Chapter 4. The Way Forward – Strategic Priorities

93. **Climate change is already a development reality in South Asia.** Existing concerns about food security, water scarcity and energy are made all the more difficult by climate risks that will challenge the goals of inclusive and environmentally sustainable economic growth. Development under climate constraints demands a dual approach. Adaptation is necessary to limit the damage caused by climate change. It enables communities to preempt and manage climate risks and allows governments to protect and "climate-proof" high value assets and infrastructure. Mitigation is also vital since no amount of adaptation planning can protect economies from the potentially catastrophic impacts of climate change. A key to a sound climate change strategy will be to strengthen the knowledge and capacity of institutions that currently manage climate-sensitive assets and natural resources. Recognizing that industrialized countries have contributed most to the existing stock of emissions, there is a broad consensus that developed countries would need to take the lead and shoulder the financial burden of mitigation actions in the near term.[36] However, there also remain wide opportunities for developing countries to participate in emission stabilization in ways that generate win-wins and benefit national development goals.

Role of the World Bank and the Pillars of Engagement

94. **The World Bank, with its development mandate, has an important role to play in supporting South Asian countries to develop under climate constraints.** Agreements on global climate strategies to stabilize emissions lie in the jurisdiction of the Parties to the UNFCCC, at which the World Bank is a neutral observer and does not participate. However, the Bank recognizes that climate change has become a significant development challenge that threatens growth prospects.

95. Addressing the climate change challenge must include adaptation, to address the inevitable; and mitigation, to prevent the avoidable. The adaptation dimension is closely linked to the development mission of the Bank. The Bank is therefore well positioned to assist its partners in building economic resilience in order to protect development from climate risks. The Bank also has a large presence in renewable energy, energy efficiency, the water sector and institutional reform. The Bank can therefore play a key role in facilitating a global transition to low-carbon-growth economies in ways that promote sustainable development and economic progress. There are a suite of instruments available to address the climate challenge. These include knowledge products, technical assistance, policy advice, as well as investments. Subsequent chapters address this issue in greater detail.

96. **Building country ownership, capacity and awareness is the key to tackling the climate change problem.** The resources available for climate change are limited, while the region is a large player whose performance (on both emission stabilization and adaptation) will have an important bearing on global outcomes. Simply strengthening or scaling-up the many climate-friendly investments in the Bank's portfolio will not be

[36] At the time of writing the turbulence in financial markets remains a major concern and source of uncertainty.

sufficient to tackle the problem. For the Bank's interventions to be effective the solution lies in building partnerships to promote country ownership of climate change challenges. This calls for tailored approaches to deepen knowledge and institutional awareness so that climate risks are incorporated in country development policies, plans and programs. It also requires high-impact investments that would have catalytic effects. Strengthening the knowledge base and institutional capacity is especially significant in this context given that most measures must be guided by government policies.

Adaptation in South Asia

97. **Effective adaptation poses many policy challenges.** Responses have to be developed in the face of uncertainties on the timing, location and severity of climate impacts. Looking to the future the scale of these impacts will be contingent upon global mitigation efforts undertaken in the next few decades. Delayed or limited emission stabilization will necessitate considerably greater investment in risk management and climate change adaptation. These uncertainties need to be factored into the development of adaptation strategies and financing plans. In some respects the risks posed by climate change are one of degree – more intense floods, or more frequent droughts, or a greater incidence of climate-sensitive diseases. The policies and institutions that enable South Asian countries to cope with these risks today, will build resilience in addressing future risks. Simultaneously, climate change is also predicted to bring new and unprecedented problems, such as those associated with sea level rise and melting glaciers. This will call for building new policies to prepare for the potential adverse impacts. However, given the large uncertainties, a rational first response is to invest in greater knowledge to better understand the scale and magnitude of these threats and to build institutional capacity and knowledge to adequately respond to the challenge of climate change. In many cases institutions will be considerable challenged by the crisis of climate change, in particular where structures are highly fragmented, such as for water resources, and where technical capacity is limited. In all South Asian countries institutional responsibility for climate change is vested in the environment sector, but the actions and responses that are needed are typically cross-sectoral. There is often limited understanding of climate change related problems in sectoral ministries and public sector companies, so an investment in knowledge is crucial.

98. **Climate policies in South Asia will need to be tailored to specific risks and country development priorities.** The projected impacts of climate change in South Asia will be varied and heterogeneous, suggesting that there are no simple blueprints for successful climate change adaptation. Responses will need to be customized to specific risks. Accordingly, the South Asia region climate change strategy sets out the broad principles of an evolutionary approach that can be tailored to fit individual circumstances. The focus would need to vary depending on country risks, needs, demands and institutional structures. Recognizing the need for flexibility, the South Asia adaptation priorities are guided by five pillars:

a. **Investment in knowledge.** In a situation of uncertainty, knowledge has high value, and this makes the case for vigorous investment in information and better understanding. Adaptation to climate change is analogous to many other forms of risk management. It requires an assessment of possible threats and opportunities

arising from climate variability; and incorporation of the outcomes of such assessments into policy through the appropriate mechanisms. The challenge is that climate science is imperfect and there is often little reliable information on the path of future climate risks and the likely damages in particular if these are regional or local in nature.

b. **"No-regrets" approach.** No-regrets approaches build resilience to climate risks while generating additional co-benefits. Faced with uncertainty about future risks, no-regrets policies provide a strategy for hedging against climate risks. Issues such as irrigation supplies, health care, infrastructure, agriculture technology, disaster preparedness, and habitat protection lend themselves to no-regrets adaptation interventions that simultaneously deliver climate resilience and address current development needs.

c. **Focus on the poor.** The most vulnerable are the poor in the developing countries who have limited resources and whose assets and livelihoods are exposed to climate-sensitive factors. The poor are also most often employed in sectors, such as agriculture, that are exposed to high climate risks. Building resilience of these groups to current climate risks is a difficult challenge given their general lack of representation in various institutions, but one that would generate immediate development dividends as well as reducing future climate vulnerability.

d. **Promoting regional cooperation to address common threats.** The most severe climate threats (such as glacier retreat and sea level rise) transcend national boundaries. Finding effective solutions for flood control, irrigation and river transport will require cooperation between upper and lower riparian countries. This calls for coordinated solutions to jointly address shared problems. Simultaneously effective regional cooperation through energy trade can also assist in lowering emissions.

e. **Maintaining the integrity of environmental services.** Recognizing that climate change is a consequence of damaged and diminished ecoservices, remedial measures need to be aimed at protecting and restoring ecosystem integrity. Indeed, maintaining ecosystem integrity can provide a cost-effective way of building climate resilience and providing a buffer against climate impacts.

Low-Carbon Development in South Asia

99. With a large proportion of South Asia's population living below the poverty line, any low-carbon growth strategy must be consistent with the region's development objectives of improving living standards and incomes. This is the overarching principle that guides the Bank's operations. Fortunately, opportunities do exist to harness *win-wins* by focusing on measures that generate significant co-benefits such as improvements in energy and economic efficiency, reduction in local pollutants and improvements in natural resource management. The South Asia region has initiated a strong dialogue and a work program to realize these multiple benefits and to expand its interventions. There are three key pillars that guide the South Asia region in promoting low-carbon development and growth:

a. **Win-win policies**. Such policies not only provide global benefits in reducing GHGs but also pay for themselves in domestic benefits such as reduced fuel

expenditure, energy efficiency, greater energy security, improved air quality. If win-win policies were easy to implement, they would have long since been put in place. But they are often impeded by regulatory barriers, financial constraints, coordination problems, institutional bottlenecks, or market failures. Some (IEA 2006; Farrell et al. 2008) see tremendous untapped opportunities for win-win policies and argue that the mitigation challenges can be largely achieved with such structural realignments. But others are skeptical, emphasizing the formidable policy and political economy obstacles that would need to be overcome**.** The Bank, with its long global experience in addressing institutional and policy hurdles, is well positioned to assist countries harness these opportunities.

b. **Compensation.** All South Asian countries would need to be compensated for the additional costs of mitigation actions that go beyond their development objectives. This approach underlies the UNFCCC principle of "common but differentiated responsibilities." It recognizes that current climate risks are the consequence of past actions by developing countries and there is a need for assuring equal and fair access to the global atmospheric commons.

c. **Technology transfer.** A third pillar is to promote the wider adoption of clean technologies. New technologies are expensive and risky, but with further research and adoption, they can become more economical and accessible. Development, deployment, and diffusion of affordable technology are critical to enabling developing countries to meet the challenges of climate change. Hence the transfer of technology and intellectual property rights regimes will be pivotal in determining the success of any global measures to stabilize GHGs. The World Bank can play a supportive and catalytic role in this process.

