CLIMATE CHANGE AND DISASTER RISK MANAGEMENT

TECHNICAL BACKGROUND DOCUMENT

FROM THE EXPERT CONSULTATION HELD ON

28 TO 29 FEBRUARY 2008

FAO, ROME

CLIMATE CHANGE AND DISASTER RISK MANAGEMENT

Key Policy Challenge Addressed by the Meeting

Climate variability will result in more frequent and intensive disasters – with the most severe consequences on the food security and livelihoods of agriculture-dependent populations in vulnerable countries. Decision-makers in programming development and humanitarian response need to provide assistance at the global, regional and national levels that is designed to improve preparedness and early warning systems, and strengthen the resilience of populations most vulnerable to disasters. Changing climate patterns thus increase the urgency to invest in disaster risk-reduction activities, preparedness and management above and beyond other efforts directed toward climate mitigation and adaptation.

The expert meeting considered cross-sectoral linkages among climate change, disaster risk reduction and management (DRM), with a particular focus on the implications for agriculture and food security. The scope of the meeting concentrated on those aspects of climate change related to increasing frequency and intensity of extreme climate events such as droughts, floods, tropical storms and wild fires. It did not address projected longer term impacts of gradual climate change such as glacier melt, sea level rise and ecosystem stress.

Knowledge basis for Climate Change, Disaster Risk management and Food Security[1]

Observed changes in increase of frequency and intensity of weather extremes

In the period between 2000 and 2007, of the more than 230 million people affected annually by disasters about 98 percent were due to climate-related hazards[2], predominantly floods and windstorms, followed by droughts. During the period 1987-2006, the number of reported disasters related to hydrometereological hazards (droughts, floods, tropical storms, wild fires) showed a significant increase: from an average of 195 per year in 1987-1998 to 365 per year in 2000-2006 (Figure 1).[3]

In late 2007, the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report drew together the scientific evidence on climate change. This report states that "warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level."

Observed changes in climate and weather extremes include:

- increase in areas affected by drought since the 1970s (particularly in the Sahel, the Mediterranean, southern Africa and parts of southern Asia),
- more frequent heat waves over most land areas,
- increase in the frequency of heavy precipitation events over most areas,
- increase in the incidence of extreme high sea level,

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[1] This section is based on the Issues Paper on *Climate Change, Food Security and Disaster Risk Management*, prepared by the Institute of Development Studies (K. Vincent, T. Tanner, S. Devereux) as background for discussion at the Expert Meeting on Climate Change and Disaster Risk Management.

[2] *CRED Crunch*, Issue No 12, April 2008.

[3] CRED, UCL, UN ISDR, *Annual Statistical Review: Numbers and Trends, 2006*, Brussels 2007. This dramatic increase in the number of reported disasters is *also* related to improvements in reporting of smaller scale disasters.

- increase in intense tropical cyclone activity in the North Atlantic since about 1970[4].

