

# Climate Change and Adaptation

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Authors: Jo-Ellen Parry, Anne Hammill and John Drexhage



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International Institute for Sustainable Development  
161 Portage Avenue East, 6th Floor  
Winnipeg, Manitoba  
Canada R3B 0Y4  
Tel: +1 (204) 958-7700  
Fax: +1 (204) 958-7710

E-mail: [info@iisd.ca](mailto:info@iisd.ca)

Web site: <http://www.iisd.org/>

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## Table of Contents

List of Acronyms.....	i
<b>1.0 Introduction .....</b>	<b>1</b>
<b>2.0 The Adaptation Context .....</b>	<b>1</b>
2.1 Present and anticipated impacts of climate change .....	1
2.2 The emergence of adaptation as a policy priority .....	2
2.3 Understanding ‘Adaptation’ .....	3
<b>3.0 Integration of Adaptation into Policy Processes .....</b>	<b>4</b>
3.1 Avenues for Integration.....	5
3.2 Tools, methods and technology for adaptation .....	5
3.3 Challenges for integrating adaptation into policy processes.....	7
<b>4.0 Mobilizing the Resources Needed .....</b>	<b>7</b>
4.1 Targets for funding.....	8
4.2 Opportunities under the Convention .....	8
4.3 Leveraging financial flows outside the Convention.....	9
4.4 Insurance and alternative risk transfer instruments.....	11
<b>5.0 Priorities for Future Activities.....</b>	<b>13</b>
5.1 Priorities for supporting an integrated approach to adaptation.....	13
5.2 Exploring post-2012 options for addressing adaptation under the UNFCCC .....	14
5.3 Moving Forward .....	15
<b>Annex A: Glossary of Terms.....</b>	<b>16</b>
<b>References.....</b>	<b>20</b>

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## List of Acronyms

ACIA	Arctic Climate Impact Assessment
AfDB	African Development Bank
AF	Adaptation Fund
ADB	Asian Development Bank
APF	Adaptation Policy Framework
CAN	Climate Action Network
CBDAMPIC	Capacity Building for the Development of Adaptation Measures in Pacific Island Countries
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CLIMAP	Climate Change Adaptation Program for the Pacific
COP	Conference of the Parties
DEFRA	UK Department for Environment, Food and Rural Affairs
EC	European Community
GCM	Global Circulation Models
GEF	Global Environment Facility
GHG	Greenhouse Gas
ICCTF	International Climate Change Task Force
IPCC	Intergovernmental Panel on Climate Change
LDC	Least Developed Country
LDCF	Least Developed Countries Fund
MDGs	Millennium Development Goals
NAPA	National Adaptation Programmes of Action
NGDO	Non-governmental development organization
OECD	Organisation for Economic Co-operation and Development
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCCF	Special Climate Change Fund
SIDS	Small Island Developing States
UNDP	United Nations Development Program
TAR	Third Assessment Report
UNFCCC	United Nations Framework Convention on Climate Change
VARG	Vulnerability and Adaptation Resource Group

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# Climate Change and Adaptation

## 1.0 Introduction

1. In preparation for its Presidency of the Eleventh Conference of the Parties (COP-11) to the United Nations Framework Convention on Climate Change (UNFCCC), the Government of Canada has identified four issues that will influence the creation of an effective and inclusive international climate change regime over the long term. The fourth of these lines of inquiry is: How should adaptation to a changing climate be more fully integrated into development policies and funding instruments?
2. The adaptation line of inquiry reflects the international community's growing need to prepare for and respond to the impacts of climate change, and the corresponding recognition that any future global climate change regime will need to address adaptation in a more prominent manner than in the past. It also reflects a growing international awareness that the most effective way to respond to the predicted impacts of climate change is to integrate adaptation considerations into core policy- and decision-making processes. Defining a new approach to addressing adaptation in a post-2012 regime will be challenging, in part because the international community is only beginning to understand how to effectively respond to the complex socio-economic and environmental impacts that will result from climate change. Adaptation to human-induced climate change is a new process for all countries, developing and developed, and concrete experience in applying an integrated approach to adaptation is limited.
3. The pages that follow provide a brief summary of research and policy developments relevant to determining a long-term, integrated approach to addressing adaptation. Section 2 provides an overview of some of the key factors and ideas influencing current approaches to climate change adaptation. It outlines present and anticipated physical and socio-economic impacts of climate change, the emergence of adaptation as an issue within the UNFCCC, and current conceptual understandings of adaptation. Section 3 focuses on the need to integrate adaptation into policy processes and describes the avenues through which this integration might take place, the supportive tools, approaches and technologies needed, and some of the challenges associated with an integrated approach to adaptation. Section 4 concentrates on how to mobilize the financial resources needed to support adaptation to climate change through avenues within and outside of the UNFCCC process. The paper concludes by examining priorities for future activity, laying out potential future options for addressing adaptation in an integrated manner.

## 2.0 The Adaptation Context

4. Climate change is one of humankind's most pressing integrated economic, social and environmental issues. While previously cast as a future condition to be avoided, there is mounting evidence that climate change is already happening and that its impacts are growing (IPCC 2001; ACIA 2004). These on-going changes signal an urgent need to take action.
5. While human societies have always responded to environmental, social, economic and technological change, the potential rapidity of climate change could test the limits of our ability to adapt. In the context of climate change, adaptation consists of the actions that people take in response to, or in anticipation of, projected or actual changes in climate, to reduce adverse impacts or take advantage of the opportunities posed by climate change (Tompkins and Adger 2003). Adaptation to climate change can therefore be reactive—undertaken in response to impacts of current climate variability/climate change—or anticipatory—implemented before impacts are observed (Klein 2002). Planned adaptation achieved through deliberate policy decisions can support either reactive or anticipatory adaptation.

### 2.1 Present and anticipated impacts of climate change

6. According to the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC), the Earth's average surface temperature increased  $0.6 \pm 0.2^{\circ}\text{C}$  in the 20th century. This trend is expected to persist, with an increase of 1.4 to  $5.8^{\circ}\text{C}$  by 2100. Even with "best case" mitigation efforts, some

climate change cannot be avoided due to the inertia of the global climate system. Warming will vary by region and be accompanied by significant changes in precipitation patterns as well as changes in the frequency and intensity of some extreme events. Average global sea levels are projected to rise between 9 and 88 cm by 2100, with implications for the 50 to 70 per cent of the world's population currently living in low lying coastal areas (MSC 2002). The probability of large-scale and irreversible impacts, such as the collapse of the Greenland Ice Sheet, are currently viewed as low,<sup>1</sup> but is expected to increase with the rate, magnitude and duration of climate change.

7. Regional impacts of climate change are already being observed. The TAR cites, among others, extended mid-to-high-latitude growing seasons, poleward and altitudinal shifts of plant and animal ranges, and earlier flowering of trees, emergence of insects and egg-laying in birds. The recently completed Arctic Climate Impact Assessment (ACIA) found that air temperatures in Alaska and western Canada have increased as much as 3-4°C in the past 50 years. Other observations from this assessment include melting glaciers, reductions in the extent and thickness of sea ice, thawing permafrost, and rising sea levels (ACIA 2004). Future impacts will likely be an extension of current observations of change.
8. In addition to altering biophysical systems, climate change will affect human health and socio-economic well-being. Recent increases in floods and droughts have already led to corresponding increases in damages and insurance impacts (IPCC 2001). In the future, even modest levels of warming are expected to increase the risks of hunger, disease, and water shortages (Parry *et al* 2001).<sup>2</sup>
9. Although climate change impacts will affect all countries, the poor, primarily, but by no means exclusively in developing countries, will be disproportionately affected. Their reliance on local ecological resources, coupled with existing stresses on health and well-being (e.g. HIV/AIDS, illiteracy) and limited financial, institutional and human resources leave the poor most vulnerable and least able to adapt to the impacts of climate change (IPCC 2001). Consequently, there is growing recognition that climate change may undermine the ability of developing countries to meet the targets put forth in the Millennium Development Goals (MDGs) (AfDB *et al* 2002).
10. Finally, it is important to note that climate change might also give rise to new opportunities. For example, changes in temperature and precipitation regimes might make it possible to grow food crops in new locations, potentially contributing to increased food security. In the Canadian Arctic, warmer winters and ocean waters could lengthen the summer ice-free season and potentially open the Northwest Passage, altering international trade routes and creating economic opportunities for northern communities while simultaneously raising concerns about potential ramifications for northern ecosystems and traditional ways of life. As the process of global warming continues, it will be important to identify, assess and take advantage of new opportunities as they emerge.