100. Tables 4.5 and 4.6 (located at the end of this chapter) provide a summary of the main climate risks and priority responses across the South Asia region – by sector and country. The Bank has at its disposal a wide range of instruments that include knowledge partnerships and capacity building (including climate risk assessments, assistance with global negotiations where required, reports and technical support) and investments. Consistent with its mandate the focus will be on the development impacts of climate change. The risks and responses suggest the need for the development of a climate sensitive approach, which builds on many aspects of the current portfolio of activities that already contain dimensions related to both adaptation and mitigation. Some existing activities would need to be further enhanced to address climate challenges, demands and needs. To be effective the strategy must aim to build country capacity and ownership of the climate change challenge.

101. In a resource constrained environment there will be a need to leverage funds effectively to achieve transformational impacts. Full use will need to be made of the evolving financial instruments, such as the Climate Investment Funds, and its components, in addition to other global resources such as special financial vehicles established by bilateral donors (such as climate change trust funds), and any international financing mechanism to be agreed under the second commitment period of the Kyoto Protocol (post-2012) and other agreements. The following section provides an overview of available financial resources.

Box 4.1 Can Regional Cooperation Reduce Climate Vulnerabilities of South Asia?

During the 1990s, South Asia's economies grew rapidly at an average of 6 percent annually. The growth further accelerated to 6.5 percent during 2000-2007. Rapid growth has been instrumental in reducing poverty in South Asia. Progress has also improved human development and social indicators. South Asia is the least integrated region in the world and has the potential to grow further if the region is integrated.

South Asia would probably gain most from regional cooperation in water, energy, and climate. Regional Cooperation can be a powerful tool for increasing growth, reducing inequality, increasing energy trade, and reducing vulnerabilities for the poor. By reducing vulnerability, regional cooperation can be helpful in lowering income inequality.

The melting of Himalayan glaciers leading to the disastrous prospect of reduced water availability in the South Asian rivers, the frequency of floods and cyclones, and the evidence of rising sea level necessitates a collective action for managing and reducing the vulnerability to climate change.

Actions at the national level cannot provide sustainable solutions since upstream flows from Afghanistan, Nepal, and parts of India impact Bangladesh, most of India and Pakistan. Finding solutions for flood control, irrigation and river transport will require cooperation with upstream countries. Thus, cross-border cooperation on water between India, Bangladesh, and Nepal offers a long-term solution to flood mitigation. There are similar benefits of water cooperation between India and Pakistan and between Pakistan and Afghanistan. The success of the Indus Water Treaty between Pakistan and India has already demonstrated that cooperation that benefits people can withstand all political obstacles.

What are the key constraining factors? First and foremost is the prevalence of a number of regional differences and priorities. Closer cooperation in climate related issues and trade could be a catalyst for resolving political and social differences. Given the magnitude of climate related events, it is critical that the regional countries move toward meaningful cooperation rather waiting for all differences to be resolved.

Financing Climate Adaptation and Mitigation

102. **Climate change represents an unprecedented development challenge and the resources needed to tackle the problem vastly exceed available funds.** Cost estimates point to a deficit in the order of hundreds of billions of US dollars per annum for several decades.[37] Responding to the climate challenge will require additional financing that should *complement rather than compete* with investments required for development. The global financial architecture would likely be negotiated in a forum such as the UNFCCC, and until this occurs it will be difficult to cover the financial gap.

103. Most South Asian countries already spend a significant proportion of their development budgets to address climate related risks. In India for instance, the direct losses from natural disasters are about 2 percent of GDP and perhaps as much as 12 percent of government revenues (World Bank 2003). Climate change is expected to increase the frequency of adverse climate events and raise the costs of development.

[37] A recent review conducted by the Bank suggests that the available funds for both climate mitigation and adaptation are of the order of US$10 billion pointing to a deficit in the order of hundreds of billions of US dollars per annum (World Bank 2008).

Though the resources that are currently available to meet the additional costs of climate change are insufficient, South Asian countries will need to prepare to utilize the new funds that are being developed to address climate risks in developing countries. There are also a number of financial instruments that are available to promote low-carbon development. These provide an opportunity to leverage the many untapped opportunities for investment in mitigation that simultaneously deliver other development benefits. The Bank can play an important role in helping South Asian countries access these resources.

Box 4.2 Lagging Regions and Climate Change

Recent rapid economic growth has been accompanied by rising regional inequality in South Asia. Growing income inequality and imbalance between regions within countries and among the countries could present social and economic problems to more prosperous neighbors as would imbalances within the countries.

India's southern and western states, taking advantage of the global economy, are growing faster than the northern and eastern states. Sri Lanka's western province now contributes more than 50 percent of national GDP. Poverty rates in Pakistan's southern Punjab are twice those in northern Punjab. The disparities are seen even within fast growing state like Andhra Pradesh in India. The dismal prospects of rural economies that depend on agriculture remain the primary factor behind this rising inequality in South Asia. Unless the lagging regions participate in the growth, not much will change for millions of poor people.

The problem of inequality is, however, a more complex challenge. Growth acceleration in the lagging regions might help reduce inequality. But this is only a part of the larger task of making growth more inclusive. The large concentration of poor in the lagging regions suggest public policy must focus on raising growth and improving human development in these lagging regions.

The lagging regions share a number of common vulnerabilities, including a high dependence on natural resources and climate-sensitive sectors of the economy. First and foremost is their vulnerability to natural disasters. South Asia has lost a significant amount of its GDP because of natural disasters and this impact is particularly harmful because of the region's high population density. This loss has been especially significant in many of the lagging regions of Bangladesh, India and Pakistan. A second and related vulnerability is resource degradation and, in particular, access to water. Many of the lagging regions are arid and depend on groundwater for irrigation. Unsustainable irrigation will take more of a toll if droughts become more frequent because of climate change. Frequent water shortages and intermittent floods create serious challenges to maintaining the income level of these large numbers of poor people. With melting glaciers, flood risks would increase in the near future and it is lagging states such as Bihar and Jharkand in India, and Nepal and Bangladesh that will bear the burnt of these major climatic changes. All of this suggests that building climate resilience is an important part of a strategy for igniting growth in the lagging regions of South Asia.

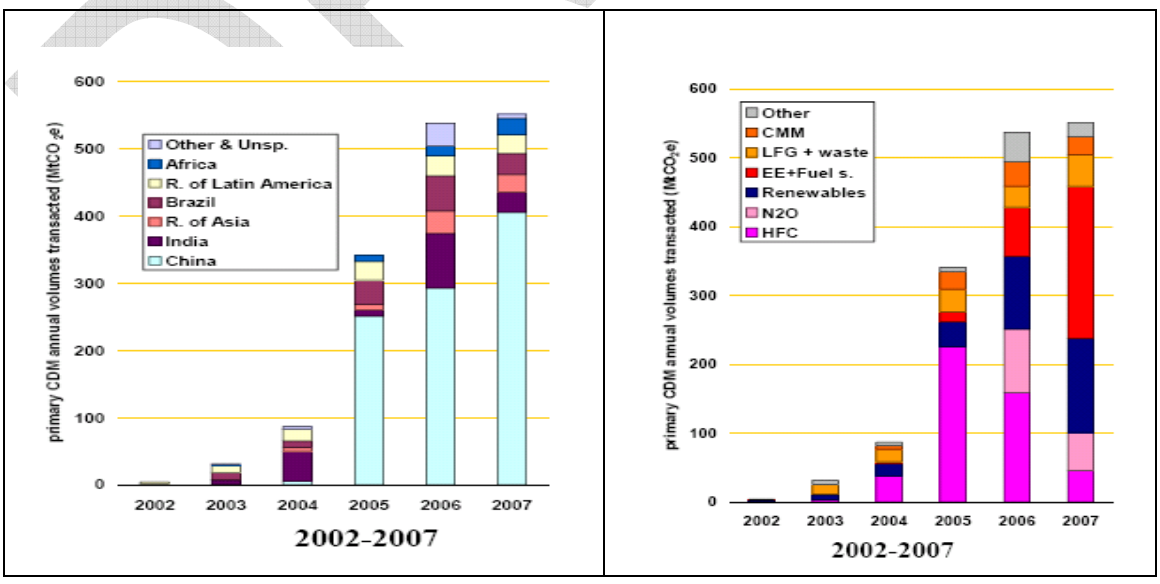
Financing the Transition to Low-Carbon Economies