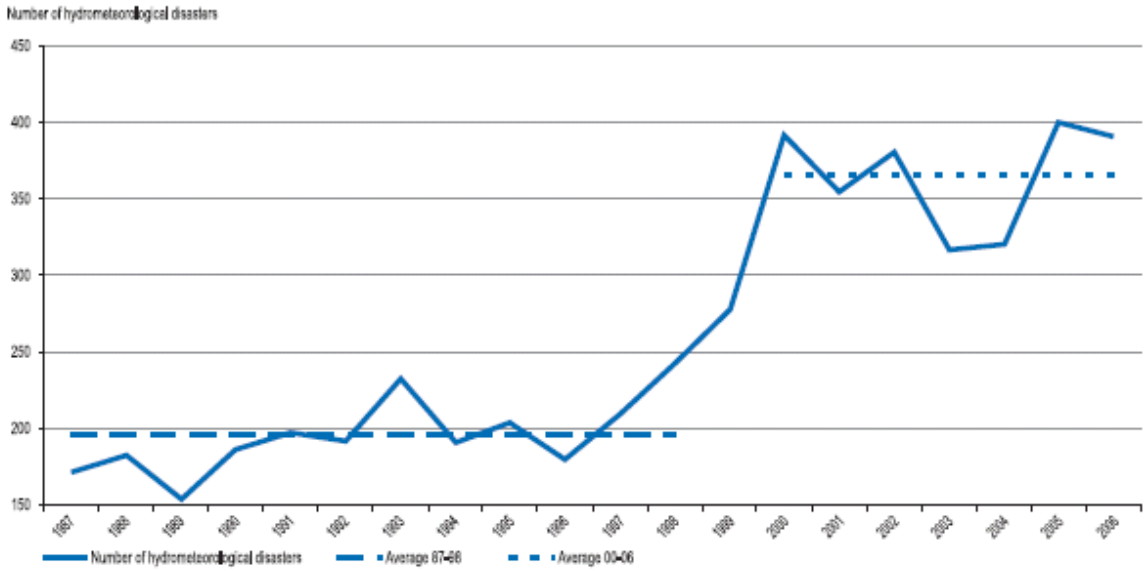


Figure 1 - Occurrence of hydrometereological hazards 1987-2006
Centre for Research on the Epidemiology of Disasters (CRED) – Annual Disasters Statistical Review 2006, Brussels, May 2007

Projected changes in increase of frequency and intensity of weather extremes

These observed changes in climate are likely to continue into the future. The IPCC Fourth Assessment Report states that there is high agreement and much evidence that, with current climate change mitigation policies and related sustainable development practices, global greenhouse gas emissions will continue to increase during the next few decades. Greenhouse gas emissions at or above current rates will cause further warming and induce other changes in the global climate system during the twenty-first century that very likely will be larger than those observed in the twentieth century. A number of socio-economic development scenarios have been developed to help project the range of potential future climate change, depending on different patterns of fossil fuel use. For the next two decades, a warming of about 0.20C per decade is projected for a range of these scenarios, after which potential increases vary with the scenario in question.

In addition to outlining the potential degree of warming, the IPCC Fourth Assessment Report expresses higher confidence than previous official reports in the projected patterns of warming and related impacts on regions and sectors. Linkages between evolving risk patterns and climate change are non-linear and highly sector and region specific. These linkages are only partially explored in the report, but they reveal some expected trends including the following[5].

Drought: Drought is a particular concern in Africa. According to the IPCC, the areas suitable for agriculture, the length of growing seasons and yield potential, particularly along the margins of semi-arid and arid areas, are expected to decrease. By 2020, between 75 and 250 million people are projected to suffer greater water stress due to climate change in the region. Agricultural production and access to food in many African countries and regions is therefore projected to be severely

[4] Note: there is no clear trend in the number of cyclones, and little evidence of similar increases elsewhere.
[5] Synthesis of the IPCC Report indications of how climate change will alter global risks patterns in: UN, *Disaster Risk Reduction: Global Review 2007*, New York, 2007.

compromised by climate variability and change. Increased drought hazard and decreasing availability of food and water could lead to scenarios of greatly increased risk that could stretch existing humanitarian response systems.

Flood: The IPCC confirmed that heavy precipitation events are very likely to become more frequent. Heavily populated mega-deltas in South, East, and Southeast Asia will be at greatest risk. In Africa, rising sea levels will affect low-lying coastal areas with large populations. To the extent that more flooding events that exceed historical parameters affect areas that have not developed early warning, preparedness and response systems, mortality risk may increase, while a generalized increase in economic loss risk in all regions could be foreseen.

Tropical cyclone: Higher sea temperatures are likely to lead to more intense tropical and extra-tropical cyclones. This will directly increase hazard exposure in existing cyclone hotspots, particularly if combined with an increase in the concentration of population and economic activities in these areas. At the same time, higher sea temperatures may also alter cyclone tracks, meaning that hazard exposure to tropical storms could increase in regions that historically have not suffered cyclones, creating new hotspots.