## 2.2 The emergence of adaptation as a policy priority

11. Although mitigation and adaptation measures must both be pursued to effectively address climate change, negotiations under the UNFCCC have tended to focus primarily on efforts to reduce greenhouse gas (GHG) emissions. Sensitivity to the issue of adaptation has grown over the last five years, largely in response to the IPCC's TAR. The TAR confirmed that we are locked into a pattern of change, and some adaptation is inevitable. Mitigation remains a priority for the international community, since the degree of adaptation required is a function of a rise in global temperatures spurred by increased concentrations of GHGs in the Earth's atmosphere and there are limits to the capacity of systems to adapt to change. However, adaptation

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<sup>1</sup> New research suggests there might be a higher probability of this event taking place. A recently completed study by the Southampton Oceanography Centre and the Tyndall Centre for Climate Change Research focused on improving estimates of the probable collapse of the thermohaline circulation system. Preliminary results suggest that the probability of this event happening is ten times higher than originally predicted (Challenor *et al* 2005).

<sup>2</sup> Parry *et al* (2001) predict that even at modest levels of global warming, by 2080, tens of millions of people worldwide will be put at additional risk of experiencing hunger and coastal flooding, hundreds of millions of experiencing malaria, and billions of people of experiencing water shortage.

has finally emerged as a legitimate – and in some cases urgent – policy priority, prompting action within and outside of the climate negotiations.

12. Within the UNFCCC process, the profile of adaptation noticeably increased at COP-7 with the establishment of the three “Marrakesh Funds” – the Special Climate Change Fund (SCCF), the Least Developed Countries Fund (LDCF), and the Adaptation Fund (AF). Attention to adaptation was further spurred at COP-8 with the Delhi Declaration, which reaffirmed economic and social development and poverty eradication as the first and overriding priorities of developing countries. Most recently, COP-10 produced the “Buenos Aires Programme of Work on Adaptation and Response Measures”.<sup>3</sup>
13. Outside the climate negotiations, there has been a veritable cascade of research and policy activity on adaptation. Apart from on-going academic investigations into the characteristics, indicators and measurability of adaptation, the issue is being noticed by a variety of agencies. Initiatives such as the United Kingdom’s Climate Impacts Program, Canada’s Climate Change Impacts and Adaptation Program and the Caribbean Community Climate Change Centre have been established to continually increase national and regional understanding of adaptation concerns. Donor agencies have started to realize that their activities can both be affected by climate change impacts and influence capacities to cope with the impacts. The 2003 report of members of the Vulnerability and Adaptation Research Group (VARG), “Poverty and Climate Change”, makes the case for integrating climate change concerns into development programming (AfDF *et al* 2003). At the multilateral level, the Convention on Biological Diversity is examining the potential impacts of climate change on biodiversity and ecosystems, and identifying opportunities for adapting to climate change while enhancing conservation of biodiversity (CBD 200x).
14. Several environmental, conservation, development and humanitarian institutions have also established work programs on climate change adaptation. Conservation organizations such as The World Conservation Union and the World Wildlife Fund are highlighting the role of ecosystem management and restoration activities in building the adaptive capacity of vulnerable communities. International and local non-governmental development organizations (NGDOs) are similarly emphasizing the contribution of community development activities, such as micro-finance, micro-insurance, income diversification, and education and training programs in reducing vulnerability to climate stress. Humanitarian organizations are using their hard-won expertise in disaster risk reduction and vulnerability and capacity assessments to inform emerging adaptation approaches, such as through the Red Cross/Red Crescent Climate Centre.

### 2.3 Understanding ‘Adaptation’

15. Conventional approaches to climate change adaptation have focused on future climate scenarios using General Circulation Models (GCMs), which help to identify and quantify potential impacts on different ecosystems and economic sectors. Based on these top-down, scenario-driven approaches, adaptation options are identified and, in some cases, prioritized. While these models are useful in depicting general trends and dynamic interactions between the atmosphere, biosphere, oceans, land and ice, low resolutions limit their ability to tell us about regional and local impacts of climate change. Nor is this scenario-driven approach intended to represent human interactions or local abilities to adapt, both of which are important for identifying appropriate adaptation strategies.
16. A new generation of research is now addressing adaptation by taking a bottom-up/vulnerability-driven approach to adaptation that usually involves assessing past and current climate vulnerability, existing coping strategies, and how these might be modified with climate change. “Vulnerability” in this context is defined as the degree to which a system is susceptible to, or unable to cope with, the adverse effects of climate change,

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<sup>3</sup> Decision 1/CP.10 builds upon earlier work on adaptation to the adverse impacts of climate change undertaken by the Subsidiary Body for Implementation (SBI) and the Subsidiary Body for Scientific and Technical Advice (SBSTA). It also initiates a process for the development of a new five-year structured work program within SBSTA on adaptation to the adverse effects of climate change that will address issues of importance to all Parties. The decision also includes a separate series of activities to address the economic impacts of “response measures” undertaken by Annex I Parties.

including climate variability and extremes (IPCC 2001). Reducing vulnerability involves reducing exposure<sup>4</sup> through specific measures, or increasing adaptive capacity<sup>5</sup> through activities that are closely aligned with development priorities. The vulnerability approach overcomes uncertainties associated with GCMs and predicted impacts by increasing the capacity of communities and governments to cope and adapt to current climate variability and future climate change; resources spent on increasing adaptive capacity will not be wasted if actual climate change impacts are different from predicted impacts.

17. Top-down, scenario-driven adaptation approaches can provide policy-makers with information about the likely long-term impacts of climate change in different regions and at particular concentrations of atmospheric GHG emissions, and are useful in raising awareness, identifying key issues and supporting international processes (UNFCCC 2004). However, they do not provide local decision-makers with the detailed information required to develop adaptation strategies (Klein 2004). Bottom-up, vulnerability-driven approaches are more suited to developing adaptation strategies that meet localized needs (UNFCCC 2004). Both top down and bottom up approaches are useful, and can be used in a complementary fashion in formulating adaptation policy and practice.
18. Adaptation needs vary across geographical scales (local, national, regional global), temporal scales (coping with current impacts versus preparing for long-term change), and must be addressed in complex and uncertain circumstances. Responding to this process requires interdisciplinary and multiple expertise at the local and international level. Researchers and practitioners in climatology, ecology, economics, and the management of natural resources, including agriculture, forestry, watersheds, and fisheries, will have to join forces with those from public health, engineering, business, disaster risk reduction, community development and social services.
19. The process of adaptation is made more challenging by the presence of additional stressors, such as HIV/AIDS and the impacts of trade liberalization on particularly sensitive domestic sectors. Climate change will impact systems that are already dealing with other shocks or global/regional trends. These shocks or trends also shape the vulnerability and adaptive capacity of human and biophysical systems, calling for the development of integrated options for adaptation.

