelihoods of forest dwellers and indigenous peoples 	321/392
Forest Investment Program under CIF	(same as for PPCR)	To mobilize funds for REDD and to promote sustainable forest management for emission reductions and the protection of carbon terrestrial sinks	Activity eligibility criteria: <ul style="list-style-type: none"> • Demonstrable mitigation potential at scale; • Cost-effective; • Integrating sustainable development (co-benefits); and • Safeguards 	262/578
UN-REDD Programme	Unknown	To strengthen the capacity of national governments to prepare and implement national REDD strategies	Country eligibility criteria (Phase I): <ul style="list-style-type: none"> • Requesting for quick start action; 	97/151

Name of Fund	Proposed Life of Fund	Program Objective	Eligibility Criteria /Eligible Sectors/Activities	Total Deposited/ Total Pledged (\$ million)
			<ul style="list-style-type: none"> • Existing collaboration with UN partners in related areas; • With emission reduction potential; • Representing regional, biome and socio-economic features; • With leadership potential in sub-regional experience sharing; • Able to contribute experiences to UNFCCC negotiations and development of REDD mechanisms 	
Global Environment Facility (GEF) - Climate Change Focal Area	<p>Period for GEF 5 is from July 2010–June 2014</p> <p>Replenishment negotiations to commence in 2013</p>	To help developing countries and economies in transition to contribute to the overall objective of the UNFCCC	<p>The Climate Change Mitigation Strategy for GEF-5 consists of six objectives:</p> <ul style="list-style-type: none"> • Promote the demonstration, deployment, and transfer of innovative low-carbon technologies. • Promote market transformation for energy efficiency in industry and the building sector. • Promote investment in renewable energy technologies. • Promote energy efficient, low-carbon transport and urban systems. • Promote conservation enhancement of carbon stocks through sustainable management of land use, land-use change, and forestry. • Support enabling activities and capacity building. 	<p>889*1,140</p> <p>*\$470 million is committed to ADB DMCs through national allocations under the “System for Transparent Allocation of Resources (STAR)”</p>
With Both Adaptation and Mitigation Objectives				
Global Climate Change Alliance	Initial funding period is for a three year period, 2008–2010	To build a new alliance on climate change between EU and the most vulnerable developing countries	<p>Country eligibility criteria:</p> <ul style="list-style-type: none"> • LDCs and small island developing States (SIDS) • With national and/or sectoral climate change policies in place or with intention to prepare them; • Keen to enhance policy dialogue and cooperation on climate change with the EU; • Received, or about to receive Budget Support through the European Commission and/or other donors; • Having within the country 	224/226

Name of Fund	Proposed Life of Fund	Program Objective	Eligibility Criteria /Eligible Sectors/Activities	Total Deposited/ Total Pledged (\$ million)
			an EC Delegation with sufficient capacity; <ul style="list-style-type: none"> • Preferably been involved and politically active in the UNFCCC negotiations 	
Green Climate Fund	(Not yet operational)	To contribute to the achievement of UNFCCC mitigation and adaptation objectives by scaling up the delivery of new and additional predictable and adequate funds for projects, programs, policies and other activities in developing countries with a balance between adaptation and mitigation funding	<i>Governance and operational details under discussion and expected to be finalized at COP17 in December 2011</i>	\$100 billion per year by 2020 is the aspirational target* *Not all of these funds will flow through GCF.

Note: The table above does not purport to provide definitive information on available climate change financing.

^a CIF was established as an interim measure to scale up assistance to developing countries in responding to climate change, and to strengthen the knowledge base in the development community on mechanism for climate change action. CIF is implemented jointly by the MDBs: African Development Bank, ADB, European Bank for Reconstruction and Development, Inter-American Development Bank, and World Bank Group.

Source: Climate Funds Update <http://www.climatefundsupdate.org/listing> as of 8 August 2011.

Distribution of Multilateral Climate Change Financing (\$ Million)

	Deposited	Pledged
Adaptation	1,264	1,826
Mitigation	4,394	7,098
With Both Adaptation and Mitigation Objectives	224	226
Total	5,882	9,150

Note: The table above does not purport to provide definitive information on available climate change financing.

Source: Climate Funds Update <http://www.climatefundsupdate.org/listing> as of 8 August 2011.

