CLIMATE CHANGE AND DEVELOPMENT

CONSULTATION ON KEY RESEARCHABLE ISSUES

SECTION 1
FRAMING THE ISSUES
SALEEMUL HUQ, LAUREL MURRAY AND HANNAH REID

Saleemul Huq and Hannah Reid
Climate Change Group
International Institute for Environment and Development
3 Endsleigh Street, London WC1H 0DD, UK
Tel: (+44 20) 7388 2117
Fax: (+44 20) 7388 2826
Email: saleemul.huq@iied.org hannah.reid@iied.org

1.0 Introduction

1.1. About the Report

The overall report brings together information from a variety of sources including published and unpublished literature on climate change and different (mainly sectoral) aspects of development, case studies from three regions (South Asia, East Africa and West Africa) and countries (India, Kenya and Senegal) in Asia and Africa, as well a questionnaire survey and inputs and opinions from a wide variety of experts. It is not meant to be a comprehensive assessment of the existing literature (such as the periodic assessments of the Intergovernmental Panel on Climate Change (IPCC), which involve hundreds of scientists over several years, or the recently completed Millennium Ecosystem Assessment, which cost over US$20 million and involved over a hundred scientists over several years). This scoping study has been undertaken by a small group of analysts, drawn from a number of institutions based in the UK, Asia and Africa (with inputs and advice from a much larger number of experts from around the world) over a period of a few months. Therefore, the report (especially the synthesis section) is based on the judgement of the authors themselves and is not meant to represent anyone else's views. However, information in all parts of the scoping exercise is available for anyone to consult.

1.2. About this Section

This section will attempt to frame some of the key issues in the climate change domain and highlight their relevance for development (and particularly poverty reduction). It is a subjective view by the authors and does not intend to be comprehensive in scope (particularly on the social science and development literature). It also tries to explain the methods and structure of the different sections of the scoping exercise outputs.

1.3. Co-evolution of Climate Change and Development/Environment Issues

The problem of human induced climate change at a global scale came to public and international policy makers' attention with the publication of the first assessment report of the IPCC in 1990. It raised the issue of the measured increases in concentrations of greenhouse gases in the earth's atmosphere in the last 150 years (i.e. since the start of the industrial revolution). It further demonstrated (based on results of Global Circulation Model (GCM) runs from a number of research groups around the world) that unless the emissions are reduced in the near future the global atmosphere may get considerably warmer with potentially extreme (and even catastrophic) consequences. This led to initiation of the process of negotiating an international treaty on climate change which culminated in the agreement and signing of the United Nations Framework Convention on Climate Change (UNFCCC) in June 2002 at the Earth Summit in Rio de Janeiro, Brazil.

Since that time the climate change issue has progressed in parallel in two domains; namely the scientific domain (mainly through the periodic assessments of the IPCC) and the political domain (through the annual conferences of parties of the signatories

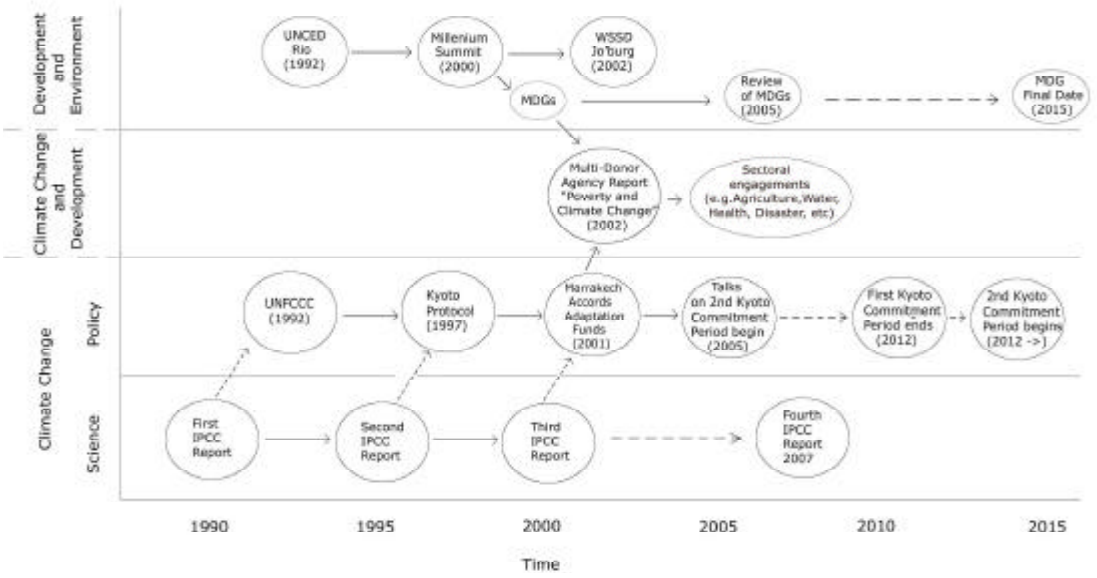
to the UNFCCC). The publication of the IPCC's second assessment report in 1995 reiterated the robustness of the GCM model results showing potential increases of atmospheric temperatures and their impacts while also demonstrating that emissions were continuing to rise. This gave impetus to the UNFCCC negotiations and to the agreement and signature of the Kyoto Protocol at the third conference of parties (COP3) held in Kyoto, Japan in 1997 (although the United States was a signatory to the Kyoto agreement at the time, they subsequently withdrew, and it was not until February 2005 that it finally came into force). The publication of the IPCC's third assessment report in 2001 highlighted the potential impacts of climate change in the near term and hence the need for more focus on adaptation to climate change as well as mitigation (which had been the main focus of the negotiations until then). This led to the adoption of the Marrakech Accords at the seventh conference of parties (COP7) in Marrakech, Morocco in November 2001 in which several new funds were created to support adaptation activities in developing countries.

Climate change and development originally began in the same political discourse. In 1992, the United Nations Conference on Environment and Development (UNCED) produced Agenda 21 and the Rio Declaration, both of which made explicit the intractable connection between climate change and sustainable development. One can go back even further to 1987, and the publication of the Brundtland's Report, *Our Common Future*, which cited climate change as one of the major environmental challenges facing development.

Since UNCED in Rio in 1992 the different aspects of environment and development have run along largely separate paths. For example, climate change, biodiversity and desertification all had a separate multilateral environmental agreement. In the more mainstream development domain, the most notable international agreement on medium term development targets was drawn up at the Millennium Summit held in 2000, where eight Millennium Development Goals (MDGs) for reducing global poverty and promoting development were agreed. However, the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa in 2002 produced the Johannesburg Plan of Action on Water, Energy, Health, Agriculture and Biodiversity (WEHAB). This helped contribute to the reunification of environment and development issues.

The co-evolution of the different domains of debate and discourse are shown schematically in figure 1. This also shows that in recent years the two domains (climate change and development) have begun to link up more. This began with the publication of the report on "Poverty and Climate Change" by ten of the leading bilateral and multilateral development funding agencies (Sperling, *et al*., 2002). This was followed by similar efforts in the different development sectors, such as human health (WHO, 2004), agriculture (FAO, 2004?), disaster management (Red Cross, 2003) and water resource management (Ref?). Different actors, such as the development and environmental NGOs (see Simms, *et al*., 2004), began to get increasingly involved.

Figure 1: Co-evolution of the climate change (science and policy making) and development/environment domains and their linkages



1.4. Challenges to Linking Climate Change and Development Discourses

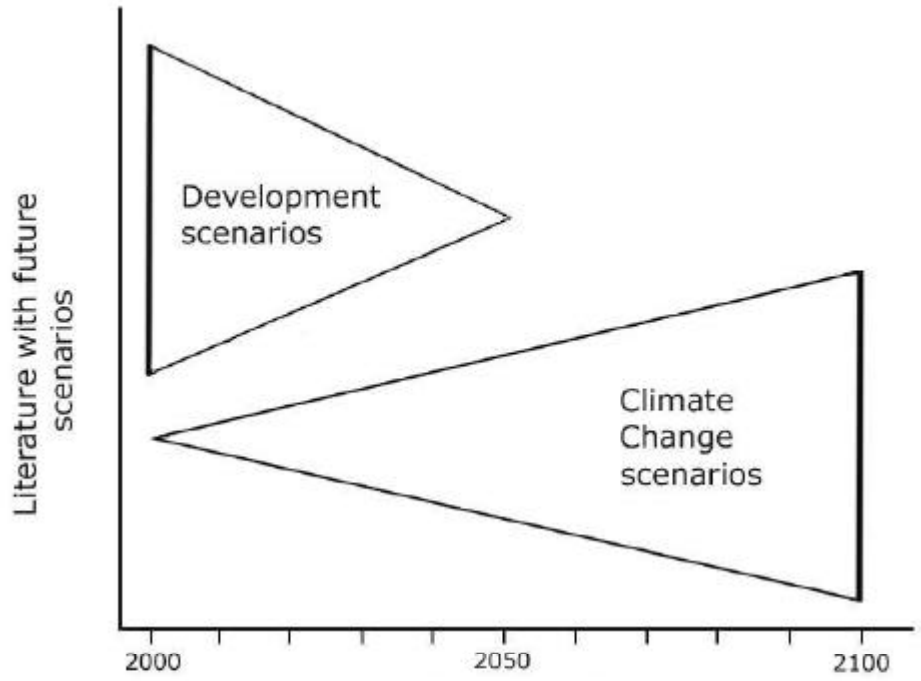
Until recently, climate change and development communities operated largely independently of one another, in both research and policy (Swart *et al*., 2003). There are a number of possible reasons for the historical mismatch of climate change and development discourses. From a conceptual standpoint, the two fields are dominated by separate disciplines: climate change by the natural sciences and development by the social sciences (Cohen, *et al*., 1998). In the 1980s, natural scientists first brought to light the problem of global warming; and since then, the political process that surrounds climate change, as seen in the UNFCCC, continues to rely on the science community to frame the issue and inform policy. In contrast, the development community is made up of a multitude of social sciences trying to identify and describe the social, political and economic obstacles to development. Environmental problems (such as natural resource scarcity, land degradation, and pollution) are recognized as impediments to development prospects, but climate change has largely escaped notice. Perhaps this is due to the fact that climate change has been defined as a 'science' problem, not a social one.