### 3.0 Integration of Adaptation into Policy Processes

20. The global community has recently begun to develop and implement strategies and approaches for adapting to the on-going process of climate change. Assessments of vulnerability to climate change have been completed and priority areas and options for enhancing adaptive capacity have been identified. However, this knowledge has thus far rarely led to the design of policies, programs or projects that bear these findings in mind in either developed or developing countries (EC 2005). For example, current documents that guide development strategies in developing countries, such as national development plans and PRSPs, pay negligible attention to climate change (Agrawala 2004). It is increasingly recognized that to effectively support adaptation to climate change and minimize the risks associated with predicted impacts, there is a great need to better integrate adaptation considerations into the center of decision-making and policy formation (Huq *et al* 2003).
21. Accomplishing this objective requires an understanding of current and future climate risks. This understanding is then used to develop new measures or adjustments to policies, programs and projects so that risks are minimized and adaptive capacity is enhanced. This process can be referred to as 'climate proofing': the development of actions to protect infrastructure, systems and processes against climate

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<sup>4</sup> Exposure in this context is defined as the degree of climate stress upon a particular unit of analysis; it may be represented as either long-term changes in climate conditions, or by changes in climate variability, including the magnitude and frequency of extreme events (IPCC 2001).

<sup>5</sup> The IPCC (2001) defines adaptive capacity as the ability of a system to adjust to climate change, including climate variability and extremes, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

impacts. Embedding climate change adaptation into sector policies and programs greatly expands the range of opportunities for reducing vulnerability to the impacts of climate change and builds into the system consideration of climate variability today as well as capacity to address changes in an uncertain future (OECD 2005; Smit and Benhin 2004). Integration also enables these impacts to be addressed in a more economically efficient manner (OECD 2005; EC 2005). As noted by Newell (2004): “Policy integration is perhaps the greatest contribution that governments can make towards providing climate protection and it is also potentially the least economically costly.”

### 3.1 Avenues for Integration

22. Adaptation considerations can be integrated into policies, guidelines, programs, strategies or projects in numerous sectors at a number of different levels, including at the local, sectoral, national and international level.
23. **Local level.** Local strategies for preparing for and responding to the anticipated impacts of climate change can be built into municipal planning processes and community level strategies, covering risk assessment practices, seed banks, community social services, and emergency preparedness programs (AfDB *et al* 2002).
24. **Sectoral level.** The impacts of climate change will be felt across a range of sectors, including human health, urban planning, agriculture, water, forestry, fisheries, coastal resources, transportation and disaster risk reduction. Consideration of these impacts needs to be built into sectoral planning processes (Huq and Reid 2004), such as infrastructure design and maintenance codes and standards.
25. The private sector also has a central role to play in building its own adaptive capacity. Businesses can bring adaptation considerations into their practices, policies and technologies, reducing their risk in the face of climate change and potentially identifying new economic opportunities (Berkhout *et al* 2004).
26. **National Level.** Adaptation considerations can be integrated into a plethora of national policies and planning processes. Particular attention might be given to integrating adaptation into national economic planning and budgetary processes. By examining budgets with an eye to whether planned expenditures will increase exposure to the impacts of climate change, national governments can minimize their financial risk, promote macroeconomic stability, set aside sufficient funds to manage the consequences of climate shocks, and provide support for adaptation activities at the local and sectoral level (AfDB *et al* 2002).
27. **International Level.** Key opportunities exist for integrating adaptation into international processes. Most critically, the implications of climate change need to be more explicitly integrated into the Millennium Development Goals, such as during the Millennium Review process taking place in September 2005. Considerable opportunity also lies in integrating adaptation considerations into the Country Assistance Strategies of the World Bank, the lending practices of international financial institutions more broadly, and initiatives such as the Group of Eight Industrialized Countries’ and other donors commitment to double their aid to Africa by 2010 compared to 2004 (G8 2005).

### 3.2 Tools, methods and technology for adaptation

28. Integration of adaptation into policy processes requires a range of tools, methods and technologies at each step of the process. A variety of frameworks have been developed to guide different stakeholders through the integration process (see Box 1), which generally involves the following steps:
  1. Understanding current risk and coping strategies;
  2. Estimating future risks and impacts;
  3. Using this information to review policies, programmes and projects to determine: (a) how they will be affected by climate change; (b) how they contribute to adaptive capacity and/or adaptation; and (c) how they contribute to maladaptation;

### **Box 1: Taking an Integrated Approach to Adaptation**

Several on-going efforts within the international community are working to integrate adaptation to climate change into policy processes. Following is small sampling of these initiatives:

- ◆ As part of the Capacity Building for the Development of Adaptation Measures in Pacific Island Countries (CBDAMPIC) project, community level vulnerability assessments were undertaken in Samoa to identify measures to improve their adaptive capacity and contribute to integrating adaptation into Samoa's national policy framework (Sutherland *et al* 2005).
- ◆ The Tyndall Centre has developed an organizational model to assist businesses in understanding their vulnerability to climate change and how to adapt their practices, policies and technologies to protect themselves while also making the most of new opportunities that may arise (Berkhout *et al* 2004).
- ◆ Portland, USA, has investigated the potential impacts of climate change on water supply and demands and evaluated system expansion alternatives to meet these impacts (Palmer and Hahn 2002).
- ◆ UNDP-GEF has established the Adaptation Policy Framework, which offers a 'structured approach to developing adaptation strategies, policies and measures in the face of climate variability and change' (UNDP 2004).
- ◆ The United Kingdom's Climate Impacts Programme has developed a risk-and-uncertainty decision-making framework to assess the risk posed by climate change and how best to respond (Willows and Connell 2003). This framework is currently being used to integrate adaptation considerations across all federal government policy and operational responsibilities, and private and public sector organizations are also being encouraged to follow suit (DEFRA 2005).
- ◆ The Climate Change Adaptation Program for the Pacific (CLIMAP), sought to integrate climate change adaptation into development planning in the Cook Islands and the Federated States of Micronesia, and into the Asian Development Bank's program and project operations (Brotoisworo 2004). The ADB is developing a set of guidelines on climate-proofing based on this experience.

4. Identifying the reform measures and investment options for minimizing vulnerabilities and supporting adaptive capacity in policies, programmes and projects. This includes assessing the institutional changes and financial means necessary to implement reforms;
5. Implementation; and
6. Monitoring and evaluation.

29. The tools, methods and technologies used at each step of the process will differ according to the scale, sector and user. They can be drawn from existing resources found in a variety of disciplines.<sup>6</sup> New tools also need to be developed, such as those that will help understand how projects and programs will be affected by climate change and/or contribute to building adaptive capacity. The main short term challenge though is applying existing tools and technologies in effective and efficient ways, and making sure they are transferred to areas that are most vulnerable to climate change. The transfer of technologies for adaptation faces additional barriers when compared to mitigation technologies;<sup>7</sup> the uptake of such technologies is dependent on the buy-in and involvement of an expanded stakeholder community, and there is unwillingness at present to provide the funding required to transfer these technologies (Klein *et al* 2005).

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<sup>6</sup> Some existing tools, approaches and technologies that can be applied in support of adaptation to climate change include vulnerability risk assessments, human health surveys, sustainable livelihood assessments, Geographical Information Systems, simulations of water and coastal resources, adaptation decision matrix, and cost benefit analysis.

<sup>7</sup> A full discussion of this issue is provided in the theme paper "Climate Change and Technology".