Examples of Integration of Climate Change in Asian Development Fund Countries' Country Partnership Strategies

Kiribati, 2010–2014

With climate change being identified as one of the most pressing issues in the country, Kiribati's country partnership strategy (CPS) will specifically support the implementation of six strategies of the Kiribati Development Plan, including the implementation of climate change adaptation activities. The CPS also identified strengthened resilience to climate change as one of the intermediate outcomes. The CPS recognized that adaptation actions such as climate proofing infrastructure investments will contribute to the strategic objectives of the CPS, allow ongoing access to infrastructure services despite climate change, and reduce the drain on public finances for infrastructure replacement. Guided by the Pacific Climate Change Implementation Plan, the country will seek to incorporate climate change adaptation and mitigation into the Kiribati program and will access available funding windows for additional support to address climate change.

Nepal, 2010–2012

One of the four pillars of CPS includes climate change adaptation and environmental sustainability. The Asian Development Bank (ADB) will assist Nepal to adapt to climate change through national and local planning, investments in risk reduction, support for insurance and other risk-sharing instruments, and climate-proofing projects. Sustainable management of forests, water, and other natural resources for provision of clean water supplies; protection of biological diversity; and sequestration of carbon from the atmosphere to offset greenhouse gas emissions will be part of ADB's assistance to Nepal. The country will promote alternative energy and energy efficiency, and will enhance efforts to strengthen the government's capacity to put in place a sustainable institutional framework for managing climate change and the environment. ADB, together with the World Bank, will assist the country to integrate climate risks and resilience into core development planning through its Strategic Program for Climate Resilience.

Papua New Guinea, 2011–2015

Papua New Guinea's CPS, approved in August 2010, recognized that extreme weather conditions and other natural hazards frequently damage infrastructure in the country, and the risk of the climate-related events is likely to increase. In response to these challenges, the environment—with a focus on climate change—was identified as one of the strategic priorities in the CPS. As part of the overall country development program, the government, with support from ADB, will seek to climate- and hazard-proof infrastructure projects, in particular in the transport and power sector, which are at moderate or high risk from the impacts of climate change and other natural hazards. In the power sector, clean energy solutions will be given priority and market mechanisms such as the Clean Development Mechanism will be explored, which may bring in additional carbon revenue. ADB will also provide support through technical assistance (TA) to strengthen the country's capacity to build resilience in key sectors and to manage its natural resources.

Solomon Islands, 2009–2011

Mainstreaming climate change was identified as one of the strategic priorities in the interim CPS. A number of programs were described in the CPS, supporting the mainstreaming of climate

change issues in the Solomon Islands both through adaptation and mitigation. ADB-assisted projects that are supporting climate change adaptation include regional TA for the Coral Triangle Initiative as well as infrastructure projects. The Coral Triangle Initiative will include investments in adaptation measures for integrated watershed and coastal management, including marine protected areas. Climate change adaptation, including climate-proofing of structures, is also a key part of ongoing infrastructure projects, including the Domestic Maritime Support Project and the Road Improvement Project. The latter is integrating adaptation measures into the design and maintenance of civil works in two ways: incorporating adaptation measures for future climate change into subproject planning and engineering designs; and including adaptation measures as part of the environmental management plan. The models developed under this project may also be replicated to other infrastructure projects under the government's medium-term strategic plan and thus have a wider impact. Through regional TA, ADB is also supporting climate change mitigation in the Solomon Islands through its work on renewable energy. The country is designing a regional renewable energy intervention to improve access to rural electrification and to support the use of renewable energy sources, including alternative fuels and mini hydro, in remote islands.

Tajikistan, 2010–2014

One of the thematic concerns identified in the CPS is the environment and climate change. The CPS emphasized that Tajikistan is one of nine countries and two regions selected to participate in the Pilot Program for Climate Resilience. ADB, along with the World Bank and other development partners, will help develop adaptation and mitigation measures in the country. Investment priorities include alternative energy, energy efficiency, renewable energy, flood mitigation measures, and construction of reservoirs for small- and medium-sized hydropower schemes. Some donors are looking at reforestation and extending cultivated areas. Tajikistan is also included in a regional climate change TA program for countries covered by the ADB Central and West Asia Department focused on building capacity and creating awareness on climate change.

Vanuatu, 2010–2014

ADB's Vanuatu CPS identified vulnerability and climate change as one of the major issues in development that needs to be addressed. The country is vulnerable to a wide range of climate-related hazards—more than most other Pacific Islands countries. Recognizing that climate change will have the most adverse impact on the poor, the environment and climate change have been identified as a cross-cutting theme in the CPS and the country has committed to undertake climate-proofing infrastructure interventions to ensure that Vanuatu is prepared to meet the challenges arising from climate change. Natural resource management and climate change considerations will also be incorporated in all ADB operations in the country because of the fragility of its natural resource base, the threat posed to the natural ecosystem by rapid population growth, unplanned urbanization, global warming, and Vanuatu's exposure to natural disasters.