Climate change may also have been viewed as a future problem, which will not manifest itself for several decades. Governments and development organizations may feel there are more urgent concerns to contend with such as poverty, health, and education (Agrawala, 2004).

Much climate change discourse is based on long-term GCM scenarios, which typically run up to a hundred years (i.e. to the year 2100). In the case of sea level rise they run for several hundred years. Most development scenarios by contrast are much more short term. For example most MDGs are set for 2015. Thus the development community (and much of its literature) is based in the present and near term rather

than medium or long term while the climate change literature tends to be much more long term. This mismatch is shown schematically in figure 2 below.

Fig 2: Time dimensions of scenarios in the climate change and development domains



Another potential mismatch comes from geographic scale. The climate change scientific literature deals mainly with global impacts on temperature changes. Models are now beginning to be much more robust at a regional level, but are less able to provide reliable scientific assessments at more local or even national scales. In contrast, most of the development literature focuses on local, sub-national and national scales (and less on regional or global scales). See figure 3 below.

Actors involved in the climate change discourse (e.g. climate modellers) as well in the mainstream development discourse (e.g. development practitioners) have also been traditionally quite different (as shown schematically in figure 4 below).

Fig 3: Climate change and development literature at global to local scales in

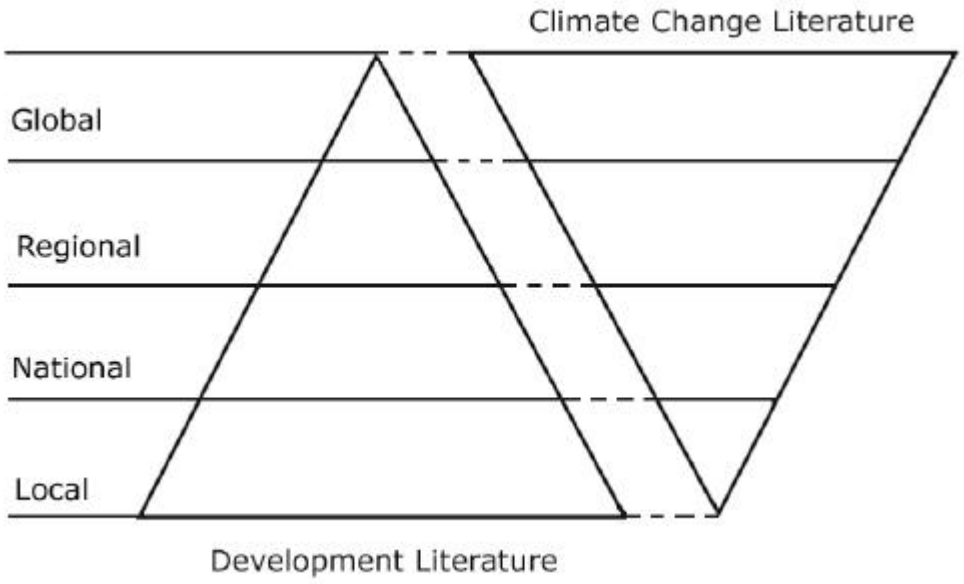
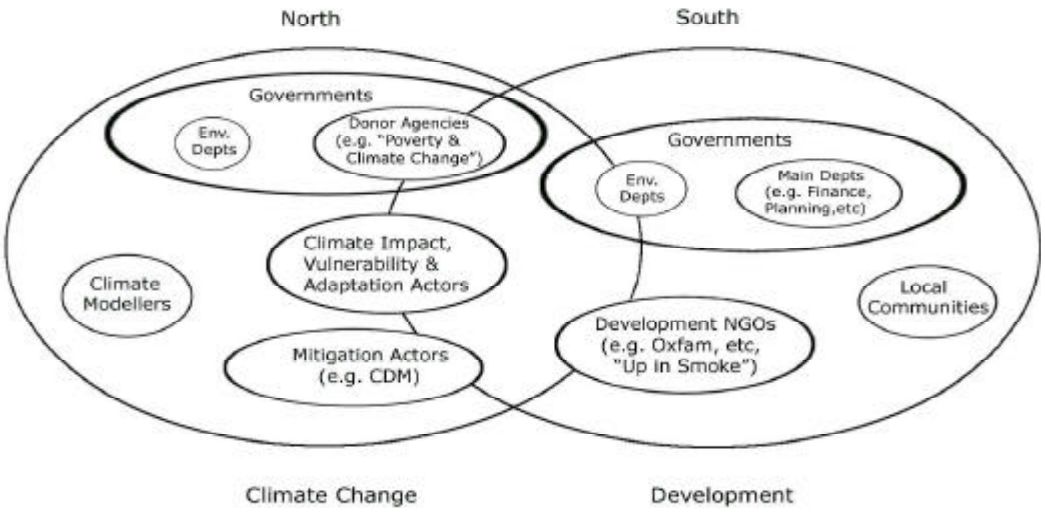


Fig 4: Key actors involved in climate change and development discourses in the North and South



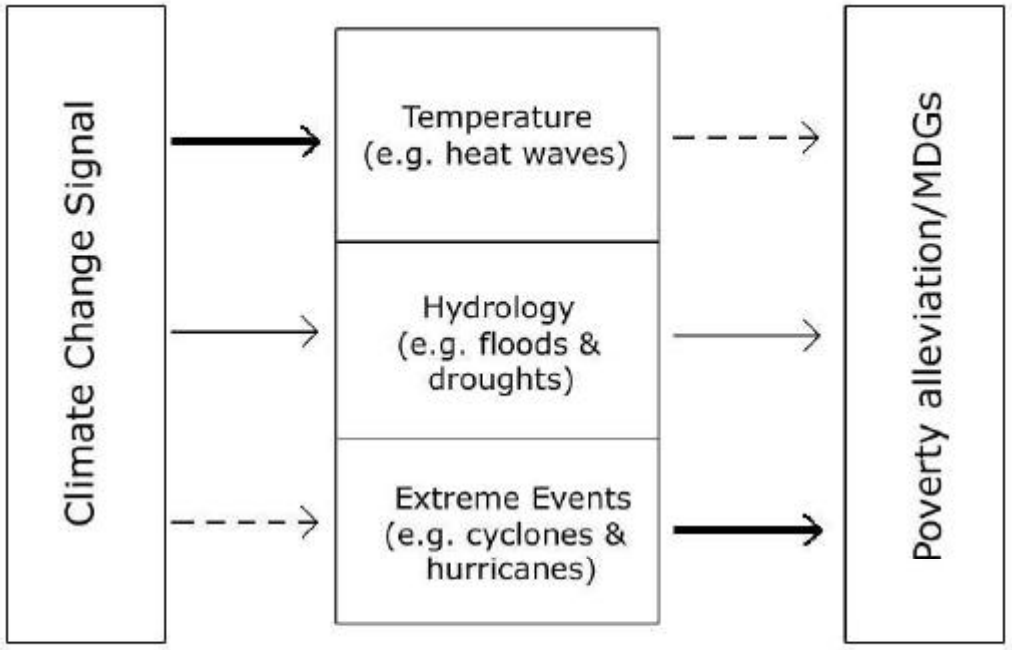
One factor stimulating discussions between the climate change and mainstream development communities has been the increasing evidence and support for potential impacts of climate change on both natural as well as human systems. This is particularly true since the publication of the IPCC's third assessment report in 2001. Table 1 (based on the IPCC's third assessment report, 2001) shows some of these key impacts, with particular focus on extreme events.

Table 1: Examples of (likely to very likely) impacts from projected changes in extreme climatic events

Projected Changes during the 21st Century in extreme climate phenomena	**Representative examples of projected impacts**
Simple extremes	
Higher maximum temperatures, more hot days and heat waves over nearly all land areas	- Increased incidence of death and serious illness in older age groups and urban poor - -Increased heat stress in livestock and wildlife - Increased risk of damage to a number of crops
Higher (increasing) minimum temperatures: fewer cold days, frost days, and cold waves over nearly all land areas	- Decreased cold-related human morbidity and mortality - - decreased risk of damage to a number of crops - Extended range and activity of some pet and disease vectors
More intense precipitation events	- Increased flood, landslide, avalanche and mud-slide damage - Increased soil erosion - Increased flood run-off
Complex Extremes	
Increased summer drying over mid-latitudes continental interiors and associated risk of drought	- Decreased crop yields - Decreased water resource quantity and quality - Increased risk of forest fire
Increased tropical cyclone peak wind intensities, mean and peak precipitation intensities	- Increased risk to human life, risk of infectious disease epidemics - Increased coastal erosion - Increased damage to coastal ecosystems and coral reefs
Intensified droughts and floods associated with El Nino events in many different regions	- Decreased agriculture and range-land productivity in drought-and flood-prone regions
Increased Asian summer monsoon precipitation variability	- Increased flood and drought magnitude and damages in temperate and tropical Asia

However, one of the additional mismatches between climate change and development is that climate change science is generally most robust on issues which have less relevance for poverty alleviation, poor communities and development. For example, much is known about enhanced atmospheric temperatures and associated heat waves, but this affects poor communities arguably less than climate related events such as floods, droughts and cyclones. This is shown schematically in figure 5.

Fig 5: Climatic aspects of relevance to poverty alleviation and the robustness of the climate change impacts science



The link between climate change and development is growing due to the efforts of key organisations and scholars. The need to integrate the two fields could not be greater given the risks of climate change and the solutions required. A useful analogy has often been made – that climate change and development are two sides of the same coin. "For either process to work, each must reinforce the other" (Huq, *et al*., 2002). The impacts of climate change will have a significant affect on the future development prospects within countries, particularly amongst developing and least developed countries. Likewise, alternative development pathways will determine future greenhouse gas (GHG) emissions and influence the capacity of communities and countries to adapt to climate change. Thus, the marriage of climate change and development policy is fundamental if progress is to be made in either area. Research is now being undertaken within both the climate change and development communities to investigate the issue-linkages and subsequent policy recommendations between the two fields. Unfortunately, the climate change and development fields have largely evolved separate from one another and it will be a significant challenge to re-integrate the two policy areas (*Climate Policy,* 2003: S5).