### 3.3 Challenges for integrating adaptation into policy processes

30. The international community's understanding of the importance of and options for integrating adaptation considerations into decision-making processes is only in the early stages of development (EU 2004). Progress is needed in some key areas, including:
- *Increase in Awareness and Dialogue* – The limited awareness and knowledge of policymakers in developing and developed countries regarding the implication of climate change for the achievement of local and national sustainable development objectives is “an immediate and continuous challenge” (EC 2005).
  - *Sharing of Knowledge, Technologies and Tools on Adaptation* – The exchange of information related to tools, technology and methodologies between countries, such as through networks, is needed to facilitate continual learning (Willems 2005; Agrawala 2004; Huq and Reid 2004).
  - *Mobilization of Tools and Technologies* – Policymakers, project implementers and other stakeholders require a variety of tools and technologies to design and implement appropriate adaptation strategies while coping with the physical and socio-economic uncertainty associated with climate change. Existing tools and technologies may be appropriately modified and new tools developed, such as those that will help undertake economic valuation of climate change impacts (OECD 2005).
  - *More Flexible Institutional and Policy Processes* – There is a growing need to develop and implement effective policies that are robust across a variety of possible futures, rather than optimized for a specific future, and have the ability to adapt to circumstances as they emerge over time (Walker *et al* 2001).
  - *Capacity Building* – Further skills are required in the areas such as: identification and analysis of policies affected by climate change; ability to effectively communicate impacts and adaptation responses to policy makers; integrated policy formulation, planning and coordination; and integrated policy implementation, evaluation and modification (Kimenyi *et al* 2004).
  - *Monitoring and Evaluation* – There is a growing need to develop the data and information banks, tools and processes needed to monitor and review adaptation actions in order to ensure their effectiveness and promotion of adaptive capacity (Kiminyi *et al* 2004; Willems 2005).

### 4.0 Mobilizing the Resources Needed

31. Appropriate human, institutional, technological and financial resources are needed to adapt to current and future impacts. Individuals require the knowledge and capacity to understand and address their vulnerability to the impacts of climate change. Institutions need to be able to respond effectively to circumstances increasingly characterized by complexity, change and uncertainty due to interconnected global trends, such as climate change. Tools need to be modified for use in new circumstances, and technologies developed, diffused and deployed in a manner that addresses the needs of the most vulnerable communities. Mobilizing these human, institutional and technical resources can be facilitated through the exchange of knowledge, experiences and lessons learned. This exchange can take place from the north to the south, but equally importantly on a south-north, south-south and north-north basis. For example, communities presently adapting to the impacts of climate change, such as those in Pacific Small Island Developing States (SIDS) and the Arctic, could exchange lessons learned and coping and adaptive strategies.
32. The UNFCCC is already playing an important role in supporting the mobilization and sharing of these types of resources. Convention activities presently support: the collection and dissemination of information on impacts, vulnerability and adaptation; the sharing of practical actions for anticipating and responding to impacts; and capacity building and enabling activities related to adaptation. Workshops and initiatives such as the *Compendium of methods and tools to evaluate impacts of, and vulnerability and adaptation to, climate change* have, will continue to, played an important role in extending international efforts to engage in adaptation efforts.

33. Adequate financial resources are also required to ensure the presence of sufficient human, institutional and technological capacity to cope and adapt to climate change. The pervasiveness of the current and anticipated impacts of climate change – across sectors, geographies, social groups, and from the local to the global – implies that hundreds of billions of dollars will be required in the near- and long-term.<sup>8</sup> Recent calculations estimate that the financial toll climate change is presently doubling every decade (Simms *et al* 2004).
34. It is increasingly recognized that stand alone funds *by themselves* are insufficient to provide the financial resources required to adapt to climate change; financing mechanisms that specifically target climate change impacts need to be accompanied by the integration of adaptation considerations into day-to-day budgeting processes. As noted earlier, an integrated approach to adaptation enhances the economic efficiency of responding to the impacts of climate change, although the process of climate-proofing itself may result in additional costs (Brotoisworo 2004).

#### 4.1 Targets for funding

35. Effective utilization of available financial resources may be supported by directing it to those areas of potential greatest need. Among others, these areas include:
- *Highly Vulnerable Countries*, particularly Least Developed Countries (LDCs) and SIDS. Although developing countries will need to undertake a significant level of adaptation by relying on their own resources and adaptive capacities (Huq and Burton 2003), as recognized under the UNFCCC, these countries also require external financial assistance to increase their technical, human and institutional capacities. In contrast, developed countries typically have the technical and financial resources needed to support vulnerable communities and adaptation activities in their jurisdiction.
  - *Climate-Sensitive Economic Sectors*, such as agriculture, forestry, fishing, herding, and hunting and trapping. These sectors are already feeling the impacts of climate change, which in turn is affecting the communities that depend upon them. Adaptation strategies that promote sustainable natural resource management are therefore priorities for a number of countries.
  - *Disaster Risk Reduction*, as the most immediate evidence of climate change is likely to be an increase in the frequency and intensity of extreme weather events.<sup>9</sup> Effective and efficient arrangements are needed to increase the ability of vulnerable communities and the poor to prepare for and recover from the impacts of these events (Linnerooth-Bayer *et al* 2003).

#### 4.2 Opportunities under the Convention

36. Through decisions of the COP and direction provided to the Global Environment Facility (GEF), the international community has established a number of avenues for supporting developing countries' capacity to adapt to climate change. These provide important financial resources to countries that already lack sufficient funding to respond to the impacts of climate change occurring today (Simms *et al* 2004).

##### 4.2.1 The Marrakesh Funds

37. Three funds specifically designed to meet the adaptation needs of developing countries were created under the Marrakesh Accords: the Least Developed Countries Fund and the Special Climate Change Fund under the UNFCCC; and the Adaptation Fund under the Kyoto Protocol. While representing a promising start, long-term, firm and regular financing under the Convention is needed to ensure the viability of these funds and to provide developing countries with a predictable source of adaptation funding (ICCTF 2005).

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<sup>8</sup> For example, Easterling *et al* (2004) compared two studies that analyzed the estimated cost of sea level rise for coastal communities in the United States. The studies estimated that a meter rise in sea level would place \$429-billion of property and infrastructure in jeopardy by 2100 while the financial cost of protecting all developed areas would be \$115 to \$174-billion—indicating that appropriate adaptation could reduce the severity of damages to development by about three-fifths to three-quarters, compared with no adaptation (Easterling *et al* 2004: 14).

<sup>9</sup> Already, the number of people affected by disasters has risen from 740 million in the 1970s to two-billion in the 1990s (Simms *et al* 2004).

38. There is also a need to ensure that the future modalities of the Adaptation Fund complement activities supported by the LDCF and SCCF. The LDCF has retained a tight focus on helping LDCs develop and now implement their National Adaptation Programmes of Action (NAPAs), while the adaptation mandate of the SCCF is quite broad, covering natural resource management activities, health impacts and disaster monitoring and prevention.<sup>10</sup> There is a need to consider how these funds can be used in the future in a complementary way.

#### 4.2.2 *The Global Environment Facility*

39. There has been a continual call for the GEF to introduce more flexible approaches to funding adaptation activities, particularly with respect to the incremental cost formulation. In principle, the GEF only funds the agreed incremental cost of activities that provide global environmental benefits; most of the benefits associated with adaptation activities though accrue at the local level. Moreover, because many adaptation activities are intimately connected to other aspects of development, such as water management, desertification prevention and disaster preparedness, it can be difficult to determine the adaptation component of a project (IISD 2004). In response to this challenge and guidance from the COP, the new Funds created to address adaptation were intended to be more flexible than funds available under the GEF Trust Fund. In administering these more flexible funds, the GEF has recently proposed that funding from the LDCF and SCCF be used to finance “the additional costs of achieving sustainable development imposed on vulnerable communities by the impacts of climate change.” (GEF 2004b: 10).
40. In addition, the co-financing requirements that the GEF has established in operationalizing the LDCF and SCCF are perceived as overly burdensome by many LDCs and SIDS (IISD 2004). Many of these countries lack access to internal and external funding opportunities and are less likely to have the human capacity required to develop complex funding proposals. Parties have additionally raised concerns (such as at COP-10) regarding the GEF’s introduction of criteria and indicators additional to those adopted by the COP, as well as the narrow scope of adaptation projects eligible under the GEF (IISD 2004).
41. It is unrealistic to expect the GEF to cover the full cost of adaptation projects: the billions of dollars this would require would quickly exhaust the resources of the GEF (Corfee-Morlot *et al* 2002). Moreover, international development experience demonstrates that the provision of local financial contribution and ownership results in more sustainable and effective development activities (OECD 1996). However, the current approach to co-financing of GEF supported adaptation projects under an expanded or extended Strategic Priority for Adaptation,<sup>11</sup> which is intended to be consistent with existing GEF practices, as well as the appropriateness of the sliding scales for co-financing of projects under the LDC and SCCF, may warrant reconsideration in view of developing country concerns and challenges (IFC 2005; GEF 2004a; IISD 2004).