Examples of ADB's Experience in Climate-Proofing Projects

1. **Cambodia.** The \$67 million Rural Roads Improvement Project aims to rehabilitate and pave 505.4 kilometers of rural roads to improve rural connectivity to national and provincial road networks, with \$5.4 million grant funding from the Nordic Development Fund for climate adaptive design and implementation.¹ These include engineering design adjustments (increasing drainage capacity, adjusting sub-grade materials to withstand higher water content, and road elevation in areas particularly at risk of flooding); capacity building (private sector contractors) and information generation (preparing climate change vulnerability maps to influence transport sector planning); introducing ecosystem-based adaptation strategies and effective road maintenance and management; disaster mitigation; and overloading control. The project roads are located in seven provinces, mainly around the Tonle Sap Basin, which has a large proportion of Cambodia's rural poor. These are Battambang, Kampong Cham, Kampong Chhnang, Kampong Speu, Kampong Thom, Pursat, and Siem Reap.
2. **Solomon Islands.** The \$24 million grant for the Second Solomon Islands Road Improvement Project aims to repair the infrastructure damaged by the floods, with enhanced engineering design-based resilience to changing climate patterns.² It will (i) improve about 30 water crossings (bridges, culverts, and wet crossings); build about 20 kilometers of roads; and selectively relocate roads for adaptation to climate change; (ii) maintain roads using local community and private contractor supplied labor-based, equipment-supported techniques; and (iii) build capacity, including a community education and awareness campaign and environmental management and road maintenance schedules. The project will remove transport accessibility constraints on economic growth and social development in the subproject areas by restoring or providing road connectivity and improving reliability of access in the face of natural hazards.
3. **Timor-Leste.** The \$46 million Road Network Development Sector Project Asian Development Fund loan was approved in 2009.³ The project involves the climate proofing of coastal roads and those passing through highly mountainous agricultural areas to adapt to rising sea levels, rising temperatures, and worsening erosion from flooding. The approach to climate proofing includes engineering and bioengineering adaptation measures, including earth levee banks with "rip-rap" protection from extreme waves along the coastline and reforestation of unstable slopes in the mountainous agricultural areas. The project is expected to benefit about 62,000 people, including 55,000 poor and 28,000 extremely poor; and reduce poverty by providing villagers in the project area with immediate employment and income-generating opportunities.
4. **Viet Nam.** ADB is working with the United Nations Development Programme to climate proof some components of a \$130 million rural infrastructure development project in central Viet Nam.⁴ With \$3.4 million support from the Special Climate Change Fund administered by the Global Environment Facility (GEF), two to four subprojects in two provinces will be climate proofed for possible replication. The proposed project was submitted in May 2011 for GEF CEO endorsement with a focus on rural roads, river embankments, and irrigation projects. The project will develop climate-proofing measures adapted to the rural areas of Viet Nam. This will

¹ ADB. 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Loan Kingdom of Cambodia: Rural Roads Improvement Project*. Manila.

² ADB. 2009. *Report and Recommendation of the President to the Board of Directors: Proposed Asian Development Fund Grant and Administration of Grants Solomon Islands: Second Road Improvement (Sector) Project*. Manila.

³ ADB. 2009. *Report and Recommendation of the President to the Board of Directors: Proposed Asian Development Fund Grant Democratic Republic of Timor-Leste: Road Network Development Sector Project*. Manila.

⁴ ADB Project Information Document. <http://pid.adb.org/pid/TaView.htm?projNo=41461&seqNo=02&typeCd=2>

include bioengineering methods, particularly for steep terrain, and the integration of these approaches for erosion control and embankment slope stabilization into standard design procedures for vulnerable rural infrastructure.

5. **Bangladesh.** The Padma Multipurpose Bridge Project is a \$2.9 billion project that will build a first fixed crossing across the Padma River in Bangladesh, to connect the southwest region with the Dhaka capital region across the Padma Bridge at the Mawa–Jaujira Crossing Point.⁵ An extensive study was undertaken to examine the possible impacts of climate change on the design of the bridge. The study examines the vulnerability of the bridge structure to projected changes in sea level, temperature, rainfall, wind speed, and salinity intrusion. The study concludes that the bridge should be raised by 0.63 meters as a result of both sea-level rise and increased basin rainfall. There are no changes to other components of the bridge as a result of the temperature and wind speed consideration. The cost of raising the bridge by 0.63 meters has been estimated to be \$15 million, or about 1% of the cost of building the bridge (the cost of the bridge itself is about \$1.5 billion).

⁵ Environment Impact Assessment report: <http://www.adb.org/Documents/Environment/BAN/35049/35049-01-ban-eia.pdf>