2.0 Core Climate Change Literature

The UNFCCC and Kyoto Protocol both mandate that climate change be tackled within the larger context of sustainable development. However, recent interest within the research community to explore issue-linkages has been followed by slower progress to do so in the political arena. Climate change negotiations are still dominated by concerns about emission reductions and mitigation strategies amongst

industrialised nations (Sagar and Kanikar, Knowledge Rhetoric and Power, 1997; Najam and Sagar, Avoiding the COP-out, 1998), and few attempts have been made to operationalize climate change into the wider development agenda. Some parties to the negotiations are sceptical about the policy link between climate change and development – fearing it may detract from mitigation efforts (Swart *et al*., 2003) and divert scarce funds to more general development projects (Klein *et al*., 2003).

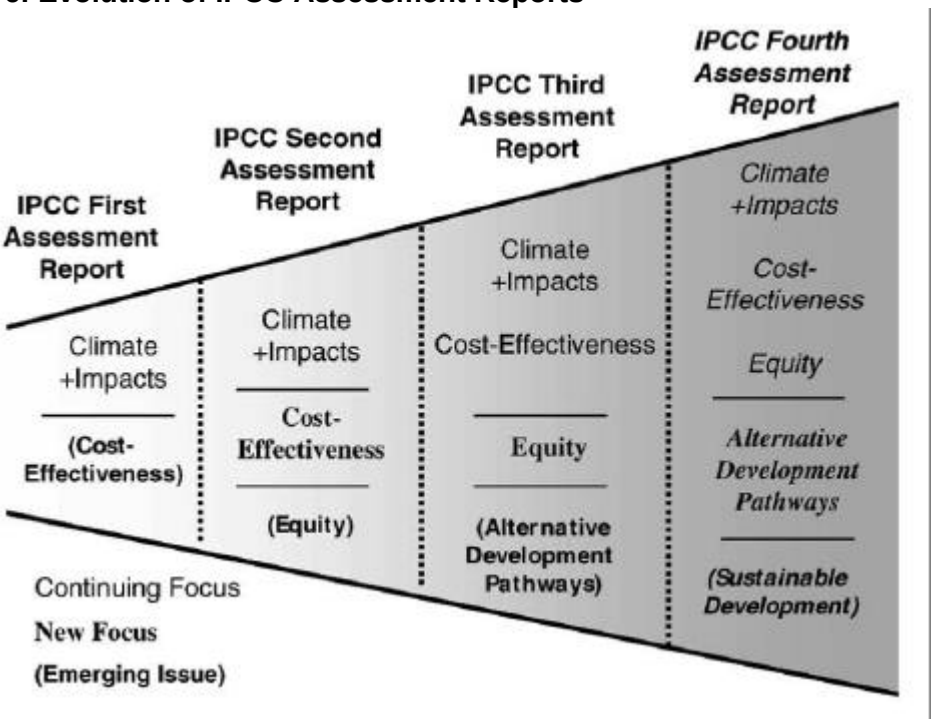
Despite this, progress has been made to bring the climate change and development communities closer together, largely due to the efforts of key NGOs and developing countries (Müller, A New Delhi Mandate?, 2002). Please see Activities Review. The 2002 World Summit on Sustainable Development also helped to bring renewed attention to the climate-development nexus (Klein *et al*., 2003). Owing to active lobbying by NGOs and developing countries there has been a resurgence of political interest witnessed in the climate change negotiations since 2001; as seen during COP-8 (Delhi, 2002) and the Delhi Declaration on Climate Change and Sustainable Development. This is a promising transformation since developing countries are unlikely to fully participate and implement the UNFCCC unless they perceive development benefits.

2.1 Intergovernmental Panel on Climate Change

The main body responsible for assessing the literature on climate change is the IPCC, which officially acknowledges that development may be the most effective policy framework to address mitigation (Banuri *et al*., 2001) and is critical to the success of adaptation strategies (Burton *et al*., 2001). However, "the IPCC's internalisation of these linkages has been rather halting and remains incomplete (Najam *et al*., 2003a). The IPCC was formed in 1988 by the WMO and UNEP and originally limited its study to the scientific, technical, and economic aspects of climate change. As seen in Figure 6, the first two assessment reports produced by the IPCC only investigated the evidence for climate change, its impacts, and the cost-effectiveness of policy options (Banuri *et al*., 2001). Indeed, the IPCC has been criticised by policy-makers and researchers alike, often by its own experts, for neglecting the climate-development nexus (Sagar and Banuri, 1999; Sokona *et al*., 1999; Shukla, 1999; Munasinghe, 2000; Huq and Sokona, 2001; Berg *et al*.; Ravindranath and Sathaye, 2002; Najam *et al*., 2003). The IPCC even published, "the attention accorded in the UNFCCC to sustainable development … [has not] been matched by its treatment in [the first two] assessment reports" (Banuari *et al*., 2001: 77). In 2001, the Third Assessment Report went the furthest to address development linkages by including "discussions about alternative development pathways and global sustainability (especially through its emphasis on scenarios)" (Najam *et al*., 2003: S11).

The IPCC assessments have evolved gradually to introduce socio-economic analysis into climate research (Swart *et al*., 2003). Although development linkages still remain on the periphery of the research agenda, it is widely hoped that the upcoming Fourth Assessment Report, due in 2007, will integrate sustainable development into all aspects of the report, and further explore how development and climate change policies, particularly adaptation measures, can be integrated.

Figure 6: Evolution of IPCC Assessment Reports[©]



♥ Najam *et al.* (2003) "Integrating Sustainable Development into the Fourth Assessment Report of the Intergovernmental Panel on Climate Change", S11.

2.2 Climate Change Impacts and Vulnerability

The link between climate change and development should be intuitive. Anthropogenic climate change is the result of increasing GHG emissions that are driven by development factors such as economic growth, technology, population, and governance (Klein *et al.*, 2003). Unsustainable development is not only the underlying cause of climate change, but development pathways will determine the degree to which social systems are vulnerable to climate change.

Table 2: Examples of Factors that Influence Vulnerability

Institutional Factors	Economic Factors	Environmental Factors
• Informal skills • Local knowledge • Formal education, skills and technology • Informal networks • Formal security networks • Strength of local institutions	• Labour • Health • Access to natural resources • Access to communal natural resources, in particular biodiversity • Access to alternative economic opportunities	• Risky environments • Degraded environment • High dependence on climate-sensitive sectors and natural resources • Communal lands and resources

Source: Pro-Poor, 2003, p. 11

Despite this, the core climate change literature has largely ignored the influence of development factors; instead choosing to investigate the impacts and vulnerabilities

through a scientific lens (Huq *et al*., 2002). Only in the last few years has there been a shift in research and policy within the climate community. Many organisations such as CCKN, TERI, and IIED have expanded climate research to include development sources (please see Activities Review). For example, the livelihoods approach in development research has been incorporated into climate studies to assess vulnerability. Originally, the concept of livelihoods was used in development research to examine the obstacles to local development initiatives, particularly for poverty reduction and natural resource management. The approach involves public consultation to identify the values and priorities of a community; learn about existing coping strategies; and identify potential opportunities and bottlenecks for policy action. Subsequently, the approach has led to a thematic link between poverty and climate vulnerability; and it is encouraging that the climate research community uses the such an approach for investigating impacts and vulnerabilities, especially at the local level. One illustration is the joint project between IISD, IUCN, and SEI exploring climate change impacts, vulnerable communities, and adaptation (framework paper entitled, *Livelihoods and Climate Change*).

Many local communities are already adapting to climate variability and change as an everyday part of their lives. Their experiences can offer lessons for national governments wishing to support adaptation activities.

Box 1: Vulnerability to Climate variability and change in the West Africa Sahel
Source: Dr Tony Nyong

The West African Sahel is characterized by recurrent droughts, the magnitude and intensity of which have been on the increase over the past 100 years (Adger and Brooks, 2001). The frequent occurrences of droughts in the zone have largely contributed to the low-income levels that characterize the lives of the rural poor, who constitute the majority of the population in the region and depend on subsistence agriculture and other forms of agiculture for their livelihood. Many people in the Sahel live in rural areas and practice subsistence agriculture which contributes about 40% of the GDP of the Sahelian countries. Climate models generally predict an increased drying and more frequent droughts in the Sahel, with rainfall declines of 10-20% by 2025 (Hulme et al, 2001), signifying a deterioration in the climatic conditions for agriculture in the future. It must be noted however that climate is not the only cause of vulnerability in the West African Sahel. Poverty is known to be pervasive in the region. For instance, out of the 30 countries with the lowest human development index, 14 are in West Africa. The 49 Least Developed Countries (LDC) listed worldwide include 14 West African States, that is, all of them except Ghana, Nigeria and Côte d'Ivoire. Moreover, Africa has the lowest GDP of all the continents (USD700), even at that it is twice that of West Africa (USD 340). This means that West Africa, especially the Sahel, is the poorest region of the poorest continent in the world (Niasse et al, 2004). While the Sahel can basically be considered under-populated with an average density of about 8.4 persons/km^2, this aggregated picture hides a great spatial disparity in population distribution between and even within countries. At least 80% of the population in the Sahel lives in 25% of the land area, thereby creating a strong demand for arable land under traditional production systems. Since rain-fed crop production and pastoralism are the main livelihood systems in the West-African Sahel, the combination of decreasing annual amounts of rainfall, increasing rainfall variability and increasing temperature, rapid population growth and rising poverty could increase the vulnerability of the Sahelians, and generally cause a serious decline in the population's capacity to secure its food and other needs.