104. **The World Bank has pioneered numerous initiatives to ensure that developing countries and economies in transition benefit from international efforts to address climate change.** The expansion of the carbon market in recent years has promoted the implementation of climate-friendly technologies in numerous developing countries and transition economies. The volume of carbon emission reduction reached

2.98 billion metric tons of carbon dioxide equivalent in 2007 amounting to trades of US$64 billion. About one-fifth of these carbon reductions were generated from developing countries through the Clean Development Mechanism (CDM) under the Kyoto Protocol mainly from China, India and Brazil, and in projects involving renewable energy development and energy efficiency. A similar mechanism focused on transitional economies, termed Joint Implementation (JI), has focused on emission reductions in economies in transition, with Russia, Ukraine and Bulgaria being the most important suppliers. Under current projections, the market-based mechanisms (CDM and JI) would contribute 20 percent of the total demand for emission reductions by 2012. Since their inception, the carbon markets have mobilized thousands of entrepreneurs in the private and public sectors, as well as in communities throughout the developing world.

105. The Carbon Finance Unit (CFU) in the Bank has developed numerous funds to assist project-based emission reductions in developing countries. The CFU has been an important catalyst in the formation of the carbon markets, by benchmarking carbon assets, and developing projects in new sectors. Funds are generated from the contributions of governments and companies in Organisation for Economic Co-operation and Development (OECD) countries and are used to purchase project-based GHG reductions in developing countries and economies in transitions. Carbon finance provides a stream of revenue for these countries, raising the bankability of projects and reducing the risks of commercial lending and grant finance. Hence, it enables the leveraging of new private and public investments into projects that mitigate climate change at the same time contributing to sustainable development. Table 4.1 lists the various sources of carbon finance that have been supported by the Bank for mitigation initiatives in energy, forestry, land-use change, agro-ecosystems and industry. These are currently being used to purchase emission reductions in developing countries.

Figure 4.1 Clean Development Mechanism Projects by Country, Beneficiary, and Sector



Source: Capoor and Ambrosi 2008.

106. A number of recent developments are expected to contribute to the evolution and transformation of the carbon markets over the next few years, in particular for emission reductions originating in developing countries. These include: (i) the second commitment period under the Kyoto Protocol (post-2012) which will likely include mechanisms to scale up the CDM and JI and provide more flexible operational procedures and eligibility requirements; (ii) the European Union is likely to extend the European Union Emissions Trading Scheme beyond 2012, and could include linkages to the CDM and JI, thereby expanding the size and scope of the market; and (iii) the growing demand for carbon offsets from the voluntary market.

107. Under these rapidly evolving conditions, the World Bank's Board of Directors has approved the launch of two new carbon facilities in September 2007. The first is the Carbon Partnership Facility, which will purchase emissions reductions for at least 10 years beyond 2012 in an effort to promote a shift towards investments in long-term, low-carbon technologies where otherwise greenhouse gas emissions would be locked in for decades to come. Recognizing the importance of forests as a carbon sink, a Forest Carbon Partnership Facility is dedicated to reducing emissions from deforestation and degradation. This initiative is aimed at setting the stage for future systems for performance-based payments that would provide incentives to slow deforestation and degradation. Consistent with the Bank's role to further develop the carbon market, these two facilities are based on the need to support long-term investments in an uncertain market environment, possibly spanning several market cycles. "Learning by doing" approaches will be an essential aspect of these facilities, as the carbon market moves from individual projects to programmatic approaches, including methodologies needed for such approaches.

Table 4.1 Available Carbon Financing for South Asia

Carbon Finance Fund	Description	Funds (US$ million)
Prototype Carbon Fund	Pioneers the market for project based greenhouse gas emission reductions while promoting sustainable development and offering a learning by doing opportunity to its stakeholders	180
Bio-Carbon Fund	Funds projects that sequester or conserve carbon in forest and agro-ecosystems. The fund aims to deliver cost-effective emission reductions, while promoting biodiversity conservation and poverty alleviation.	53.8
Community Development Carbon Fund	A public/private initiative designed in cooperation with the International Emission Trading Association and the UNFCCC that supports projects that combine community development attributes with emission reductions to create development plus carbon credits and improve the lives of the poor and local environment.	128.6

Italian Carbon Fund	A fund that purchases greenhouse gas emission reductions from projects in developing countries and countries in economies in transition that may be recognized under CDM and JI. It is open for *Italian* private and public sector entities.	155.6
Danish Carbon Fund	The fund supports mitigation initiatives by Danish public and private entities in wind, combined heat and power, hydropower, biomass use for energy and landfill.	68.5
Spanish Carbon Fund	Purchases GHG emission reduction from projects under Kyoto protocol to mitigate climate change while promoting the use of cleaner technologies and sustainable development in developing countries and economies in transition.	278.6
Umbrella Carbon Facility	A facility that pool funds from existing International Bank for Reconstruction and Development-(IBRD-) managed carbon funds and other participants for the purchase of emission reductions from large projects.	719
Forest Carbon Facility	Assists developing countries in their efforts to reduce emissions from deforestation and degradation by providing value to standing forests.	300
Carbon Partnership Facility	It is designed to develop emission reductions and support their purchase over long periods after 2012. This facility is prepared for large-scale, potentially risky investments with long lead times, which require durable partnerships between buyers and sellers.	

108. A capacity building and technical assistance program has been established to enhance capacity and expertise of developing countries in engaging in greenhouse gas market**.** The CF-Assist is a capacity building and technical assistance program that supports project identification and preparation for greenhouse gas emission reduction and sequestration. The program is undertaken in three phases with clearly defined objectives. The first phase is aimed at establishing focal points, identifying potential CDM and JI opportunities and training. In the second phase, technical assistance is provided for development of project design documents, marketing of projects to carbon buyers, identification of industry association or intermediary, integration of carbon finance into investment promotion strategies, and engagement of financial sector to promote integration of carbon finance in lending strategies.

109. The Global Environment Facility (GEF) has also provided some assistance for development of clean renewable energy and improving energy efficiency in developing countries. The GEF-financed energy projects in renewable energy and energy efficiency approved in 2003-2006 are expected to directly reduce emissions of greenhouse gases by 388 million tons over the project lifetime.

Box 4.3. Carbon Partnership Facility

The Carbon Partnership Facility ("CPF" or "the Facility") promotes greenhouse gas emission reductions ("ERs") on a larger scale through the provision of carbon finance for long-term investments that is designed to scale up the delivery of carbon finance through programmatic and sectoral initiatives and methodologies. Moving to programmatic and sectoral and country-wide approaches is a response to the limitations of the project-based Clean Development Mechanism and Joint Implementation initiatives that have high transaction costs. Ultimately, the Facility aims to contribute to a transformation of economic activities in energy, energy efficiency, waste management, oil and gas, transportation and urban sectors of Bank client countries in the direction of less carbon-intensive activities.

The CPF will establish partnerships to sell and purchase ERs from long-term programs beyond 2012 and support greenhouse gas emissions mitigation programs ("ER Programs"). Unlike the traditional carbon funds administered by the Bank whereby the Bank acts as trustee, the governance structure and trustee role of the CPF will include developing country governments and companies as sellers. This partnership approach reflects the sharing of risk between potential sellers and buyers of ER Programs during a period when the regulatory environment beyond the first Kyoto Protocol is uncertain and the global carbon market remains fragmented.

The CPF will be comprised of two trust funds, the Carbon Asset Development Fund (CADF) and the Carbon Fund. The CADF will hold funds generated from fee payments from buyer participants, donor contributions as well as investment income. The second trust fund, or *Carbon Fund*, will use financial contributions from buyer participants (governments or public and eligible private entities) to pay for ERs as they are received. The Carbon Fund will have funding tranches, with a discrete set of buyer participants and portfolio criteria. The portfolio criteria may cover several sectors and technologies or be more narrowly focused. Seller participants can participate in the facility by putting forward ER Programs allocated by the Trustee to one or more of the Carbon Fund tranches.