### 4.3 Leveraging financial flows outside the Convention

42. Significant financial resources that could be leveraged in support of adaptation to climate change exist outside of the UNFCCC process. Greater attention might be given to identifying and utilizing these opportunities to support adaptation efforts in developing countries in particular.

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<sup>10</sup> The SCCF is to support: adaptation activities in the areas of water resources management, land management, agriculture, health, infrastructure development, fragile ecosystems, including mountain ecosystems, and integrated coastal zone management; improved forecasting, monitoring and prevention of diseases and vectors affected by climate change; capacity-building for preventive measures, planning, preparedness and management of disasters relating to climate change; and strengthening or establishing national and regional centres and information networks for rapid response to extreme weather events (UNFCCC 2003).

<sup>11</sup> The GEF Trust Fund’s new strategic priority for adaptation (SPA) has been established to assist countries with integrating adaptation into their development planning. The GEF SPA will cover the “incremental cost of those adaptation activities that generate global environmental benefits as well as the incremental cost of selected adaptation activities that are identified as high priorities by national communications” (GEF 2004a: 7).

### 4.3.1 *Bilateral Development Agencies*

43. The contribution of bilateral agencies, and their multilateral development counterparts, in assisting developing countries to address climate change is explicitly called for under the Convention.<sup>12</sup> Annex II Parties have played an important role thus far in facilitating implementation of the Convention through the provision of financial resources directly to the GEF, to the Marrakesh Funds, and through various multi-donor and bilateral programs. The level of funding provided for these initiatives, though, represents only a small proportion of bilateral development agencies overall portfolio of activities.<sup>13</sup> Supporting climate change adaptation has rarely been a top priority of donor agencies, although this is changing (OECD 2005).
44. Integration of adaptation considerations into the mainstream work of development agencies would allow for more cost-effective and wide-ranging support to be provided, as well as ensure that investments are not exposed to unacceptable risk (Huq and Burton 2003). However, some concerns also need to be recognized. Bringing adaptation into the centre of decision-making and programming makes it even more challenging to separate financial flows that are ‘new and additional’ (as mandated by the UNFCCC) from non-climate change ODA activities (Huq and Reid 2004). As well, using existing funds in support of adaptation could also reduce the pressure on donor agencies to provide additional resources (Yamin 2004). Greater emphasis on the provision of support to developing countries through bilateral processes also increases the opportunity for duplication of activities and reduction of synergies, a disadvantage in comparison to channeling funding through the GEF (Greene 2004).

### 4.3.2 *World Bank and other International Financial Institutions*

45. The World Bank has been active in building its understanding of the risks associated with climate change impacts, such as through its participation in the VARG, and is beginning to integrate adaptation considerations into its regular activities and the policies of its partner countries (OECD 2005). However, like other international financial institutions, such as the Asian Development Bank and the African Development Bank, effective integration of climate change considerations, including adaptation, into the main activities of the Bank has not yet taken place (Newell 2004). The World Bank has completed few adaptation projects and has not strengthened the capacity of its client countries to address adaptation concerns (OECD 2005).
46. Continued and stronger efforts to integrate climate change into World Bank activities could have significant benefits, particularly given its high level of lending<sup>14</sup>, support for long-term infrastructure development projects and role as a re-insurer.<sup>15</sup> For example, the World Bank’s carbon funds—the BioCarbon Fund and the Community Development Carbon Fund—have the potential to contribute to reducing the vulnerability of local communities to the impacts of climate change.<sup>16</sup>

### 4.3.3 *Private Sector*

47. Significant portions of foreign direct investment, presently the largest component of external financing to developing countries, is directed toward energy infrastructure development projects through public-private

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<sup>12</sup> Article 11.5 of the UNFCCC states: “The developed country Parties may also provide and developing country Parties avail themselves of, financial resources related to the implementation of the Convention through bilateral, regional and other multilateral channels” (UN 1992).

<sup>13</sup> An OECD DAC review found that on average, bilateral donor activities targeting the objectives of the UNFCCC—mitigation and adaptation—constituted 7.2 per cent of annual ODA commitments in 1998-2000, or about US\$2.97 annually (Greene 2004).

<sup>14</sup> In 2004, the IBRD approved 87 projects for US\$11 billion in fiscal 2004 in 33 countries (World Bank 2004).

<sup>15</sup> The World Bank is the third largest ‘reinsurer’ in the world, according to its own statistics, and issued post-disaster loans (though not all weather-related disasters) in the region of \$30 billion in the 1980 to 2001 period.

<sup>16</sup> The BioCarbon Fund and Community Development Carbon Fund provide financing for projects such as reforestation to conserve and protect forest ecosystems, community afforestation activities, mini and micro-hydro and biomass fuel projects (World Bank nd-a; World Bank nd-b). These types of project contribute not only to the mitigation of climate change but also to reducing rural poverty and improving sustainable management of local ecosystems, thereby enhancing adaptive capacity.

partnerships. More than \$680 billion was invested in infrastructure projects in more than 120 developing countries between 1990 and 2000 (Heller and Shukla 2003). Climate proofing these investments would help minimize risk to investors and developing countries. As well, consideration might be given to the provision of incentives for investments in those activities that support sustainable, adaptation-friendly activities, such as the development of technologies that support adaptation or implementation of decentralized renewable energy systems (reflecting the World Summit for Sustainable Development's recognition that energy provision is a necessary pre-condition for poverty alleviation and sustainable development, and by extension to reducing vulnerability to climate change).

48. At a different scale, micro-credit schemes have demonstrated their effectiveness in increasing the financial resources of the poor and supporting income-generation and livelihoods activities. Expansion of these schemes may be an important tool, along with micro-insurance, in improving the resilience of the poor in the face of a changing climate.

#### 4.3.4 *Non-Governmental Development Organizations*

49. Participation by non-governmental development organizations in climate change adaptation activities has thus far been quite limited and could be expanded. Unlike their larger government counterparts, NGOs have a greater ability to reach the most vulnerable members of communities and to support the small-scale, site-specific projects needed to enhance the adaptive capacity of the poor and rural communities (Huq and Reid 2004).

### 4.4 Insurance and alternative risk transfer instruments

50. Insurance and other pre-disaster risk-transfer instruments are increasingly recognized as important means of accessing the substantial financial flows within capital markets, increasing private sector funding for coping with weather catastrophes, and contributing to incentives for loss reduction (Huq 2005; Linnerooth-Bayer *et al* 2003). The potential role of insurance is acknowledged in Articles 4.8 and 4.9 of the UNFCCC and Article 3.14 of the Kyoto Protocol, and it has been considered as an option for meeting the specific needs of developing countries since COP-7.