Despite the quarter century of research into the West African Sahel that followed the great droughts of the 1970s, there is still limited understanding climate change vulnerability, particularly of how to achieve more prosperous, yet sustainable livelihood systems in the region. Part of the problem stems from the fact that climate change research is still being pursued from a sectoral perspective, looking at differential vulnerability. Rather, emphasis

should be placed on livelihood system vulnerability because people in different livelihood systems are vulnerable in different situations and seasons. Livelihood systems experience different trigger events that can cause food and livelihood stress, exacerbate poverty and ultimately lead to famine. Emphasizing livelihood systems vulnerability will result in a fundamental shift in focus away from the resource itself to people as well as lead to a greater understanding of the multiple dimensions of drought vulnerability. Every intervention effort that aims at reducing vulnerability in the West African Sahel should revolve around poverty reduction and building adaptive capacity of the rural population to cope with drought-related vulnerabilities. A first step towards achieving this is to understand how vulnerabilities differ across the various livelihood systems in the Sahel. Not everyone that is exposed to drought events is equally vulnerable.

Research questions that need to be addressed are:

- Which livelihood systems are most vulnerable in the Sahel and what makes them most vulnerable? Understanding the nature of vulnerability and impacts is a first and necessary step towards developing effective and sustainable adaptation strategies for the region.
- What is the mechanism through which a household or vulnerable group becomes vulnerable? Vulnerability is a process through time and efforts should be made to understand the dynamics of vulnerability. While the physical sciences have recognized the need to set up monitoring stations to collect temporal data on climate, we also need to set up human monitoring stations to collect data on human systems to be able to monitor human systems in a bid to understanding temporal nature of vulnerability.
- What is impact of climate change on socioeconomic development in the West African Sahel? Climate change is not the main problem facing the Sahel; it is one of the many stresses. However, it has the capability of reversing the modest socioeconomic gains that have been achieved in the past decade. The achievement of the Millennium Development Goals can be hindered by climate change. It is therefore important that research be conducted on the implications of sustained droughts in achieving the Millennium Development Goals.

References

Adger, W. N. and N. Brooks (2001) Does global environmental change cause vulnerability to disaster? In M. Pelling (ed.) Natural Disaster and Development in a Globalising World. Routledge.

Hulme, M., R. Doherty, T. Ngara, M. New and D. Lister (2001). African Climate Change: 1900 – 2100. Climate Research 17: 145-168.

Niasse, M., A. Afouda and A. Amani (Eds)(2004). Reducing West Africa's Vulnerability to Climate Impacts on Water Resources, Wetlands and Desertification: Elements for a Regional Strategy for Preparedness and Adaptation, IUCN – The World Conservation Union.

Development pathways, particularly in developing and least developed countries, can either increase or diminish the impacts of, and vulnerability of households and communities to climate change. It is particularly important that development activities be included in climate research when assessing the vulnerability of the world's poor. For instance, diversification of livelihood sources, improved infrastructure, education, and institutional strength all help to reduce future climate vulnerability as well as lead to socio-economic development. In this respect, climate change adaptation and development share many of the same goals to reduce social and environmental vulnerability. This will be further explored in the sections addressing climate change adaptation and development.

However, current development schemes could also have the undesired consequence of increasing climate change vulnerability in the pursuit of social and economic gains.

The climate change research community is beginning to incorporate development issues into their study of impacts and vulnerability; however, the emphasis is on "win-win" outcomes. In certain situations there will be conflicting interests between climate change and development agendas; and difficult trade-offs will need to be addressed (Klein, 2002; Burton and van Aalst, 1999). This is especially important when examining current development projects that have a "lock-in" character that may hinder a country or community's ability to cope with climate change in the future (Agrawala and Berg, 2002). For example, certain development plans may increase the dependency for climate-sensitive resources, thus increasing vulnerability. Development schemes can also lower adaptive potential. For example, many African countries, influenced by external funding projects, are reforming the water sector (including reformalising water rights), which could have the undesired consequence of reducing water access among the poor, and therefore increase their vulnerability to climate shocks such as droughts (Prasad, *et al*., 2004). For these reasons, climate change research into impacts and vulnerabilities must encompass development issues if a complete evaluation is to be drawn.

The notion of 'double exposure' is also worth mentioning in the context of climate change and development. Climate change research often uses the concept of 'winners and losers' when exploring future impacts. At the global, regional, and local levels, certain sectors may experience positive or negative impacts to climate change. This is particularly apparent in the agricultural sector, where changes in future rainfall distribution may favour certain agricultural sectors and harm others, depending on the region and specific crops/livestock. Development research also uses this concept of 'winners and losers' to examine, for instance, the socio-economic impacts of economic liberalisation. O'Brien and Leichenko (2000), have undertaken research to explore the interaction between the impacts of climate change and economic globalisation (although other development issues can be included). What has emerged is the notion of 'double exposure', in which the impacts of climate change and globalisation can have a cumulative effect and essentially create 'double winners' and 'double losers'. This also raises important questions about equity and the affect development has on vulnerability and adaptive capacity. Within countries, the negative impacts of climate change may put an additional burden on those communities and sectors already facing socio-economic marginalisation. Likewise, the negative impacts of climate change have the potential to *offset* the benefits now being enjoyed in certain areas due to economic globalisation. All these important questions are now being explored within the climate change community. For example, a current project incorporating this notion of double exposure is *Climate Change and Economic Change in India: Impacts on Agriculture*, by IUCN, SEI and Intercooperation (See Activities Review). These questions should also be of great relevance for development and climate change funding.

2.3 Climate Change Adaptation

Climate research has traditionally focused on mitigation efforts to lower and stabilise GHG emissions, with less attention afforded to adaptation measures. This is represented in the UNFCCC process where, until recently, adaptation was only mentioned in a single COP decision (11/CP.1). However, it has become apparent to researchers and policy-makers alike that the world will need to adapt to a changing climate. Even if industrialised countries under Annex I were willing and able to lower

their emission levels, anthropogenic climate change is already set in motion. Policy-makers are beginning to acknowledge this reality and develop coping and adaptation strategies in response. Indeed, many industrialised countries such as Canada, US, and the UK are dedicating significant resources to protect themselves against the negative impacts of climate change (although not always under the climate change banner). As Burton *et al*. (2002) describe, adaptation has moved from being "the handmaiden to impacts research in the mitigation context" to the centre of an emerging research agenda.

Adaptation is inherently linked to the development process within all countries. Adaptive capacity ultimately depends on the "availability and distribution of economic, natural, social, and human resources" (Munasinghe, 2002: 16) including institutional structure, access to decision-making processes, information, and public awareness. As such, development projects could either enhance or hinder the adaptive capacity of communities. Adaptation policies can only be effective if they are built into the wider development agenda, both in developed and developing countries. Following from this, the concept of 'mainstreaming' has emerged to describe the full integration of climate change adaptation policies into national development programmes. The concept of 'mainstreaming' has become increasingly prominent in climate policy and negotiations. However, there may be certain weaknesses to the approach, which should be explored in climate research. For 'mainstreaming' to move from a buzzword to an operational tool, much more research is needed to explore case studies and the potential strengths and weaknesses.

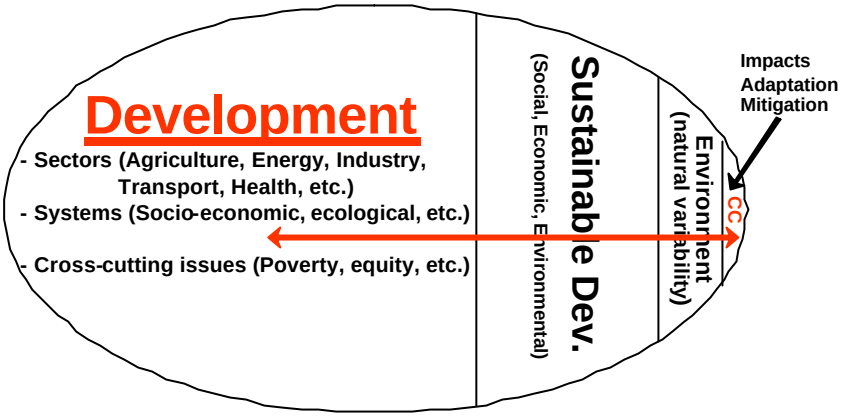
Box 2: Integrating Climate Change Adaptation and Mitigation into National Development Strategy
Source: Mohan Munasinghe, Vice Chair, IPCC, and Chairman, Munasinghe Institute for Development (MIND)

Climate change responses (adaptation and mitigation or AM) ultimately must be implemented by nations, and will receive attention from decision makers only if they are successfully integrated into sustainable development (SD) strategy at the national level. The Action Impact Matrix (AIM) is a tool devised to assist AM-SD integration, by identifying and prioritizing key AM-SD policy linkages, upward to the national macro-economic level, and downward to the micro-project level.

Decision makers normally focus their attention on conventional development strategies like growth and poverty alleviation. As shown in the figure below, SD is considered a rather obscure component of traditional development. The environmental aspect of SD, and finally climate change are seen as even smaller subsets.

AM may be integrated with SD in two complementary and interlinked ways:
1. Upward link: where AM is embedded in the macro-strategy of a country via the medium- to long-term sustainable development path, including strengthening of adaptive and mitigative capacity.
2. Downward link: where AM is integrated into the national development strategy in the short- to medium-term, by implementing sustainable micro-level adaptation and mitigation projects and policies.

Decision makers see climate change as a minor element in the national development strategy



Action Impact Matrix (AIM) Methodology and Applications

The AIM has been widely used since the early 1990s, and originally presented as part of the Sustainomics methodological framework, at the 1992 Rio Earth Summit [1]. Initially, it was used to integrate environmental concerns into development planning [2]. Subsequently, expanding the AIM approach to address the CC-SD interaction, was a natural evolutionary step [3]. It is currently being used in UN sponsored capacity building workshops on climate change [4]. The approach is used to better understand interactions among three key elements, at the country-specific level:
(a) national development policies and goals;
(b) key SD issues and indicators; and
(c) climate change adaptation and mitigation.