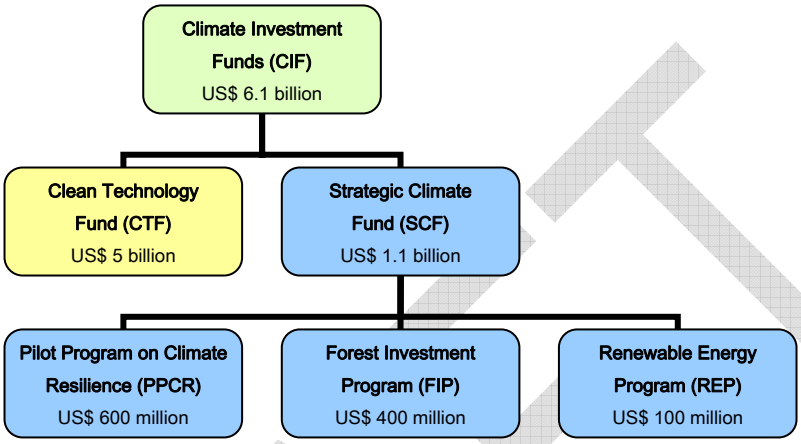
The proposed CPF is an important and integral part of the Bank's strategic framework on climate change that is currently under preparation and is expected to complement the Climate Investment Funds, notably the Clean Technology Fund (CTF).

Source: Partnership Review Note: Carbon Partnership Facility, The World Bank, Carbon Finance Unit

110. **The Climate Investment Funds (CIF) are the most recent source of funding that provide an opportunity for increased assistance to developing countries for promoting climate resilience and low-carbon growth.** When they signed the UNFCCC, governments agreed to help developing countries meet the climate change challenge through additional resources for both adaptation and mitigation. The Climate Investment Funds represent a major global effort for financing mitigation and adaptation efforts in developing countries in advance of the global financial architecture to be developed under the UNFCCC. Two trust funds have been established under the Climate Investment Funds: the Clean Technology Fund and the Strategic Climate Fund (Figure 4.2). The Clean Technology Fund is designed to support projects and programs in developing countries which contribute to the demonstration, deployment, and transfer of low-carbon technologies that can have significant potential for long-term greenhouse gas savings. The Strategic Climate Fund, on the other hand, is broader in scope and serves as an overarching fund for various programs to test innovative approaches to climate change, with an emphasis on adaptation. In September 2008, about US$6.1 billion had

been pledged for this investment. There are also plans to establish a Forest Investment Program and a Scaling-Up Renewable Energy Program under the Strategic Climate Fund in the coming months. Designed as an interim measure, the Climate Investment Funds include specific sunset clauses.

Figure 4.2 Structure of the Climate Investment Funds



Financing Options for Climate Adaptation

111. **The Global Environmental Facility has been the main source of grant and concessional funding for adaptation projects.** The initial phases of GEF financing covered vulnerability and adaptation assessments and capacity building projects. Pilot adaptation projects are funded through the Strategic Priority on Adaptation (SPA), a US$ 50 million GEF trust fund. Other GEF resources include the Least Developed Countries Fund (LDCF) which is targeted to 49 least developing countries and the Special Climate Change Fund (SCCF) which is accessible to all developing countries (Table 4.2). These funds integrate adaptation measures into development practices. Since its inception, the GEF has disbursed about US$120 million for "National Communications", of which a significant amount has been allocated to vulnerability and adaptation assessments. In addition, about US$28 million has been provided to support capacity-building and about US$78 Million worth of projects have been approved under SPA, LDCF and SCCF. While these funds have delivered resources for filling information gaps and capacity building their magnitude has been insufficient to catalyze robust adaptation initiatives on the ground. South Asia's share in these resources has been limited with only three projects approved amounting to about US$8 million (Table 4.3).

Table 4.2 Sources of Funds for Adaptation

Name of the Fund	Funding Source	Total Funds Mobilized (US$ million)	Operational Criteria	Main Activities of Support
Global Environment Facility (GEF) Trust Fund	GEF		Incremental cost to achieve global environmental benefits	Vulnerability and adaptation assessments as part of national communications and enabling activities
Strategic Priority on Adaptation (SPA)	GEF	50	Incremental cost guidance with some flexibility, especially for Small Grants Programme	Pilot and demonstration projects on adaptation Small Grants Programme (US$5 million) to support community-based adaptation
Special Climate Change Fund	Voluntary contributions from 11 developed countries	45.4 (Contributions: 36.7; pledged 8.7)	Additional cost of adaptation measures Sliding scale for co-financing	Addresses adaptation as one of the four funding priorities
Least Developed Countries Fund	Voluntary contributions from 13 developed countries	75.7 (Previous contributions: 29.9; pledged: 45.8; GEF allocation to date: 11.8)	Guiding principles: country-driven approach, equitable access by LDCs, expedited support and prioritization of activities Provision of full cost funding for adaptation increment as identified and prioritized in NAPAs Sliding scale for co-financing	Implementation of NAPAs (all projects for the preparation of NAPAs in 44 countries approved with a budget of US$9.6 million)
Adaptation Fund	2 percent share of proceeds from CDM	Under negotiation	Guiding principles country-driven and a learning by doing approach, sound financial management and transparency, separation from other funding sources	Concrete adaptation projects and programs identified in decision

112. **Future funding for adaptation is also being established through a special Adaptation Fund**. The structure, governance and management of this fund are still under negotiation. The Fund is to be managed by an independent board with representation from the five UN regions. It is to be financed through a 2 percent levy on CDM projects. Estimates of the size of this fund vary and suggest that the levy could translate from about US$100 million to US$5 billion depending upon the demand for emission reduction credits. The sustainability of this fund clearly depends on the continuity of the CDM and the development of the carbon market. Existing estimates of adaptation needs

suggest that the expected level of funding will be insufficient to cover future costs of adaptation.[38]

Table 4.3 GEF Projects under the New Climate Change Funds

Country	Project Title	Agency/ Fund	Project Grant (US$ approved)	Co-financing Total (US$)
Sri Lanka	Participatory Coastal Zone Restoration and Sustainable Management in Eastern Province of Post Tsunami Sri Lanka	IFAD[39]/ Strategic Priority on Adaptation	1,919,000	7,569,000
Bangladesh	Community Based Adaptation to Climate Change through Coastal Afforestation	UNDP/ Least Developed Countries Fund	3,000,000	6,080,000
Bhutan	Reduce Climate Change Induced Risks and Vulnerabilities from Glacial Lake Outbursts in Punakha-Wangdi and Chamkhar Valley	UNDP/ Least Developed Countries Fund	3,455,000	3,469,000

113. **The Global Facility for Disaster Reduction and Recovery (GFDRR), is an additional instrument that can finance development projects and programs that enhance local capacities for disaster prevention and emergency preparedness and adaptation to climate change.** The GFDRR aims to mainstream disaster reduction and climate change adaptation in country development strategies to reduce vulnerabilities to natural hazards. It funds disaster risk assessments, risk mitigation policies and strategies, preparation of disaster prevention projects and additional financing for recovery. Its program is undertaken in three tracks representing global, regional and country-level engagements. Track I supports annual work program of the International Strategy for Disaster Reduction (ISDR) to enhance global and regional advocacy, partnerships and knowledge management in disaster risk reduction. Track II provides ex ante support through 3 year technical assistance program to improve investments in risk reduction, institutional development, risk transfer mechanisms and adaptation to climate change. Track III is geared towards enhancing the mobilization of international assistance for disaster recovery and towards supporting the accelerated disaster recovery of low-income

[38] Financing adaptation through a tax on CDM implies that adaptation is being encouraged by making mitigation more expensive and hence less attractive. The extent of substitution this would promote is unclear in the absence of data on the relevant elasticities. A more consistent strategy would involve a levy on emissions (the cause of the problem) rather than mitigation (a solution to the problem).

[39] International Fund for Agricultural Development.

countries. Activities supported by GFDRR in South Asia amounted to US$4.3 million (Table 4.4).