#### 4.4.1 *Insurance Schemes*

51. Given the rising toll of weather-related catastrophes, and the anticipated increase in their frequency and intensity in the future, demand for insurance is growing and insurers are looking for innovative ways to keep premiums low and reduce risk (Linnerooth-Bayer *et al* 2003). Insurance is important in helping individuals and countries recover from shocks such as extreme weather events. It can also influence human behaviour in the face of risk by encouraging risk-abating behaviours (e.g., limited coverage for settlement in floodplains, prompting people to live in less exposed areas or invest in flood protection) or risk-taking behaviours (e.g., planting climate-sensitive crops knowing that insurance will cover drought-related losses).
52. Insurance options and risk transfer opportunities are vastly different in developed and developing countries (Vellinga and Mills 2001). In developed countries, the commercial insurance sector plays a leading role in spreading risk. Nevertheless, insurers and the insured need better information on future risks as premiums calculated based on past climate variability are no longer relevant for covering future risks. Moreover, low awareness of emerging risks has translated into insufficient coverage and inadequate risk-reducing measures. Better cooperation between climate scientists, hazards specialists, government and the insurance industry could certainly fill this gap.
53. In developing countries, formal insurance schemes play a limited role in protecting individuals and countries. Only one per cent of disaster losses are insured in low income countries (Hoff *et al* 2003), while these countries bear the brunt of disaster fatalities<sup>17</sup> and incur significant economic losses. Governments, local communities, families and foreign aid must step in to meet the costs of recovery. The likelihood of developing a traditional commercial insurance market in the developing world to cover climate-related risks is

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<sup>17</sup> Ninety-five per cent of deaths from disasters occur in developing countries (Linnerooth-Bayer *et al* 2003).

limited, as there is no guarantee of commercial returns particularly in light of the expected impacts of climate change (Hamilton 2004). For this reason, the international community will need to devise alternative risk transfer and risk management schemes that can protect the most vulnerable communities against economic shocks, enhance their adaptive capacity, and enable their sustainable development. Some options include:<sup>18</sup>

- *International Insurance Pool*: Proposed in 1991, the pool was envisaged as a collective loss-sharing fund to compensate the victims of sea-level rise, to be administered by a Board under the UNFCCC and funded by mandatory contributions from industrialized countries in proportion to their GHG emissions and Gross National Product (Hamilton 2004; Linnerooth-Bayer *et al* 2003; Muller 2002).
- *Public-Private Insurance Partnerships*: Schemes where the insurer is the government, but the policies are developed and managed by the private insurance sector, and sometimes joint, mutually beneficial activities are undertaken.
- *Regional Catastrophe Insurance Schemes*: Regional cash reserves are pooled through mandatory contributions from member governments. These reserves are then used for on-lending to members affected by a weather catastrophe (DFID 2004). These schemes or risk pools could be backed by a regional facility that provides a layer of reinsurance cover.
- *Micro-insurance*: Micro-insurance uses risk-pooling to provide compensation to (low income) individuals or groups adversely affected by a specified risk or event (Hoff *et al* 2003). Especially relevant to individuals and communities in developing countries, these schemes can be index-based (Skees *et al* 1999) and should be developed jointly with governments, non-governmental organizations and private companies. Local calamity funds, savings and credit schemes are examples of micro-insurance.

#### 4.4.2 *Alternative Risk Transfer Instruments*

54. Alternative Risk Transfer Instruments have also been developed by financial institutions to reduce financial exposure to climate change impacts (UNEP-FI 2005). These instruments include:

- *Catastrophe bonds*, which provide private insurers with protection against extreme natural catastrophe events. Capital is provided by institutional investors, with money raised on the stock market by issuing bonds against a particular catastrophic event (DFID 2004; Hamilton 2004). While slowly growing, the market for these bonds is targeted primarily to OECD countries and its potential in developing countries has not yet been fully explored.
- *Weather derivatives* are financial mechanisms developed to hedge financial risk associated with weather volatility. They are financial contracts whose value is tied to, or derived from, an underlying asset such as a temperature or precipitation index. While the weather derivative market continues to grow in the US and Europe, developing countries have not yet been engaged (Figueres 2005).
- *Weather hedges* provide farmers with protection against extreme weather events. Insurance against a specific local weather phenomenon is sold by banks, farm cooperatives and micro-finance institutions to buyers at the same premium, who in turn receive the same indemnity payment per unit of insurance. Catastrophe bonds can be used to backstop this micro scheme to ensure that the insurance provider has sufficient capital to cover claims (Linnerooth-Bayer *et al* 2003).

55. Insurance and alternative risk transfer instruments, while expanding the financial options available for managing the impacts of climate change, can be more expensive than traditional state-supported, loss sharing financial mechanisms. Public-private partnerships might provide an avenue for meeting these costs if, for example, the international donor community hedge the disaster liabilities of vulnerable countries as a partial substitute for post-disaster relief, or if governments were to provide tax incentives for the charitable investment of their citizens in developing country catastrophe bonds (Linnerooth-Bayer *et al* 2003).

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<sup>18</sup> Fuller descriptions of these options are contained in Annex A.

## 5.0 Priorities for Future Activities

56. Integrating climate change adaptation into policy processes and decision-making across a range of sectors and scales is a critical next step in managing the impacts of climate change. Efforts to achieve this objective might be undertaken under the direction of the UNFCCC, or independently through actions supported by governments. An important issue for Parties is therefore determining the role of the UNFCCC in supporting an integrated approach to adaptation in the period after 2012.

### 5.1 Priorities for supporting an integrated approach to adaptation

57. Integrating adaptation considerations at the local, sectoral, national and international level requires the engagement of a diversity of stakeholders from a variety of disciplines. Bringing non-climate experts into efforts to develop anticipatory strategies for addressing climate change impacts is essential, and efforts to reach out to the private sector, national finance ministries, international financial institutions, non-governmental development organizations, and various agencies in the United Nations, for example, should be accelerated to enable effective integration to take place on a variety of fronts.
58. There is also a need to develop, disseminate and implement the knowledge, tools and technologies required to effectively and efficiently engage in an integrated approach to adaptation. Priority should be given to applying existing tools and technologies in new ways that help reduce vulnerability to climate change. At the same time, new tools are needed to address gaps that have already been identified, such as tools for screening projects for their exposure to climate risks (Agrawala 2004) and undertake economic valuation of climate change impacts (OECD 2005). There is also a need to develop effective mechanisms for sharing knowledge, tools and technologies between Parties, such as through knowledge networks and various information clearinghouses. The five-year SBSTA programme of work on impacts, vulnerability and adaptation to climate change will be an important venue for furthering efforts to meet these needs.
59. Financing vulnerability reduction activities and costs associated with the impacts of climate change is a key question for all countries, but particularly for developing countries. The financial resources available to developing countries through the LDCF and SCCF are insufficient to implement the full range of activities that currently fall within their mandates. Greater demand upon these resources can be expected in the future as climate change proceeds. Long-term, firm and regular financial support is needed by developing countries such as through these Funds. Continuing efforts are also needed to address developing country concerns and challenges related to current co-financing requirements under the LDC and SCCF, as well as under the GEF's Strategic Priority for Adaptation.
60. Bilateral development agencies should also play an enhanced role in addressing the adaptation concerns of developing countries. Greater awareness within some of these agencies is needed regarding the interconnectedness of climate change impacts and the sustainable development objectives of developing countries and the opportunities for achieving synergies between current development activities and efforts to reduce vulnerability to climate change. Potential difficulties will also need to be overcome, such as demonstration of the provision of 'new and additional' financial resources to developing countries when adaptation efforts are integrated into mainstream policies, programs and projects.
61. International financial institutions and the private sector should be more effectively engaged as well to support adaptation efforts. Mechanisms are needed to ensure that long-term investments in infrastructure, for example, account for predicted future climatic changes to minimize the risk to investors and developing countries. Private sector involvement could be enhanced by providing incentives to promote activities that support sustainable, adaptation-friendly activities (such as the development and deployment of technologies for adaptation).
62. Finally, there is a pressing need to identify ways to more effectively utilize other existing financial and capital flows such as: insurance or alternative schemes for protecting against losses in developing countries; micro-credit and micro-insurance schemes; and financial markets and alternative risk transfer instruments such as catastrophe bonds, weather derivatives and weather hedges. Innovative public-private partnerships could be

established to address the additional cost of alternative insurance and risk transfer instruments compared to traditional state-supported, loss sharing financial mechanisms.