First, the two-way linkages between national development policies and key sustainable development issues -- elements (a) and (b) -- are explored, in the context of natural climate variability. Then, we impose the additional impacts of climate change -- element (c) -- on the interactions between elements (a) and (b). The AIM approach analyses key economic-environmental-social interactions to identify potential barriers to making development more sustainable (MDMS), including climate change. It also helps to determine the priority strategies, policies and projects in the economic, environmental and social spheres that facilitate implementation of climate change adaptation and mitigation, as a response to climate change.

The AIM process involves several key practical steps: (1) determine the most important national goals and policies; (2) determine critical SD issues and indicators relevant to climate change; (3) identify how goals/policies might affect SD issues/indicators; (4) identify how SD issues/indicators might affect goals/policies; (5) overlay impacts of climate change and response strategies (adaptation and mitigation, respectively) on steps 3 and 4 above; (6) prioritize most important interactions and determine appropriate remedial policies and measures (preliminary AIM); (7) perform more detailed studies and analyses of key interactions and policies identified in step 6 above; and (8) update and refine steps 3 to 6 above (updated AIM).

The AIM is generated through a fully participative stakeholder exercise involving 30-35 experts/stakeholders who represent various disciplines and sectors relevant to both sustainable development and climate change. They interact intensively over a period of two

days. This participative process promotes important synergies and cooperative team-building activities, while helping participants to better understand opposing viewpoints, resolve conflicts, and ultimately cooperate in implementing agreed policy remedies.

The methodology draws on the following principles:
1. MDMS approach – SD is defined as a process (rather than an end point), while the step-by-step approach of "making development more sustainable" (MDMS) becomes the prime objective.
2. Sustainable development triangle - SD is viewed through three main domains or perspectives: social, economic and environmental.
3. Trans-boundary approach – the analysis transcends conventional boundaries imposed by discipline, space, time, stakeholder viewpoints, and operationality.
4. Full cycle application of integrative tools– AIM is the key link from initial data gathering to practical policy application and feedback. AM is integrated into SD strategy in two main ways: an upward link to national macro-strategy; and a downward link to sustainable micro-level adaptation and mitigation projects and policies.

Key Research Questions
1. Apply the AIM-MDMS approach to different countries and build a portfolio of representative case studies.
2. Explore different macro-models to incorporate AM into long term SD startegy.
3. Identify key SD indicators to facilitate assessment of AM projects.

References

1. Munasinghe, M. 1992. *Environmental Economics and Sustainable Development*, UN Earth Summit, Rio de Janeiro, and World Bank, Washington DC.
2. Munasinghe, M. 2002. "The sustainomics trans-disciplinary meta-framework for making development more sustainable", UN World Summit on Sustainable Development (WSSD), Johannesburg, *International Journal of Sustainable Development*, Vol.**5** (1-2), pp.125-82.
3. Munasinghe, M., and R. Swart. 2005. *Primer on Climate Change and Sustainable Development*, Cambridge Univ. Press, UK.
4. MIND. 2005. *Action Impact Matrix Manual*, Munasinghe Institute for Development, Colombo (URL: www.mindlanka.org).

Box 3: Integrating Climate Change Research into the Development Process

Source: Dr Thomas Tanner, Climate Change Policy Advisor, Climate Change Cell, Department of Environment, Government of Bangladesh

In Bangladesh, a significant climate change component has been incorporated as part of the Comprehensive Disaster Management Programme, funded by DFID and UNDP. This recognises that climate change impacts constitute an increased disaster risk requiring specific attention, and that using the disaster lens gives anticipatory climate change adaptation greater impetus rather than being seen as a distant concern.

Efforts to reduce climate change risks through this programme are focused on: Building longer term resilience by reducing risks and vulnerability to existing disasters; Awareness-raising, advocacy and coordination to promote climate change adaptation and risk reduction in development activities; strengthening knowledge and information accessibility on impact prediction and adaptation to climate change; and piloting a livelihood adaptation strategies for climate risks, focusing on drought in the first instance.

Our principle area of interest is therefore in facilitating the management of long-term climate risks and uncertainties as an integral part of national development planning. This links into ongoing research and action on the policy and practice of 'mainstreaming' climate change adaptation. For example:

- Least Developed Countries Expert Group (2002) Annotated Guidelines for the Preparation of National Adaptation Programmes of Action. UNFCCC, Bonn.
- Huq S, Rahman A, Konate M, Sokona Y and Reid H (2003) Mainstreaming

Adaptation to Climate Change in Least Developed Countries (LDCs). IIED, London.

- Sperling F et al (2003) Poverty and Climate Change: Reducing the Vulnerability of the Poor through Adaptation. AfDB, ADB, DFID, EC, BMZ, DCIS, OECD, UNDP, UNEP, World Bank.

Effective climate change adaptation requires integration into other development and poverty reduction policies, planning and activities. Consistency can help ensure that adaptation policies don't work counter to development efforts (so-called 'maladaptation') and equally that development policies don't increase vulnerability to climate change impacts. The key challenges are in overcoming the difficulties in integrating climate change risks within the planning and policy decision-making frameworks, particularly in poorer countries and those with weak or failing state apparatus. These challenges include, among others, a shortage of quality information, the difficulties of decision-making in the context of uncertainty, poor cross-sectoral linkages, short planning horizons, weak implementation of policy, and low levels of awareness and technical capacity.

Key Research Area: Best practice in integrating climate change into development processes.

What experience do we have to date globally? What major lessons can we learn in practical terms? What barriers exist and how have they been bridged? What approaches, have been most successful in increasing resilience to climate change impacts [including the distinction between vulnerability-led bottom-up approaches and science-led top-down impact assessment]. How can vulnerability assessments be improved so that they better inform adaptation options? What tools and approaches are best suited to different country and sectoral contexts (eg Risk assessments, building in greater margins, adaptive systems development)?

Key Research Area: Providing User-friendly Information and Dealing with Uncertainty

How do available tools and methods for climate change risk reduction most effectively tackle the issue of information (dealing with and presenting scientific, uncertain predictions)? To what extent are there transferable lessons from industrialised countries? Equally, what lessons are transferable from other areas of policy-making in similar contexts of low capacity and significant uncertainty?

Vital to the successful integration of climate change risk reduction into is the question of matching information needs to information generation and provision. How can we ensure that climate change information is generated and presented in ways that are most relevant to users needs? Are there successful examples of research that has started with an analysis of user needs in terms of policy-making, planning, programmes and projects, prior to the development of research projects? How can information from bottom-up approaches best be combined with top-down impact assessments in this context?

Key Research Area: Adaptation Technology.

There has been relatively little dissemination of info on the use of (appropriate) adaptation technologies to date. What techniques and technologies exist that could facilitate adaptation to climate change (eg seed varieties, crop types, cropping practices, water resources technology, soil and water conservation techniques, disease prevention and control technology)?

How could existing technologies best be transferred across different environments? How can these technologies be utilised appropriately in ways that don't inadvertently increase vulnerability (maladaptation)? What are the most appropriate channels for this process?

2.4 The UNFCCC Process and Climate Change Funding

Within the UNFCCC policy process, climate policy, until recently, was largely synonymous with energy policy, with little attention given to enhancing sinks or adaptation (Klein *et al*., 2003: 7). Although mitigation is still the primary focus for

Annex I countries, adaptation and development have been placed on the policy agenda. The UNFCCC negotiations are a perfect illustration of this change. Since 2001, adaptation and development have gained increased importance in the climate change negotiations (please see Box 4). This development in the climate agenda can be attributed to lobbying efforts of key environmental NGOs, researchers, and developing countries, particularly the LDCs, who have long advocated adaptation and development action. It can also be credited to the US withdrawal from the Kyoto Protocol, followed by Australia. At the time, many observers believed the Protocol was essentially torpedoed when the US pulled out in March of 2001. Even though Kyoto came into effect in February 2005, there exists widespread concern about its effectiveness in mitigating and reducing GHG emissions among industrialised countries. For many, 2001 was a wake-up call to the realities of climate change. Although every effort must be made towards mitigation, countries will be faced with the impacts of a changing climate in the coming decades. For developing countries, especially small island states and LDCs, it will be a matter of survival. And this recognition about the imperative for adaptation measures has led to the renewed focus on development issues.

As explained above, mainstreaming adaptation measures into the wider development agenda is an essential strategy. The issue-linkage is also necessary from a political standpoint. For developing countries to fully participate in the UNFCCC negotiations, and implement climate change mitigation and adaptation policies within their respective countries, there must be a clear benefit to their development aspirations. This is particularly relevant for countries such as India, Brazil, and China, who will become large future sources of GHG emissions as their economies grow in the coming decades (Adger, *et al*., 2003).

Box 4: Evolution of Adaptation and Development in the UNFCCC and Kyoto Protocol Negotiations

COP-6 in Bonn, Germany (July 2001) established three new funds: the Special Climate Change Fund, the Least Developed Countries Fund, and the Adaptation Fund.

COP-7 in Marrakech, Morocco (October-November, 2001) shows the formation of the LDC Expert Group. The COP also laid out the objectives of the three new funds. The SCCF will finance activities relating to climate change in the areas of adaptation, technology transfer, energy, transport, industry, agriculture, forestry and waste management. The LDC fund will support the NAPAs for LDCs. Lastly, the Adaptation Fund will be financed from the "share of the proceeds" on the CDM and other sources of funding to fund adaptation initiatives.

COP-8 in Delhi, India (October-November, 2002) produced the Delhi Declaration (FCCC/CP/2002/L.6 Rev.1), which reaffirms development and poverty eradication, building on the WSSD outcome. "It calls for policies and measures specific to each country's conditions, integration of climate change objectives into national sustainable development strategies" (ENB Summary Report of COP-8).
The COP proceedings also refuted the perceived divide between environment and development agendas.

COP-10 in Buenos Aires, Argentina (December 2004) brought to light the difficulties of funding adaptation projects in the context of development. At present, the GEF (the body responsible for administering UNFCCC funds) will only finance projects with a core focus on adaptation. Adaptation projects with additional development benefits will not receive full-cost funding. However, "[a]daptation projects are generally built on, or embedded in, larger national or local development projects" and, therefore, co-financing would be required with development and donor agencies, which puts additional burden on poor countries seeking funds. (ENB Coverage, 2004: 15) These funding concerns have yet to be resolved in the UNFCCC process.