Table 4.4 GFDRR Projects in South Asia under Track II

Proposal Title	Country	Total Cost (US$)
2nd Asian Conference on Disaster Reduction	India	75,000
Development of Lessons Learned Reports from Gujarat Emergency Reconstruction Project	India	350,000
Implementation Support for High Priority Disaster Risk Mitigation Program in India	India	400,000
India Crop Insurance: Developing Market-based Products	India	668,250
Bangladesh: Agricultural Risk Insurance Feasibility Study	Bangladesh	296,000
Climate change and future flood risks	Bangladesh	370,000
Improving Bangladesh's Response and Recovery Activities	Bangladesh	230,000
Building capacity to effectively deliver Safety Nets in post-disaster situations in Pakistan	Pakistan	290,000
Communicating Results Achieved and Lessons Learnt in the Bank-funded	Pakistan	250,000
Improving Sri Lanka's response and recovery in the aftermath of natural disaster	Sri Lanka	230,000
Hazard Risk Management Program: Nepal	Nepal	914,000
Nepal: Agricultural Insurance Feasibility Study	Nepal	188,000

114. Recognizing the need to address the funding gap the Bank has been working with bilateral donors and other groups to establish country partnerships to mobilize additional resources. The most recent example is the DfID[40]-financed Bangladesh Climate Change Trust Fund that provides grant resources for urgent adaptation needs. In the short term greater effort will need to be devoted to build partnerships with donors and other groups.

115. What is clear is that the current framework for climate change financing is provisional and the funds available are not commensurate to country needs for either adaptation or emission stabilization. The financial instruments to address the climate change challenge in developing countries are still evolving. There is a need for

[40] United Kingdom Department for International Development.

considerably greater international commitment, cooperation and coordination on funding if the world is to successfully address the development challenges brought about by climate change.

116. The International Finance Corporation also supports the private sector in transitioning to a lower-carbon growth path and in adapting their business operations to climate risks.

Box 4.4. IFC's support to Climate Mitigation and Adaptation in South

Sustainable Energy Finance and Energy Efficiency

A key impediment to the large scale adoption of energy efficiency is financing of energy saving improvements, renewable energy. IFC has two projects under development – one in Sri Lanka and one in Nepal – which have a high level of replication potential.

The Portfolio Approach to Distributed Generation Opportunities (PADGO) in Sri Lanka aims to improve access to cleaner and more reliable sources of energy for underserved populations. The model will develop a framework under which various parties (manufacturers, developers, operating companies, banks, rural communities, etc.) are provided tools (template agreements and contracts, performance standards for equipment, and financing opportunities) to encourage entry into the market while maintaining quality of service provided, so as to lower transaction costs. The framework is designed to be flexible to address the various local constraints and available energy resources to allow for replication in other countries/regions.

In Nepal, IFC will support three commercial banks to develop a portfolio of energy efficiency finance projects that they will offer to Nepalese industry. Energy intensive industries such as rolling mills, cement, sugar, paper, structural clay, distillery, bakery, rubber, leather, noodle, wool dyeing, jute, would be targeted with tailored financial products for energy efficiency that would enable the companies to reduce their energy consumption, costs, and emissions of greenhouse gases. This effort is also intended to serve as demonstration case in Nepal (and potentially for the region) that will improve awareness and understanding of energy efficiency and build technical capacity among financial institutions to provide energy efficiency lending services.

Investing in Renewable Energy

While climate change presents a considerable challenge, it also provides the private sector with the opportunity to expand its activities and grow while helping mitigate the risks of climate change and adapt to its impacts. In this context, IFC has a growing portfolio of renewable energy investments that are helping displace coal power generation and reduce greenhouse gas emissions that includes: four hydropower projects (two in Nepal and two in India); a bagasse cogeneration plant at two mills for a large sugar producer in India for a total of 40 megawatts; wind energy investments in two wind farms in India totaling 37 megawatts; and a potential investment in a photo-voltaic plant in Tamil Nadu (India).

IFC has supported Indian manufacturer Moser Baer expand into solar photovoltaic (PV) cell and module production. Solar PV is a renewable energy source that is used for electricity production in stand-alone and grid-connected applications. IFC is also supporting Jain Irrigation, one of the major agribusiness companies in India, in setting up an agricultural waste-based power project as well as help them define a strategy to become a renewable power sector player in India.

Carbon Finance

IFC's role in the carbon finance market is to help create a level playing field between emerging

market projects and developed country buyers without distorting the market. In South Asia, IFC has successfully concluded emissions reduction purchase agreements (ERPAs) with Eco Power, a private developer of small hydropower plants in Sri Lanka with more than 30 megawatts in seven projects and with Indian Hydropower Development Company (IHDC) for small-scale "bundled" projects owned and operated by the latter.

IFC has also recently provided a Carbon Delivery Guarantee for credits from a waste heat recovery project done by Rain CCII Carnon India Limited that reduces the company's dependence on fossil fuels.
As part of the World Bank Group's effort to deepen access to Carbon Finance, IFC also expects to offer carbon market-related advisory services to its clients, especially municipalities and financial institutions through wholesale aggregation arrangements for energy efficiency savings in lighting, water pumps, etc.

Cleaner Production Assessments

IFC's work in Cleaner Production Assessments supports the adoption of profitable cleaner production initiatives – such as energy efficiency and water conservation and recycling – among IFC's clients, thus setting an example and promoting demand for cleaner technologies. Typically, IFC provides technical assistance to companies in the form of clean production (CP) audits that help identify energy, water, and other type of resource savings, which reduce GHG emissions for client operations as well as improve profitability.

In South Asia, IFC has targeted a high-carbon footprint sector in India (paper and pulp) to conduct CP audits in three companies that will focus on energy and water audits, resource conservation, and GHG estimation. These audits are currently underway and another 7 – 10 companies have expressed interest in undertaking CP audits. IFC has also set up a global fast-tracking financing facility called "Cleaner production Lending Pilot" (CPLP) that will enable existing IFC clients to access loans up to US$5 million to implement some of the recommendations from the CP audits.

Cleaner Technologies Program

IFC'Cleaner Technologies investing focuses mainly on supporting small, high-risk ventures with accelerated technology transfer and commercialization of intellectual property. IFC has directly invested in areas of increasing strategic interest, such as the water sector, and it will play a major role in guiding the World Bank Group's work on accelerating clean energy technology innovation. The Cleaner Technologies program typically provides funding ranging from US$200,000 to US$2,000,000 for innovative business initiatives that produce goods and services with environmental benefits. The program's strategy going forward is to focus on Asia and on India, in particular.

Conclusions

117. The aim of this strategy is to catalyze a process that would build climate-resilient economies that grow along a low-carbon trajectory. To achieve this it will be necessary to promote country ownership, knowledge and institutional and financial capacity. The challenges are wide ranging suggesting the need for integrated approaches that transcend sectors and countries. As an example, in the water sector synergies can be built between approaches to flood prevention that promote adaptation, energy trade to facilitate low-carbon growth and water transport to stimulate economic integration. But this will require

a level of coordination and cooperation far beyond what is commonly observed in the region. More importantly, unilateral actions can often worsen underlying climate vulnerabilities. The introduction of export restrictions and bans of basic food staples (such as rice) may have alleviated shortages within countries, but this has had the unintended consequence of restricting global supply that has aggravated food price inflation.

118. The Bank is one of many players in the global arena of climate change. It sees its comparative advantage in addressing the development implications of climate change and stands ready to assist countries in South Asia across the many dimensions of the development challenges of climate change – local, national, sectoral and regional. With its convening power and presence across all countries in South Asia, the Bank can promote regional dialog and cooperation. The following section of the report provides a detailed assessment of the climate challenges and impacts in a sectoral context.