## 5.2 Exploring post-2012 options for addressing adaptation under the UNFCCC

63. Adaptation will need to be addressed in any future international climate regime, and in a more prominent manner than in the past. It could be treated as a separate issue or, perhaps more effectively, approached as a cross-cutting theme that is fully integrated into the design of a new climate change regime. As a cross-cutting theme, adaptation could be integrated into UNFCCC actions related to future commitments, research, capacity building, technology transfer and sustainable development more generally (EU 2004), as well as into national, sectoral and local level decision-making and management practices.
64. A few broad proposals that specifically incorporate adaptation into the design of a post-2012 regime have been put forward (Bodansky *et al* 2004). These include: the Climate Action Network's three track Global Framework proposal; the North-South Dialogue on Equity in the Greenhouse proposal for a Global Climate Agreement; and the Center for International Climate and Environmental Research – Oslo (CICERO) proposal for Broadening the Climate Regime.
- *Global Framework* – This proposal lays out a future climate change regime that includes three parallel, interlinked tracks: a Kyoto Track that builds on the UNFCCC and the Kyoto Protocol; a Greening Track that focuses on decarbonisation supported by the rapid introduction of clean technologies; and an Adaptation Track for the most vulnerable regions. Countries would move from Track 2 to Track 1 based upon factors such as historical responsibility, level of per capita emissions, and ability or capacity to act. Few details are provided regarding the content of the Adaptation Track beyond that it would build upon the Marrakesh Funds, be funded by industrialized countries, include compensation for damages, and that countries in Track 3 would also be eligible for involvement in Track 2 and, as appropriate, Track 1 (CAN 2003).
  - *North-South Dialogue Proposal* – Subtitled “A proposal for an adequate and equitable global climate agreement”, this proposal puts forward a comprehensive approach to addressing mitigation and adaptation in the post-2012 period. Proposed elements include: linking funding for adaptation to responsibility for the impacts of climate change based on the ‘polluter pays’ principle; support for capacity building in developing countries in a range of areas including sector-specific adaptation strategies, sensitization of policy-makers, public awareness, and negotiating skills; modification of existing GEF rules related to adaptation projects on incremental costs and global benefits and facilitating access to funding; and the piloting of innovative insurance schemes for the management of climate risk at the local, national and international level (Ott *et al* 2004).
  - *Broadening the Climate Regime* – This proposal set forward a three-stage approach in which countries in three different stages of development, as determined by an index based on GDP and emissions per capita, have different levels of mitigation commitments. It is suggested that a separate Adaptation Protocol be established to complement this multi-stage approach. The Adaptation Protocol would be designed to secure the transfer of funds and technology to those countries most vulnerable to the impacts of climate change. It is noted that adaptation funding could also be earmarked to support the implementation of policies and measures that move recipient countries on to a low-emission development path while increasing their adaptive capacity (Torvanger *et al* 2005).
65. Along with these holistic approaches, some suggested elements of a future climate change agreement have been put forward. Many of these proposals focus specifically on options for increasing the availability and effective use of finances for adaptation in developing countries. A number of the insurance and risk transfer instruments described in Section 4.4, for example, could be integrated into a post-2012 approach to adaptation. These financial instruments serve to reduce the financial risks associated with climate-related extreme weather events, and increase adaptive capacity by creating systems that allow for quick access to capital for reconstruction following a disaster.

66. Specialized funds have also been suggested, such as a *Solidarity Fund with Mandatory Contributions* structured to support preventative measures as well as relief from impacts. A *Climate Change Insurance Fund* to meet the restorative costs of the impacts of climate change has been advocated as well. Financing for such a fund could come from a share of proceeds from a levy on fossil fuel sales in Annex I countries, contributions from governments, insurance funds and high GHG emitting industries (Government of Tuvalu 2005).
67. It has also been suggested that a *Vulnerability Assessment Clearinghouse* be established. This entity would operate as a toolbox for assisting countries with implementation of their vulnerability assessments (Government of Tuvalu 2005).
68. Although existing proposals warrant consideration, it is clear that further research is needed by the international policy community to develop options that might be appropriate for addressing adaptation in an integrated manner in a post-2012 climate regime.

### 5.3 Moving Forward

69. The international community is only beginning to understand the complex socio-economic and environmental impacts that will accompany the on-going process of climate change. Experience and analysis is needed to support greater policy coherence between climate change and development within and outside of the UNFCCC regime (Agrawala 2004; Burton and van Aalst 2004; OECD 2005). Economic and social development at all levels needs to be undertaken with an eye to ensuring that it is ‘climate proof’ and ‘climate friendly’. Doing so requires mobilizing human capacity and knowledge, institutions and governance, tools and technologies, and appropriate financial resources.
70. As the international community moves forward in its efforts to take an integrated approach to addressing current and future impacts of climate change, and works to collectively increase its capacity to adapt and reduce its vulnerability, consideration can be given to addressing the following questions:
- How can Parties to the UNFCCC support an integrated approach to adaptation to climate change by bringing these concerns into other multilateral processes such as the Rio Conventions, World Trade Organization negotiations and efforts to achieve the MDGs, and by more effectively reaching out to and engaging with other communities, such as the private sector, the financial sector, and non-governmental development and disaster reduction organizations?
  - What role, if any, should the UNFCCC Secretariat play in developing the knowledge, tools and technologies needed to integrate adaptation into policy- and decision-making processes?
  - As bilateral donors increasingly integrate efforts to reduce the vulnerability of developing countries to climate change into their mainstream development activities, how can Annex II countries effectively track and report upon their financial contributions to non-Annex I countries?
  - What mechanisms might be used to encourage private sector investment in activities that reduce the vulnerability of countries to the impacts of climate change? What incentives and policies can promote these investments and transfers?
  - How might the LDCF and SCCF be energized with long-term, firm and regular financial commitments? What lessons from the establishment of the LDCF and the SCCF might be applied to the future development of the AF? How can Parties ensure that activities support by the Marrakesh Funds complement each other as well as bilaterally- and nationally-funded efforts to integrate adaptation considerations into national development processes?
  - Should the UNFCCC Secretariat host an international workshop to support efforts to identify and describe possible approaches to addressing adaptation in the post-2012 period?

## Annex A: Glossary of Terms

- Adaptation:** The actions that people take in response to, or in anticipation of projected or actual changes in climate, to reduce adverse impacts or take advantage of the opportunities posed by climate change (Tompkins and Adger 2003).
- Adaptive capacity:** Adaptive capacity is the ability of a system to adjust to climate change, including climate variability and extremes, to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC 2001).
- Adaptation Fund:** The Adaptation Fund is a Kyoto Protocol Fund, to be financed through a two per cent levy on the sale of certified emission reduction (CERS) credits generated by Clean Development Mechanism (CDM) projects as well as other sources of funding. Its purpose is to support concrete adaptation projects and programs in developing countries that are Parties to the Kyoto Protocol. The AF was established with the Marrakesh Accords and entry into force of the Kyoto Protocol. The modalities for the operation of this fund have not yet been determined. Estimating the financing that will be available through the AF is difficult given the current uncertainty associated with size of the market for CERs and the price associated with their sale. An indicative range based on a projected size of the CDM market in 2010 suggests that the levy could generate US\$113-million to US\$244-million per year for the AF. This estimate is based on an assumed value of the CDM project activity market in 2010 ranging between US\$112.97-billion to US\$243.76-billion (CER demand: Haites 2004; CER prices: NatSource, cited on IADB web site – <http://www.iadb.org>) and that value of CERs represents five per cent of this total project value.
- Buenos Aires Program of Work on Adaptation and Response Measures:** Agreed to at COP-10, decision 1/CP.10 recalls and builds upon earlier agreed SBI adaptation activities, including improving data collection, strengthening training and in-country capacity to address adaptation, carrying out pilot adaptation projects, promoting the transfer of technology for adaptation, and building institutional capacity related to the management of disasters related to climate change. It also creates a process for the development of a SBSTA five-year programme of work on adaptation. On response measures, the decision calls for expert meetings to exchange information on the possible impacts of mitigation measures and ways to promote economic diversification in oil-producing countries (Pew Center 2004).
- Catastrophe Bond:** An insurance instrument whereby the investor receives an above-market rate or return when a specific catastrophe, such as an earthquake, does not occur but shares the insurer's or government's losses by sacrificing interest or principle following the event (Linnerooth-Bayer *et al* 2003: 21).
- Exposure:** The degree of climate stress upon a particular unit of analysis; it may be represented as either long-term changes in climate conditions, or by changes in climate variability, including the magnitude and frequency of extreme events (IPCC 2001).
- International Insurance Pool:** In 1991, the Alliance of Small Island States put forth a proposal to create an international insurance pool to compensate small island states and low-lying developing countries for loss and damage stemming from sea level rise. No formal negotiation of such a mechanism is taking place at present. The pool was envisaged as a collective loss-sharing fund to compensate the victims of sea-level rise, to be