Lastly, the UNFCCC has produced three key funds for financing adaptation policies: the Special Climate Change Fund, the Adaptation Fund, and the LDC Fund. Individual countries will also fund their own mitigation and adaptation projects, at home and abroad. To ensure efficient and effective project financing, existing and planned development projects must be considered when devising adaptation and mitigation policies. Climate change projects could have additional socio-economic gains, which should be capitalized upon. They may also compete with existing development plans, in which case, trade-offs will have to be assessed. Essentially, any climate change programme or policy should pass the development litmus test.

Currently, the most promising vehicles for integrating climate change and development policies are through the formation of National Communications, Assessments of Impacts and Adaptation to Climate Change (AIACC), and the National Adaptation Programs of Action (NAPAs). The NAPAs, in particular, are targeted towards some of the most vulnerable countries to climate change, the LDCs, and offer an opportunity to assess and prioritise climate adaptation actions within existing development goals. Please see Activities Review.

Box 5: Linkages and synergies between the Climate Convention and the other two Rio Conventions
Source: Serigne Kandji, ICRAF

There is a lot to be gained from establishing links between the UNFCCC and the other two major environmental conventions namely the CBD and the UNCCD. It is in recognition to this need that a Joint Liaison Group (JLG) was created in 2001 to foster collaboration between the secretariats of the three conventions (www.unfccc.int). There are probably numerous reasons why the synergies between these conventions should be explored. Here are three of them.

1. The inherent links between the three problems

It is necessary to understand the driving forces behind the three major environmental problems the international community is currently addressing, i.e. climate change, loss of biological diversity (or biodiversity) and desertification. Climate change, if we use the UNFCCC definition, is the result of the concentration of carbon dioxide and other heat-trapping gases known as greenhouse gases (GHGs) in the atmosphere, which has increased to reach alarming levels over the last century (IPPC, 2001). It is also understood that a significant fraction of the GHGs that have been emitted to the atmosphere has originated from the destruction of natural forests and other biomes, and their subsequent conversion to agricultural or grazing land, the very process that has led to the extensive destruction of habitats and the loss of biological diversity (Wood et al., 2000). In many cases, especially in the tropics, when natural systems are brought into agricultural production, a degradational process begins whereby the land progressively loses its productivity. If such a process is allowed to start and to continue unchecked in arid, semi-arid and dry sub-humid environments, it can ultimately lead to an irreversible state of land degradation called desert. This is what the process of desertification is all about. Loss of natural vegetation (hence biodiversity), degradation of agricultural and grazing lands, and climatic variations are therefore some of the recognised causes of desertification. In many tropical areas, climate change will exacerbate climatic variations leading to more frequent droughts and wild fires that in turn will accelerate the loss of biological diversity and desertification. It is therefore clear that there are inherent linkages between the three problems although a causal relationship may not always be easy to establish between them. Nonetheless, the desertification – biodiversity loss – climate change nexus is without any doubt the biggest threat to sustainable development, especially in Africa.

2. The commonalities in the response strategies

A large number of programmes, policy measures and projects have been developed to meet the objectives of the Rio Conventions, including the sustainable use of natural resources. In the framework of the UNCCD, soil and water conservation measures (including forestry and agroforestry based solutions) have been implemented in various parts of Africa and elsewhere in the world. Although the initial goal is to improve land productivity and halt the process of desertification, it is becoming increasingly clear that these measures have useful spill-over effects in the form of biodiversity restoration/conservation and climate change mitigation/adaptation. For example, restoring degraded land by growing trees or with other means offers environmental benefits such as carbon sequestration that may have an effect on the global climate. At the local level also, trees provide useful watershed and microclimate services. The effect of the feedback between land cover and the atmosphere on precipitation is well established (Bruijnzeel, 2004). The feedback mechanism suggests that vegetation cover exerts some influence on rainfall patterns at the local scale, thus mitigating the effects of the global climate. Furthermore, successful implementation of the technologies and measures that are meant to combat desertification or enhance biodiversity is likely to create resilient production systems susceptible to buffer land-users against environmental stresses such as climate variations. Therefore, the development of diversified agricultural and natural resources management systems that encourage the mixing of various crops species/varieties and the use of soil and water conservation techniques including agroforestry is not just an effective way to enhance biodiversity and control desertification, it also contributes to bringing responses to climate change.

3. The limited resources of many countries

Some of the countries that are implementing activities related to the three conventions have a narrow economic and institutional resource base to operate from. This is particularly true of African countries, which incidentally, have often been at the receiving end of environmental disasters. For many of these countries, addressing climate change, desertification and biodiversity loss as separate matters may be not only technically impractical but also economically unsustainable. There is a genuine concern that putting too much effort in environmental issues can divert attention from, and drain resources that could go to, more urgent development priorities (Odingo, 2001). Therefore, there is a need to find strategies in order to streamline these limited resources in a way that produces impacts, focussing on technology and policy options that can address all these environmental problems together. This can be achieved if the various people and institutions that are active on the environmental arena enter into a sound collaboration and join efforts to develop common strategies.

References

L. A. Bruijnzeel, L.A., 2004. Hydrological functions of tropical forests: not seeing the soil for the trees? Agriculture, Ecosystems & Environment 104: 185-228

IPCC, 2001. Climate Change 2001. Third Assessment Report of the Intergovermental Panel on Climate Change (www.grida.no/climate/ipcc_tar).

Odingo, R.S., 2001. The Clean Development Mechanism in Africa – A Framework for the Design of Sustainable Development Projects. Climate Network Africa, Nairobi, Kenya, 210pp.

Wood, A., Steadman-Edwards, P. and Mang, J. (eds), 2000.The Root Causes of Biodiversity Loss. Earthscan, London and Stirling, VA, 399pp.

3.0 Development Research and Policy

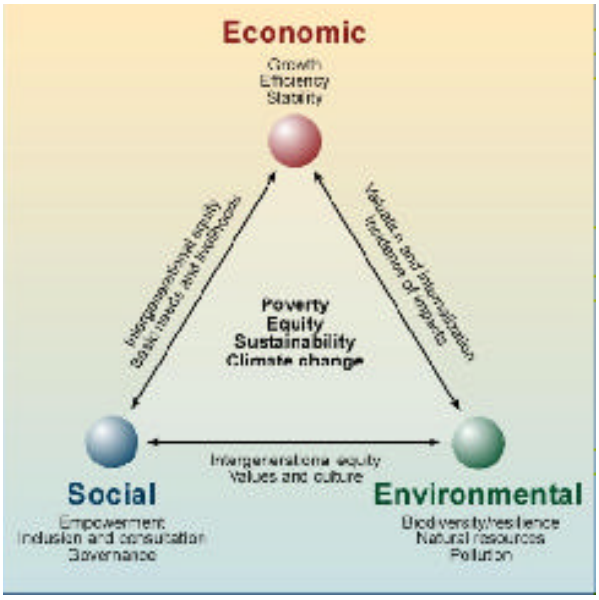
Sustainable development has long been the mantra of the development community. The well-known sustainable development triangle (Figure 7) illustrates the link between social, economic, and environmental factors in shaping long-term development prospects. However, it is worth noting that environmental issues, and even social concerns, were not always deemed relevant in the development agenda. In the 1950s, the dominant development paradigm focused on growth and increasing economic output and consumption. The 1960s witnessed an evolution in development studies to encompass social (distributional) objectives and the notion of 'equitable growth' (Munasinghe, 2002). It was not until the 1970s, and the emergence of the environmental movement, that the majority of the development community began to recognise the influence of environment factors on development pathways.

Also, it is important to mention that there is no one definition of sustainable development and that the idea has come to mean different things for various disciplines and stakeholders. For example, some people add a technology component to the traditional triangle diagram. However, for our purposes, sustainable development can be understood as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987). Munasinghe (1994) also provides a useful definition, describing sustainable development as "a process for improving the range of opportunities that will enable individual human beings and communities to achieve their aspirations and full potential over a sustained period of time, while mainstreaming the resilience of

economic, social and environmental systems". Climate change will *indeed* affect the resilience of economic, social, and environmental systems, and it is for this reason that climate change must be considered when devising and implementing sustainable development strategies.

Despite the inclusion of environmental issues into the sustainable development paradigm, most development research has not specifically addressed climate change until very recently. Although climate change was acknowledged as a potential problem, it has not received much attention within the community (AfDB, 2003; Newell, 2004). This may be due to the fact climate change has traditionally been viewed as a distant problem that does not compare with more urgent concerns such as food security, HIV/AIDS, or pollution. Although one can find climate-development publications dating back to 1998, such work has been few and far between. A quick glance at the bibliography reveals a relatively small number of researchers and organisations publishing on the climate-development nexus. A few development organisations, such as CARE International, have incorporated climate change into their development projects for some years. This early work must not be understated; however, the community *as a whole* has largely ignored the affect climate change impacts will have on development goals. In contrast, there is a wealth of literature from the development community addressing climate variability (which is expected to increase in certain regions under climate change). This existing research does not necessarily translate for climate change policy, but must be acknowledged nonetheless.

Figure 7: Sustainable Development Triangle[§]



[§] IPCC, SYR – Figure 8-3

In 2002, the major donor agencies (AfDB, ADB, DFID, DGIS, EC, BMZ, OECD, UNDP, UNEP, and World Bank) released the paper, *Poverty and Climate Change*, at COP-8 in Delhi. This publication marked a major shift within the development community to incorporate climate change into the wider development agenda. The report stated that "[c]limate change is a serious risk to poverty reduction and threatens to undo decades of development efforts" (AfDB, 2003: 5). Furthermore, a survey

completed in 2002 of more than 250 experts and practitioners from 71 countries concluded that climate change was the second most important issue, after poverty eradication, for development (Najam *et al*., 2002). Since 2002, many international development organisations have launched projects to address climate change (please see Activities Review). Working groups have also been formed to bridge the gap between climate change and development communities, as seen with the establishment of a coalition of 18 climate and development NGOs and their launch of *Up in Smoke?* (2004). Despite these efforts, most climate-development research is still undertaken at the international level by large NGOs and donor organisations. Government agencies within developing and least developed countries, as well as local-level development groups, often inadequately consider climate change in their development activities.