Table 4.5 Summary of Sector Impacts in the Context of Climate Change and Priority Responses

Sectors	Risks	Priority Response	World Bank's Potential Role
Regional and Cross-sectoral	• Information gaps • Limited coordination between sectors and countries • Funding gaps for both adaptation and low-carbon growth	• Knowledge products • Institutional coordination and strengthening • Resource mobilization	• Climate policy support targeted to needs • Low-carbon growth studies (India, Pakistan, Sri Lanka) • Trade barriers to clean technology adoption • Poverty-climate linkages • Build knowledge partnerships between countries and sectors • Assist with resource mobilization
Water	• Glacier melting in the Himalayas, including lake outburst • Floods • Droughts • Saline intrusion in coastal aquifers (due to sea level rise)	• Regional cooperation on international rivers and river basins • Improved water resources management • Climate sensitive infrastructure "packages" to build climate resilience • Knowledge investments, e.g. to assess risks in Himalayas and the region's large river basins • Increased research on new water efficient technologies and (drought resistant) crop varieties.	• Convening power/leadership role to catalyze regional cooperation • Honest broker role without footprint • Technical assistance • Lending and financing for hydropower and storage
Agriculture	• Declining yields of major crops • Agriculture unviable in marginal areas e.g. arid, semi-arid, coastal (saline intrusion affected zones due to sea level rise) • Crop destruction by extreme events	• Promotion of climate resilient cropping patterns and techniques • Agricultural research and extension for promoting climate resilient crop varieties • Improvements in risk management (e.g. climate insurance, contingent credit schemes) • Irrigation development and increased investment in water harvesting infrastructure at required scales that take account of climate risks	• Technical assistance (TA) to help in dissemination of climate-resilient crop varieties and cropping systems • Investments in agriculture research, improved extension services, irrigation and livelihood diversification • Sector work to identify innovative financing mechanisms (e.g. climate insurance, carbon credits)

Sectors	Risks	Priority Response	World Bank's Potential Role
		• Development of incentives and innovative approaches for rural development to diversify income and buttress against climatic risks	
Natural Disasters	• Higher probability of extreme climate events (cyclones, storms, floods, heat waves) • Higher probability of slow onset disasters (prolonged droughts, sea level rise)	• Emergency preparedness and information (early warning systems) • Risk mitigation: structural and nonstructural measures • Catastrophe risk financing or transfers (where needed)	• Strengthening institutional capacity for disaster reduction management (DRM) and emergency response • Technical assistance • Funding support for disaster preparedness and adaptation • Donor mobilization
Health	• Increased incidence of water related diseases (malaria) • Heatstroke • Direct health risks; e.g. injury and death caused by extreme events	• Awareness of the health implications of climate change • Monitoring and surveillance of disease and improved health sector response and training for new disease risk profiles • Improved water supply and sanitation	• Analytical and advisory activities (AAA) and TA for impact assessments and review of the evidence base • Lending and financing • Convening role facilitating national and regional policy dialogues to prevent spread of climate sensitive diseases
Social	• Increased poverty, vulnerability and nutrition insecurity • Social conflict • Aggravation of social exclusion and inequity • Indebtedness in climate vulnerable areas • Migration • Increased urban slum population	• Awareness raising, social mobilization and capacity building • Education and skill training for women, indigenous populations (IPs) and other vulnerable groups for reducing agricultural dependence • Promotion of self-help groups (SHGs); and enhancing access to microfinance and banking services • Strengthening public-private partnerships and social capital of vulnerable groups, their access and decision making • Promotion of community-based asset building and sharing of natural resources	• Financial and technical support for promoting equity, inclusion, rights and livelihoods through targeting vulnerable groups and enhancing voice, decision making and capacity of the vulnerable to adapt • Partnership with community-based organizations (CBOs), coastal state organizations (CSOs), non-governmental organizations (NGOs) and private sector for capacity building. • Governance, strengthening institutions and social capital by initiating parallel capacity building and social accountability initiatives

Sectors	Risks	Priority Response	World Bank's Potential Role
Ecosystems and Biodiversity	• Quantitative and qualitative damage upon freshwater, coastal, marine and terrestrial ecosystems with consequences upon livelihoods • Loss of habitats, dependent species and important ecological goods and services • Biodiversity loss in the Himalayas, glacier-fed ecosystems, forests and coral reefs • Shifts in vegetation regimes in forests, grasslands and semi-arid deserts resulting in altered community structures and climate feedbacks	• Expansion of protected area networks and promotion of ecosystem-based approach in biodiversity conservation • Mainstreaming of biodiversity and ecosystem management in development projects, climate mitigation, adaptation and risk management • Designing and building biodiversity friendly and climate resilient infrastructure • Generation of knowledge and capacity	• Financing for arresting and reversing ecosystem degradation, especially in *biodiversity hotspots* • Pilot new approaches for protecting, upgrading, restoring, sustaining and expanding ecosystems–Payment for Ecosystem Services, Debt for Nature Swap • Increasing the AAA and TA portfolio for building knowledge and capacity, particularly of the regulatory agencies
Energy	• Political economy (non-climate) barriers to developing regional energy trade • Poor quality local coal • Aging and inefficient thermal power generation, high transmission and distribution losses • Inefficient energy use • Poor energy pricing frameworks	• Regional energy trade from power surplus countries (Bhutan, Nepal for hydro and Sri Lanka for wind) to energy-deficient economies (India and Pakistan) • Cleaner coal – through rehabilitation and replacement of inefficient generation units • Harness hydropower potential • Energy efficiency and reduction of system losses. • Investment in (non-polluting) renewable energy	• Scale-up transmission &distribution (T&D) loss reduction investments in India, Pakistan and Bangladesh, including selected Indian state-level T&D companies • Expand renewable energy support through leveraging climate investment funds and advancing investments in hydropower (India, Nepal, Pakistan), coal (India), gas-fired (Bangladesh) • Operationalize energy efficiency possibilities in India, Pakistan and Bangladesh • Low-carbon growth studies for Pakistan, Bangladesh, and Sri Lanka • Advance energy pricing reform dialogue • Groundwork and dialog for investments in regional energy trade infrastructure

Sectors	Risks	Priority Response	World Bank's Potential Role
Transport	• Increase in number of private vehicles and usage per vehicle • Increase in age and efficiency of vehicle fleet • Ongoing deterioration of public transport in cities • Expansion of low-density urban land development which is not friendly to public transport and non-motorized transport	• Sustainable and energy efficient public transport, and aggressive transport demand management, particularly in mega-cities • Reorienting urban growth patterns and practices so as to create networks of walkable neighborhoods, particularly in high growth, medium-sized cities • Slowing the modal shift to rail transport • Fuel efficiency standards for road vehicles	• Financial and technical support for the - development of more energy efficient transport modes, such as public transport, non-motorized transport and clean transport - transitioning traffic management priorities from private transport to public transport and non-motorized transport - long-term land-use and transport planning • Greater weight given to assessment of transport impacts (particularly on energy use and climate change) in the project appraisal process • Institutional support to - Capacity development for transport planning, operation and management at national and local level - Regional or national initiatives that help develop and disseminate information on fuel efficiency standards and best-practices in vehicle maintenance - National or local initiatives that advance the adoption of transport CO_2 emission targets and monitoring mechanisms
Urban	• Climate related damage upon urban settlements, lives, assets and basic water and sanitation services, • Increase in urban vector and water-borne diseases, (associated with urban poverty mainly in slums). • Growth of GHG emissions of future urbanization	• Integration of climate adaptation and disaster risk management within the urban climate change strategy. • Harnessing mitigation potential in industries such as solid waste, wastewater treatment, energy efficient buildings and infrastructure. • Improving energy efficient buildings	• Technical, financial and capacity-building support on adaptation and risk management in urban areas • Building knowledge and capacity of cities to adopt mitigation strategies and in developing urban climate change agenda • Assist cities in integrating urban transport, energy and construction within urban climate change strategy • Supporting the improvement of urban water infrastructure and sanitation services and demand management