administered by a Board under the UNFCCC and funded by mandatory contributions from industrialized countries proportional to GHG emissions and GNP. Advocates point to the fact that there are precedents in other international agreements that provide compensation to victims where harm is foreseeable. Examples of other international insurance pools include the 1963 Brussels Convention on Third Party Liability in the Field of Nuclear Energy and the treatment of oil spills under the 1992 Civil Liabilities Convention and the 1992 Fund Convention. Under the Fund Convention, an International Oil Spill Pollution Compensation fund is constituted to offset damage from oil spills, through a levy imposed on receivers of oil shipped in bulk, who tend to be oil companies, based on total tonnage received (Hamilton 2004; Linnerooth-Bayer *et al* 2003; Muller 2002).

**Least Developed Countries Fund:** The LDCF is a UNFCCC fund established to support a programme of work for LDC countries, including the development of National Adaptation Programmes of Action (NAPAs) by the 49 LDCs. NAPAs are to communicate priority activities addressing the urgent and immediate needs and concerns of LDCs relating to adaptation to the adverse effects of climate change. One LDC (Mauritania) has completed the development of its NAPA. A draft decision agreed to at the Subsidiary Body meetings in June 2005 will provide further guidance in the future operation of the Fund when adopted by the COP. A total of USDeq 42.8-million has been raised as of April 2005 in support of the LDCF since its establishment in 2000, of which over USD 11-million has been expended (GEF 2004a).

**Micro-insurance:** Can be defined as, “the provision of financial service that uses risk-pooling to provide compensation to (low income) individuals or groups that are adversely affected by a specified risk or event” (Hoff *et al* 2003). It is especially relevant to individuals and communities in developing countries, as they often require only a small amount of money to recover from weather-related catastrophes. These schemes can be index-based, whereby insurance is based on area-yield, rainfall or soil moisture indices (Skees *et al* 1999), and should be developed jointly with governments, non-governmental organizations and private companies. Local calamity funds, savings and credit schemes are examples of micro-insurance.

**Mitigation:** Actions to cut net emissions of greenhouse gases and so reduce climate change. Examples are using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other "sinks" to remove greater amounts of carbon dioxide from the atmosphere (UNFCCC web site).

**Public-Private Insurance Partnerships:** Refers to establishing schemes where the insurer is the government, but the policies are developed and managed by the private insurance sector – e.g. actuarial calculations, underwriting, and marketing. Under some public-private partnerships, joint activities are undertaken, such as hazard assessments, to the benefit of both parties.

**Regional Catastrophe Insurance Schemes:** Pooling regional cash reserves may also provide a form of self-insurance. Mandatory contributions from member governments in, for example, the Caribbean, are collected and then used for on-lending to members affected by a weather catastrophe (DFID 2004). The possibility for regional pooling is currently being explored in the Caribbean and Pacific and shows promise for other regions as well. These schemes or risk pools could be backed by a regional facility that

provides a layer of reinsurance cover, such as is provided by the World Bank in a number of countries through initiatives like the Turkish Catastrophe Insurance Pool.

**Resilience:** The capacity of a system to absorb disturbance, undergo change and still retain essentially the same function, structure, identity and feedbacks (Resilience Alliance: <http://www.resalliance.org>).

**Special Climate Change Fund:** The SCCF is a UNFCCC fund that supports: (1) adaptation activities, as a top priority; (2) technology transfer and capacity building; (3) energy, transport, industry, agriculture, forestry and waste management; and (4) economic diversification. The fund is to become operational in 2005, providing funding for adaptation activities, technology transfer and capacity building. Decisions on the priorities and focal areas for the third and fourth parts of the SCCF remain outstanding. Donors have pledged USD 39.8-million in support of the SCCF as of April 2005.

**Strategic Priority for Adaptation:** The GEF Trust Fund has established a new strategic priority for adaptation to assist developing countries with integrating adaptation into their development planning. A total of \$50-million will be allocated to these activities between 2005 and 2007. The GEF SPA will cover the “incremental cost of those adaptation activities that generate global environmental benefits as well as the incremental cost of selected adaptation activities that are identified as high priorities by national communications” (GEF 2004a: 7).

**SBSTA Programme of Work on Impacts, Vulnerability and Adaptation to Climate Change:** At COP-10, the COP requested SBSTA develop a five-year programme of work on the scientific, technical and socio-economic aspects of the impacts of, and vulnerability and adaptation to, climate change. The programme of work is to assist Parties in addressing: methodologies, data and modelling; vulnerability assessments, adaptation planning, measures and actions; and integration into sustainable development. Draft text developed at SBSTA-22 suggests that the work programme: provide the COP and SBI with timely information and advice related to capacity building, economic diversification and financial assistance; and include information sharing to promote cooperation, avoid duplication and effectively utilize complementarities (FCCC/SBSTA/2005/L.14).

**Vulnerability:** The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of “exposure” and “adaptive capacity” (IPCC 2001).

**Vulnerability and Adaptation Resource Group:** An informal network of bilateral and multilateral institutions hosted by the World Bank. The purpose of the VARG is to share existing information and experiences for the purpose of integrating climate change adaptation into development processes.

**Weather derivatives:** An alternative risk transfer mechanism developed to hedge financial risk associated with weather volatility. Weather derivatives are financial contracts whose value is tied to, or derived from, an underlying asset such as a temperature or precipitation index. They emerged in the United States in 1997 in response to deregulation of the power industry, which led companies to seek a financial vehicle to help manage their weather risk and reduce the impact of adverse weather on a company’s bottom line.

For example, by buying a rainfall derivative that locks into a future precipitation level, hydro generation plants could protect themselves against the financial impact of diminished rain, and fossil fuel electricity generators could protect themselves against the financial impact of excessive rain (Evomarkets.com nd). The market for weather derivatives has expanded from involvement of large energy trading companies to include end-user industries affected by the weather, and had a notional market value of \$4.2 billion in 2001 (Evomarkets.com nd). While the market continues to grow in the US and Europe, developing countries have not yet been engaged. Experience has shown that the main barriers to the successful use of weather derivatives are data availability and quality, the existing regulatory environment and the credit worthiness of end user (Figueres 2005).

**Weather hedges:**

These provide farmers with protection against extreme weather events. Insurance against a specific local weather phenomenon is sold by banks, farm cooperatives and micro-finance institutions to buyers at the same premium, who in turn receive the same indemnity payment per unit of insurance. Catastrophe bonds can be used to backstop this micro scheme to ensure that the insurance provider has sufficient capital to cover claims (Linnerooth-Bayer *et al* 2003).

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