Box 6: Assessment of the Robustness of Development Projects to the Adverse Impacts of Climate Change: A Priority Research Question in Adaptation
Source: Ajay Mathur, *SenergyGlobal,* New Delhi, India

Issue
Non-attainment, or partial attainment, of the goals, objectives and outputs of development projects (in sectors such as water management, agriculture, forestry, coastal-zone infrastructure, etc.) because of the adverse impacts of climate change.

Background
Climate change is occurring, and though there is uncertainty about the exact magnitude, rate and regional patterns of its impacts, it will almost certainly bring about sea level rise and shifts in climatic zones due to increased temperatures and changes in precipitation patterns. Also, climate change is likely to increase the frequency and magnitude of extreme weather events such as droughts, floods, and storms.

Consequently, in some parts of the world, climate change will further reduce access to drinking water; in other places, it will further strain limited infrastructure; and in yet other places, it will lead to decreasing crop yields. There will be countries and regions where more than one of these additional stresses will occur simultaneously. *In other words, the adverse impacts of climate change will exacerbate stresses from current climate variability, and in most developing countries, will be superimposed on existing vulnerabilities.*

This superimposition suggests that there is no such thing as an "adaptation project", and that the best way to address climate change impacts would be by integrating adaptation measures into sustainable development and poverty reduction strategies and projects. This would ensure that climate-change risks are integrated with all the other risks that are faced by the poor.

However, the uncertainty about the nature, timing, and location of climate-change impacts makes it difficult to assess the appropriate additional risks, or indeed judge whether adaptation is even necessary. It is impossible – in terms of money, time, or human capacity - to carry out a full-fledged impact risk assessment and adaptation analysis for every location and every sector (water, forestry, agriculture, infrastructure, etc.) in the developing world to figure out whether adaptation is needed, and if so, how should it be designed.

Recommendation
All sustainable development and poverty reduction strategies and projects should assess the limits of climate variability within which they can be expected to meet their goals.

As the first step, this assessment should consider the resilience of the strategies and projects to climate change. This would involve assessing the limits of climate variability beyond which the project outputs would be negatively affected. For example, such an assessment of an agricultural development project could indicate that sustainable yields would decrease if the average temperature increases by more than 1.5 C, or if there are more than seven

consecutive days when the maximum temperature is more than 35 C, or if the soil moisture decreases by more than 10% of the current value, or if the rainfall is 25% less than the current amount, etc. These kinds of climate-variability limits establish the climate robustness, or climate resilience, of the proposed development project. They are relatively easy to carry out with currently available data. However, to the best of my knowledge, there are only a handful of projects for which such an assessment is available. Protocols for these assessments, and the human capacity to implement these protocols, therefore need to be developed. Pilots to develop these protocols could be the first item on the research agenda.

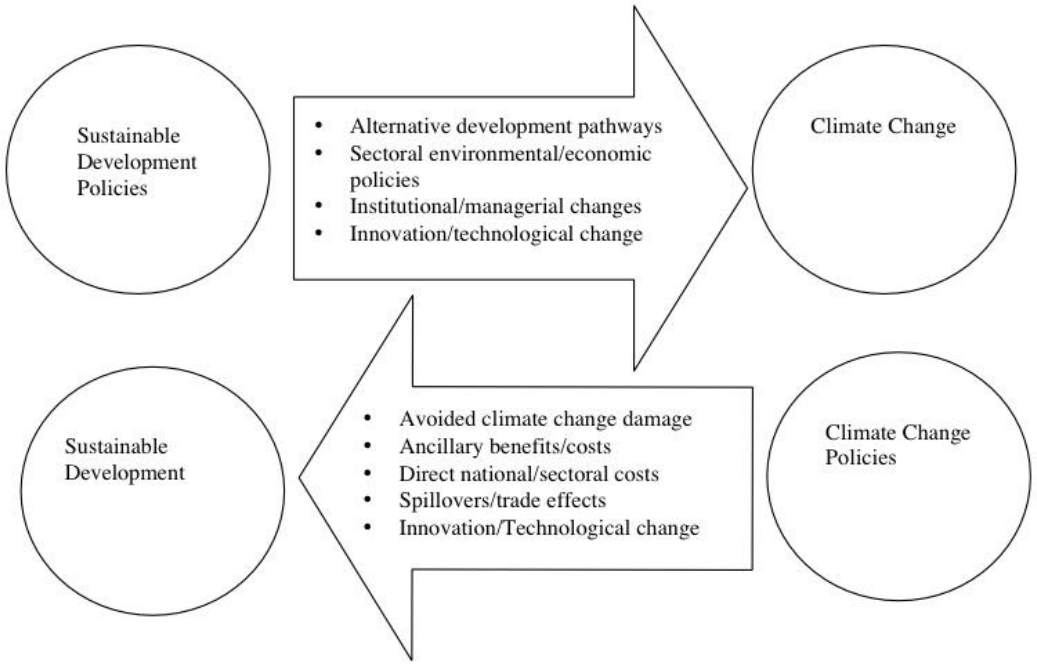
The second step would involve an assessment of the probabilities that the future climate limits would be substantially outside these climate limits. This step would need international cooperation in order to provide the outputs of global climate models (GCMs) for the region under consideration. This would mean that the GCMs would have to be downscaled and validated. There is a reasonable global effort, through the GCOS (Global Climate Observation System) program of the WMO, to provide countries with the outputs of downscaled models. However, in most cases, countries are not clear about the nature of the outputs that would help them address the adverse impacts of climate change. The climate-variability limits of development projects, assessed in the first step above, would help better define the outputs needed from the downscaled models.

If the outputs indicate that climate-variability limits are not expected to be breached over the project lifetime, no further assessment or analysis is required. However, if the climate-variability limits are seriously compromised, then the sectoral experts would need to redesign the project with the climate data in mind.

This approach would provide robustness to current development efforts, irrespective of climate change, and could help identify projects which are maladapted even to today's climate. They would provide the metric and hands-on experience to sectoral experts in considering climate variability and climate change as an integral part of project design. In a sense, this would be a win-win intervention.

As mentioned earlier, climate change will have a *direct* impact on development in relation to climate-dependent activities (such as hydropower, infrastructure and agriculture) and *indirect* consequences on social systems (such as issues of poverty, conflict and education) (Eriksen and Nœss, 2003: 10). Please see Figure 8. Furthermore, "climate change is likely to exacerbate inequalities [both among and within countries] due to the uneven distribution of the costs of damage, as well as those of necessary adaptation and mitigation efforts" (Munasinghe, 2002: 15). Climatic changes could lead to environmental scarcity in certain regions. This would impact climate-sensitive sectors and harm people's livelihoods; lead to migration; and produce *resource capture* by powerful group(s) within countries or communities, resulting in *ecological marginalization* of lesser groups. In extreme situations, the impacts of climate change may exacerbate conflict between social groups in countries already facing political instability or ethnic conflict.

Figure 8: Link between Climate Change and Development[a]



[a] Swart *et al*., 2003

It is vital to the success of both development and climate change policies that climate change be incorporated into development programmes. As argued by Newell (2004), "[p]olicy integration is perhaps the greatest contribution that governments can make towards providing climate protection and it is also potentially the least economically costly". This means that climate change should not simply be delegated to environmental programmes and ministries, but incorporated into all levels and branches of government. Donor agencies also need to mainstream climate change mitigation and adaptation policy into their economic and development activities.

3.1 Development Funding

The limited attention climate change receives among international donor organisations and governments "is a growing frustration" and untenable considering how the problem "is so deeply implicated in prevailing models of development" (Newell, 2004: 120). For instance, a review of 136 GTZ funded projects in Africa found no references to climate change (Klein, 2001). International organisations such as the IMF and WTO still make few specific considerations for climate issues in their operations and projects. However, in recent years, donor organisations and governments have begun to incorporate climate change into their development programmes. In 2003, a multi-agency report (published by AfDB, ADB, DFID, DGIS, EC, BMZ, OECD, UNDP, UNEP, and World Bank) affirmed the "central importance of climate change impacts and adaptation to achievement of their core mandate on poverty alleviation" (Agrawala, 2004). Organisations and governments such as the World Bank, GTZ, NORAD, DFID, and CIDA are now in investigating the linkages between climate change and development assistance. Please see Activities Review. To illustrate, the OECD Environment and Development

Cooperation and DAC branch launched a six-country project in 2002 to explore the potential for mainstreaming adaptation into development assistance. The project revealed the magnitude of development assistance and aid into sectors potentially affected by climate risks. In Egypt and Bangladesh alone it was estimated that between US$1-2 billion was directed towards sectors affected by climate change and climate variability from 1998 to 2002. As much as 50-65% of development aid in Nepal was given to climate-sensitive sectors. There are also many examples where specific development projects may be put in jeopardy due to climate change. In 1985, a glacial lake outburst in Nepal destroyed a World Bank funded hydropower dam in one single event (as luck would have it, just after it was completed). Glacial lake outbursts are expected to become more frequent under climate change as rising temperatures cause glacial retreat in the Himalayas. Such examples demonstrate the clear need to take into consideration the impacts and vulnerabilities of climate change into current and planned development programmes.

Box 7: Adaptation within the Poverty Reduction Strategy Program in Sudan
Source: Balgis Elasha

Sudan is highly vulnerable to climate impacts, in particular drought; through its First National Communications, Sudan has identified key climate change vulnerabilities (NC, 2002). Much of Sudan's vulnerability stems from low adaptive capacity – a result of poor development and poverty. Effective adaptation should therefore address these root causes of vulnerability. For a range of reasons, which range from competing priorities to institutional inefficiency, it is desirable that adaptation should work through existing efforts to address root causes. Because poverty is prevalent in the country, the Sudanese government initiated the Poverty Reduction Strategy Process (PRSP) in 1999. A higher council chaired by the President of the Republic was established by presidential decree in year 2000, to supervise the preparation and implementation of a comprehensive program for Poverty Reduction.