Table 4.6 Priority Response and Potential World Bank Country Engagement

Country	Risks	Current Initiatives and Potential Role
Afghanistan	*Climate Change Impacts:* - Exposure of agriculture (pasture), ecosystems and water resources to drought and desertification - Flooding from glacial melt and long run vulnerability of depletion of water supplies of glacial-fed rivers - Water and food insecurity, malnutrition and possible migration and conflict	*Adaptation* - TA on impact assessment and benefits of mainstreaming adaptation responses - Scaling up of existing developmental investments that promote economic, social and ecosystem resilience to climate change - Regional dialogues on international/river basin water resources
Bangladesh	*Climate Change Impacts:* - Combined impacts of sea level rise and glacial melt lead to increased incidence of flooding and land loss - Drought in some areas - More intense cyclones - Lower agricultural output through diminished yields and loss of land - Increased incidence of heat-related illnesses, water-borne diseases, poverty, child and infant mortality; lower access to safe water and sanitation and possible migration - Loss of biodiversity in coastal ecosystems – Sunderbans at high risk *Mitigation Issues:* - Increased coal dependence (risks of early transition to coal)	*Adaptation* - Development Policy Loan (DPL) (under preparation): (i) TA on coastal risks and defenses – hard and soft engineering; (ii) planning and zoning policies for climate resilience, (iii) infrastructure design, (iv) institutional strengthening*[41] - AAA work on agricultural adaptation (including groundwater issues)* - Flood forecasting, early warning system, public awareness* - Food security support by developing of climate resilient cropping systems - Water and sanitation program in climate vulnerable areas - Building livelihood resilience in ecologically fragile areas - Strengthen human resources and intuitional capacity *Mitigation* - Improve energy efficiency, gas exploration, reservoir management; renewable energy development - Scale up carbon finance in industry
Bhutan	*Climate Change Impacts:* - Damages from glacial melt - Impact of increased temperature on rangelands and agriculture. - Potential loss of forest biodiversity due to vegetation shift and increased incidence of forest fire due to temperature increase	*Adaptation* - TA or AAA focus on filling gaps in the official "National Communications" to IPCC and identifying vulnerabilities - Support for hydro developments (flood risks downstream and energy trade)

[41] * denotes current or in preparation.

Country	Risks	Current Initiatives and Potential Role
India	*Climate Change Impacts:* - Exposure of agriculture, water resources, and ecosystems to extreme weather events and more variable precipitation - Impact of glacial melt on water resources quantity, biodiversity and low-lying agriculture - Increased heat-related illnesses and water-borne diseases and changes in epidemiological patterns - Impacts on urban infrastructure including drainage, water and sanitation - Vegetation shift in forests and biodiversity, regime shifts in rangelands, decreased agricultural yields in tropics and sub-tropics - Increased exposure to sea level rise *Mitigation Issues:* - Increased emissions from energy production and transformation, transport, urban, agriculture, industrial and residential sectors due to economic growth and urbanization - Impact of climate change upon carbon sequestration capacity of forest ecosystems, other biomass and soils	*Adaptation* - AAA: Towards New Groundwater Strategies in India: Investing in Groundwater Management for Responsible Growth* - TA: AP Pilot Drought Adaptation Initiative* - AAA: Coastal Cities and Adaptation to Climate Change* - TA: Sundarbans Biodiversity and Sustainable Development* - AAA: India 2030: Vision for an Environmentally Sustainable Future* - AAA on agricultural adaptation - Agriculture and rural sector adaptation: storage to address rainfall variability (strengthening climate change considerations in portfolio) - Climate insurance, livelihoods diversification (in marginal areas) *Mitigation* - AAA: Low-carbon Growth Strategy for India * - AAA: Operations and Maintenance Best Practices of Coal-fired Power Plant Rehabilitation* - TA: Biomass for Sustainable Development* - AAA: Capacity Building in Hydro and Renewable Energy* - AAA: Improving Rural Electricity Services through Renewable Energy-based Distribution * - Strengthening Investment Climate for renewable energy*, energy efficiency and clean technologies, including through the use of grants, concessional lending and carbon finance - Regional cooperation on water resources management* - State-level capacity building - Coal Thermal Rehabilitation Project* - Accelerated Chiller Replacement Project* - Financing Energy Efficiency Measures in Small and Medium Enterprises* - Sustainable Transport Project * - Energy efficiency in industry - opportunities for Carbon Finance (CF) - Energy trade

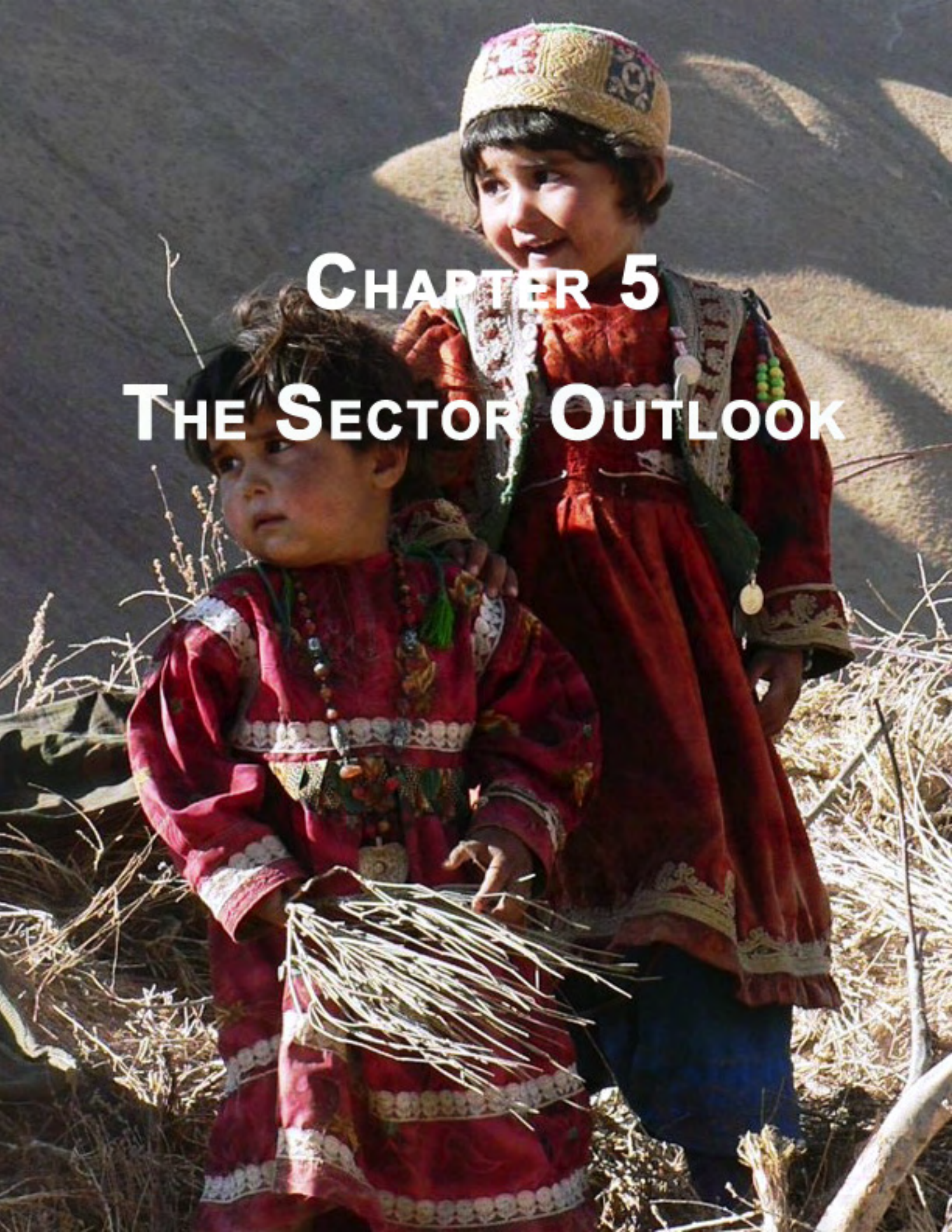
Country	Risks	Current Initiatives and Potential Role
Maldives	*Climate Change Impacts:* - Ecosystem damages and loss of protection afforded by coral reefs - Inundation of islands due to sea level rise and physical damages from flooding - Increased salinity of groundwater resources - Possible migration and large scale relocation	*Adaptation* - Island level risk assessments to identify safe and vulnerable islands - Institutional capacity building for implementing National Adaptation Plan of Action - Promote better stewardship of protective reefs and natural defenses - Maldives Environmental Project – (under implementation - builds capacity, addresses waste problems and knowledge gaps)* - with potential mitigation component
Nepal	*Climate Change Impacts:* - Decline in agricultural production in some areas - Glacial lake outburst floods (GLOF) and future desiccation of water resources due to rapid glacial melt and impact on dependent ecosystems and agriculture - Impact of vegetation shift to forest biodiversity - Likely outbreak of malaria and similar diseases *Mitigation Issues:* - Impacts on carbon sequestration of vegetation shifts and forest productivity changes - Land-use changes due to future development - Slash-burn agricultural practices	*Adaptation* - TA Glacier retreat dynamics, impacts on Himalayan rivers and ecosystems and economics of climate change* - TA River basin-level hydrological and economic dynamics of climate change* - AAA Assessment of impacts on agricultural with adaptation pilots - Assist with capacity building global negotiations at Conferences of the Parties (CoPs) - Community –level coping strategies and capacities - River basin management: river regulation, flood control, water allocation and land use planning - Disaster management systems: GLOFs including weather and hydromet monitoring *Mitigation* - Hydro developments, micro to large scale* - Energy (hydropower) trade with India - Deforestation/ avoided deforestation (CF) - Enhance knowledge/capacity for carbon and climate finance

Country	Risks	Current Initiatives and Potential Role
Pakistan	*Climate Change Impacts:* - Increased intensity and frequency of drought and effects on agriculture (pasture), water resources and ecosystems (wetlands) - Initial flooding and future drying of water resources due to glacial melt and impact on water consumption - Damages of sea level rise - Outbreak of heat related and insect-transmitted diseases, malnutrition, food and water insecurity, migration and conflict *Mitigation Issues:* - Increased emissions from energy, transport and urban sectors - Emissions from agriculture and rangeland degradation	*Adaptation* - TA filling gaps in "National Communications" for IPCC and assist in preparation for global negotiations at COPs - AAA on agricultural adaptation* - TA for Sindh (sea level rise, water resource, coastal adaptation) - TA for programmatic Clean Development Mechanism (CDM) opportunities - Investment in Indus 21 - TA on the Implementation of the National Environment Policy* *Mitigation* - TA for promoting carbon finance unities for CF in industry* - Carbon-assist Japan Policy and Human Resources Development Fund (PHRD)
Sri Lanka	*Climate Change Impacts* - Reduced crop yields due to temperature increase - Sea level rise - damages upon settlements, industries and livelihoods in coastal areas - Salt water intrusion in agriculture, freshwater and groundwater - Ecosystem degradation and biodiversity loss in coastal and marine ecosystems *Mitigation Issues:* - Release of stored forest carbon due to land-use changes - Increase in thermal power	*Adaptation* - Assistance with "Second National Communications" to IPCC - Assessment of risks – sea level rise and agriculture - Agricultural adaptation in rural areas focus on non-plantation sector *Mitigation* - Technical Assistance for CDM as the country transitions to coal-based power - Industry and energy opportunities for CF

South Asia Region

CLIMATE CHANGE STRATEGY

Part II: Sectoral Context and Strategy



Chapter 5
The Sector Outlook

Chapter 5. The Sector Outlook[42]

119. **Climate change will have wide-ranging environmental, social, and economic implications in South Asia.** The cascading effects of more variable rainfall and higher temperatures will touch most aspects of life in the region. Weather extremes and greater fluctuations in rainfall have the capacity to adversely dent the region's productive areas and comparative advantage. Food security, health, livelihoods, access to basic services, energy, and shelter could all be affected. Climate change has the potential to reverse the development gains that have been achieved by South Asia over the past decades.

120. **However, there are differences among and within South Asian countries in the ability to adapt to the impacts of climate change.** The capacity to adapt to climate change depends on a wide range of factors that include social, economic and political dimensions. How these factors interact differs between and within countries and determines vulnerabilities and coping capacities. Within any sector or social group, some may be more vulnerable than others depending on their economic status and exposure to climate risks. Reflecting the diverse nature of the challenge, this section of the SARCCS addresses activities in key sectors ranging from agriculture, biodiversity, energy, transport, urban development, and water to social development. It recognizes that changing climate affects development through many lenses and an effective response must combine both mitigation and adaptation. The strategy advocates an integrated approach to address the impact of climate change on agriculture, ecological resources, health, infrastructure, livelihoods, and natural disasters. South Asia's heavy reliance on agriculture provides an important lesson. The impact of climate change on agriculture cannot be decoupled from water resources, floods, drought, and economic structure. These interact in ways that determine vulnerabilities, impacts and adaptation opportunities. The subsequent chapters identify the many cross-sectoral and regional linkages.

121. **Chapter 6 on the impact of climate change on water tackles the fundamental challenge to balance more variable water supplies with accelerating water demands.** The potential adverse impacts of climate change could be alleviated through enhanced cooperation and dialogue between and within regional counties. India and Bangladesh have 54 transnational rivers. Many important tributaries originate in Nepal, Bhutan, and China and supply water to Bangladesh, India, and Pakistan. Although there are agreements between some countries in the South Asia region, further regional cooperation will be required to address these future climate challenges.

122. **Chapter 7 highlights the urgency for implementing measures that are needed to revive agricultural growth in the region and address rural poverty.** With their economies closely tied to the natural resource base and climate sensitive sectors such as agriculture, South Asian countries are expected to suffer significant losses from climate change. In this context, the impact of climate change on agriculture is an issue of great significance to the lives of millions of poor people in South Asia who depend on agriculture.

[42] Suresh Ramalingam.

123. **South Asia is highly vulnerable to natural disasters and the risks from climate change and the responses are articulated in Chapter 8.** Many of the impacts associated with climate change alter the risk profile of existing hazards, such as floods, droughts, cyclones, and other extreme weather-related events. Adaptation measures can benefit from the practical experience in disaster management. When dealing with climate change risks, it is important to recognize the existing vulnerability to climate variability. Enhancing the ability of local communities to manage current natural hazard risks will help improve their capacity to prepare for and respond to future climatic changes. In this context, the disaster risk mitigation and climate adaptation agendas require an integrated approach.

124. **Though the relationship between climate change and human illness is complex and difficult to assess, Chapter 9 provides a broad qualitative overview of its likely impacts.** In South Asia, heat waves, flooding, and increased intensity of tropical cyclones and storm surges all pose threats to human well being and health. Possibly the greatest health impacts could be those associated with population dislocation and displacement. People displaced internally or across borders are vulnerable to disease. Mental health impacts of extreme climate events and disasters present another public health challenge. The most common consequences of severe weather events, such as floods and cyclones, include anxiety, depression, and post-traumatic stress disorder.

125. **Chapter 10 highlights the social dimensions of climate change and identifies three particularly vulnerable groups – women, indigenous people and the rural poor.** In natural disasters female mortality vastly outnumbers that of males. Indigenous people, with their dependence on forests and natural resources are also sensitive to climate variations**,** while the rural poor whose livelihoods are based on agriculture are another group that will be directly impacted by climate change. The Chapter then argues that climate change could exacerbate prevailing disparities unless the root causes of the problems are addressed. Effective adaptation strategies would need to address these fundamental disparities.

126. **Chapter 11 looks into how climate change will increase the damage from current risks and present new challenges to the sustainability of ecosystems and their services.** The region's natural resource base is currently facing tremendous pressure from rapid population and economic growth. The chapter suggests that better environmental stewardship can help build greater resilience to future climate risks and also assist with stabilizing emissions.

127. **Chapter 12 draws attention to the opportunities for harnessing low-carbon growth in the region by addressing substantial loss of energy due to poor transmission infrastructure and inefficiencies in power generation**. Rising energy demand is driven by urbanization, industrialization, and prosperity, all of which are parts of a broader process of development that is lifting millions out of poverty. However, increased energy consumption has been accompanied by rising greenhouse gas emissions. The energy that does not have to be generated due to loss reduction or efficiency gains is attractive from both the cost and the climate change standpoints. Chapter 11 suggests that there is a need for more active and extensive interventions to tilt the balance in favor of cleaner technologies.

128. **Chapter 13 explores the policy measures and initiatives needed to address the impending increase in transport carbon emissions.** While the transport sector has been a relatively small contributor to South Asia's CO_2 emissions the rapid pace of urbanization and likely acceleration of motorization trends present a threat to mitigation efforts in the future.

129. **Chapter 14 investigates the vulnerability of cities to climate change and their contribution to GHG emissions.** It suggests that the threats are likely to grow as cities expand in a largely unplanned manner. In general the concentration of people and assets in cities increases its vulnerability to climate change. But South Asian cities are uniquely vulnerable to climate change impacts. This is due to a combination of non-climatic and climatic risks. Factors such as high levels of urbanization and concentration of poor people, and poor infrastructure increase the vulnerability of South Asian cities.