The main objectives of the Poverty Reduction Strategy Process are to maintain economic stability, ensuring political stability (through peace process), achieve social stability, increasing the standards of living, assist in achieving debt relief, and assist in the flow of external funding. Consequently, four pillars of the PRSP are identified: economic stability, environmental integrity, social stability, and political stability. We demonstrate how climate change adaptation strategies can be mainstreamed into the Sudan poverty reduction strategy, using a case study of rural communities in western Sudan This example represents an opportunity for linking both top-down (PRSP) and bottom-up (community-based project) mainstreaming.

In mainstreaming climate change adaptation into the PRSP, we have identified some opportunities and weaknesses. The main opportunities are that objectives of adaptation could be translated into community resource management strategies and mainstreamed into development plans and this will lead to the achievement of many economic, environmental and social benefits resulting from the sustainable management of natural resources. Secondly, the integration will as well assist in exploring indigenous knowledge and its importance to local livelihoods. Some of the obstacles to enhancing integration of adaptation are: first, win-win options which support both adaptation and development objectives tend not to be promoted in development policy and planning as sectoral strategies favour short term economic interest without accounting for longer term impacts on the natural resource base on which poor rural communities depend for their livelihood. Second, development plans are mostly not finely-tuned to the specific needs, priorities and capacities of local communities and are usually models that are developed in the west. Third, Local communities are rarely consulted or able to influence decision-making, and fourth there is the lack of attention among scientists to identify links to sectoral policies and plans and develop mechanisms for integration. Fifth, there is the usual problem of not engaging all major stakeholders' especially local communities in the process of development planning at the national level. Sixth, lack of sufficient communication and awareness among different stakeholders needed to integrate adaptation in routine development

activities. Seventh, there is the tension between the different planning departments, which rarely encourage cross-sectoral thinking or approaches.

Mapping Adaptation against PRSP in Western Sudan

Pillars of Poverty Reduction Strategy	Economic Stability	Social Stability	Environmental Integrity	Political Stability
Sustainable Livelihood Generic Indicators	-Average income levels (stabilized or increased)	-Migration (slowed, stabilized or reversed) -participation of local communities in community works and in the decision-making process (improved or increased)	-Land degradation (slowed or reversed) -Condition of the vegetation cover (stabilized or improved) -Soil and/or crop productivity (stabilized or increased)	-Reduced conflicts over natural resources
Adaptation Strategies	-Introduction of revolving credit -Increasing number of livelihood alternatives (income generating alternatives)	-Community development -Training and capacity building -Community institutional structure created	-Rangeland rehabilitation -Water harvesting and management -Stabilization of sand dunes -Creation of windbreaks	-Institutional building -Conflict resolution

This leads us to conclude that: To successfully address climate change adaptation and incorporate it into national development policies, we should give priority to the following:

- Focus on priorities, outcomes and means of implementation to develop a strategic planning at the national level which is agreed amongst all sectors and levels;
- Use a combination of top-down and bottom-up approaches beginning at local level and then moving up;
- Establish a well defined mechanism for coordination, provide necessary guidance, capacity building and resources;
- Institutionalize adaptation planning within each sector and highlight potential incentives;
- Secure high level political commitment to support the process of integrating adaptation in the development plans;
- Demonstrate through the results of case studies that adaptation is central to key concerns of poverty, social marginalization, conflict and instability etc;
- Demonstrate the ways in which adaptation can reinforce existing specific natural resource policies and institutional frameworks (enabling environment);
- Provide a framework for monitoring and measuring performance within each sector to be established

References

NC (2002) Sudan's First National Communication (2002), HCENR

Text box adapted from Dougherty and Elasha (2004)

Several climate change pilot projects have been initiated, but often, subsequent action to incorporate findings and lessons into national and local level development is limited. Any future development research needs to build on these findings and lessons.

4. Regional and Sectoral Approaches

The relevance of climate change (both of emissions/mitigation as well as impacts/adaptation) will vary for different sectors of any economy as well as by geographic region. The IPCC takes a differential approach to defining the regions depending on the relevance to the assessment. Thus for Working Group I (on science of climate change) they tend to take a latitude-based approach to regions (e.g. tropics, mid-latitudes, polar regions etc.) as the temperature rise will be different in these latitudes. Working Group II (on impacts, vulnerability and adaptation) on the other hand takes a more continental approach by defining the regions in terms of the major continents (e.g. Africa, Asia-Pacific, Europe, North America, South America, etc) and finally Working Group III (on response options) takes another approach aggregating types of countries based on similarity of economies and emission profiles (e.g. China and India).

The UNFCCC takes another approach to defining vulnerable regions. In Article 4.8 it mentions ecosystems (e.g. mountains, coastal, island etc.) and in Article 4.9 it mentions groups of countries defined by physical and economic features (e.g. small island developing states) as well as by purely economic criteria (e.g. the least developed countries).

Similarly the different sectors of the economy have varying degrees of relevance to climate change (especially to either emissions/mitigation or impacts/adaptation). For example emissions (and mitigation) are largely related to the energy sector (and to some extent to the transport and land use sectors) while impacts are mostly related to disaster management, agriculture and food, water and coastal zone management. While recognising that the energy (and possibly also transport) sectors have an important role to play in emissions/mitigation related issues and that there are also important poverty alleviation linkages in these sectors, the scoping exercise focused more on the impacts/adaptation-relevant sectors than the emissions/mitigation-relevant sectors.

There are also cross-regional issues (e.g. trade) as well as cross-sectoral issues (e.g. gender) that are of relevance.

Although most sectors and most geographic regions will be affected to greater or lesser extent it is not possible (or necessary) to review every sector and region. Therefore a few relevant sectors and regions have been selected (as well as a few cross-sectoral issues) for review in the following sections. These include:

Sectors:

(i) Agriculture and food security
(ii) Water resources
(iii) Natural Disasters
(iv) Coastal zones
(v) Health
(vi) Ecosystems
(vii) Energy

Cross-sectoral issues:

(i) Security
(ii) Gender

Regions (and countries):

(i) South Asia (India)
(ii) East Africa (Kenya)
(iii) West Africa (Senegal)

5. Key Concepts in Climate Change and Development Literature

Adaptation is the process of coping with the potential impacts of climate change, encompassing both planned (anticipatory) and reactive strategies (Huq and Reid, IDS Bulletin, 2004). It is an increasingly important concept within climate change literature, and can provide a conceptual bridge between the fields of climate change and development.

Climate Change can broadly be defined as any change in climate over time whether due to natural processes or as a result of human activity (IPCC). Climate change can also be understood as a change in "average weather" over months, years or millennium. The WMO uses a classic time period of 30 years. However, the UNFCCC employs a more specific definition, referring to only those changes which are attributable directly or indirectly to human activity. When climate change is addressed in environment and development literature, it is usually with reference to this last definition.

Climate Variability refers to variations from the mean state of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural processes within the climate system or human, external forces. Climate variability must not be confused with climate change, which refers to longer term trends in climate, as opposed to short-term deviations.

Coping capacity refers to the means by which people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and human-induced hazards (ISDR).

Disaster refers to a serious disruption of the functioning of a community or society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources (ISDR). The term, shock, is found in climate change literature referring to disruptions or negative changes to a community or society, but does not imply the same severity as disaster.

Disaster Risk Management is the systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This

comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards.

Disaster risk reduction (disaster reduction) is a conceptual framework used in the field to minimize vulnerabilities and disaster risks throughout a society, either through prevention or mitigation (preparedness). The ISDR outlines five elements of disaster reduction: (1) risk awareness and assessment including hazard analysis and vulnerability/capacity analysis; (2) knowledge development including education, training, research and information; (3) public commitment and institutional frameworks, including organisational, policy, legislation and community action; (4) application of measures including environmental management, land-use and urban planning, protection of critical facilities, application of science and technology, partnership and networking, and financial instruments; and (5) early warning systems including forecasting, dissemination of warnings, preparedness measures and reaction capacities.

Early warning is the provision of timely and effective information, through identified institutions that allows individuals to take action to a upcoming hazard in order to avoid or reduce their risk and prepare for effective response. Early warning systems include understanding and mapping the hazard; monitoring and forecasting impending events; processing and disseminating understandable warnings to political authorities and the population, and undertaking appropriate and timely actions in response to the warnings (ISDR).

Hazard is a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Natural hazards refer to damaging events caused by natural processes or phenomena.

Impacts refer to the effects of climate change, both the direct consequences of rising CO2 on the natural environment, and subsequent downstream effects on ecosystems and human societies.

Livelihoods refers to all activities at the household level for sustaining a living or earning an income.

Mainstreaming is the integration of climate change strategies into the development process, across all sectors and all levels of government. Interestingly, the concept originates in gender and development literature as a way to ensure gender equity in development policies (Integrating Mit and Adapt into C and Dev Policy, 2003)

Mitigation refers to activities taken to reduce GHG emissions or enhance CO2 sinks in order to combat the problem of climate change. This term is not to be confused with disaster mitigation, a term found in disaster risk management literature, which concerns the reduction in the adverse effects of disasters or shocks.

Resilience is the capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the

social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures (ISDR).

Risk refers to the probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions. Some disciplines also use the term exposure to refer to the same concept. Within Disaster management is expressed as:
Risk = Hazards x Vulnerability.

Sink refers to any process, activity or mechanism which removes a greenhouse gas (GHG), aerosol, or precursor of a GHG or aerosol from the atmosphere (IPCC).

Vulnerability is the "extent to which a natural or social system is susceptible to sustaining damage from climate change" (Schneider and Sarukhan, 2001, p 89). The extent to which communities are vulnerable to climate change depends on both exposure and sensitivity to changes in climate, as well as ability to adapt to new conditions (Kelly and Adger, 2000).