Table 1: Projected major sectoral trends and impacts due to changes in climate and extreme weather events during the twenty-first century (not taking into account adaptive capacity)[6]

Phenomenon and direction of trend.	Likelihood of future trends [7]	Examples of major projected impacts by sector			
		Agriculture, forestry and ecosystems	Water resources	Human health	Industry, settlement and society
Warmer, fewer cold days and nights, more frequent hot days and nights	Virtually certain	Increased yields in colder environments; decreased yields in warmer environments; increased insect outbreaks	Effects on water resources relying on snowmelt; effects on some water supplies	Reduced human mortality from decreased cold exposure	Reduced energy demand for heating; increased demand for cooling; declining air quality in cities; reduced disruption to transport due to snow, ice; effects on winter tourism
Warm spells and heat waves with frequency increasing in most land areas	Very likely	Reduced yields in warmer regions because of heat stress; increased wildfire danger	Increased water demand; water quality problems, e.g. algal blooms	Increased risk of heat-related mortality, especially for the elderly, chronically sick, very young and socially isolated	Reduced quality of life for people in warm areas without appropriate housing; impacts on the elderly, very young and poor

[6] IPCC, *Technical Summary: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge UK

[7] Based on projections for the twenty-first century using IPCC Special Report on Emissions (SRES) scenarios

Heavy precipitation events with frequency increasing in most areas	Very likely	Damage to crops, soil erosion, inability to cultivate land due to soil waterlogging	Adverse effects on quality of surface and groundwater; contamination of water supply; less water scarcity	Increased risk of deaths, injuries and infectious, respiratory and skin diseases	Disruption of settlements, commerce, transport and societies due to flooding; pressures on urban and rural infrastructures; loss of property
Area affected by drought increases	Likely	Land degradation; lower yields, crop damage and failure; increased livestock deaths; increased wildfire risk	More widespread water stress	Increased risk of food and water shortage; increased risk of malnutrition; increased risk of water and food-borne diseases	Water shortage for settlements, industry and societies; reduced hydropower generation potentials; potential for population migration
Intense tropical cyclone activity increases.	Likely	Damage to crops; trees uprooted; damage to coral reefs, coastal ecosystems and communities	Disruption of public water supply from power outages	Increased risk of deaths, injuries, water- and food-borne diseases; post-traumatic stress disorders	Disruption by flood and high winds; private insurers withdraw risk coverage in vulnerable areas; loss of property; potential for population migration
Increased incidence of extremely high sea level (excludes tsunamis)	Likely	Salinization of irrigation water, estuaries and freshwater systems	Decreased freshwater availability due to saltwater intrusion	Increased risk of injury and death by drowning in floods; migration-related health effects	Costs of coastal protection vs. costs of land-use relocation; potential for movement of populations and infrastructure; see tropical cyclones above

Impacts on Food Security

Climate change will have profound implications for food security across the globe, but these implications are far from clear – the causal pathways from changes in climate to changes in food security outcomes are likely to vary from region to region. Climate change is happening together with rapid changes in the global economy, communications and social support structures, which generate additional threats and opportunities for climate risk reduction and response. The complex interactions between these factors need to be better understood to advance the knowledge base on the impacts of climate change on food security. In addition to a rural focus, it also requires attention to urban and peri-urban areas which are becoming increasingly important for markets, storage and production as well as consumption.

To date, analysis of climate change impacts on food security has focused mainly on the implications of climate change for global food production while analysis of the stability, utilization and access dimensions of food security and of livelihoods under alternative climate change scenarios has been limited. This is reflected in the limited level of citable literature in the 2007 IPPC Fourth Assessment Report which, while noting these lacunae, focuses on changes in food availability by modelling gradual long-term climatic changes[8]. More focused attention on the connections between environmental, social, economic and political processes is necessary to understand the present and longer term impacts on livelihoods, food access, stability and use[9]. Some of the emerging food security issues are the following.

Availability of food: The most direct impact of climate change on food security is through changes in food production. Short-term variations are likely to be influenced by extreme weather events that disrupt production cycles. Most assessments of the impacts of climate change deal with aggregate changes (gains and losses) in arable land, changes in actual and potential yields, and inter-annual variability of harvests. These models all agree that climate change impacts on the availability of food will vary geographically – temperate regions in the high latitudes will see a slight increase in productivity with South Asia and southern Africa suffering negative impacts on food crops).

Stability: Weather extremes and climate variability are the main drivers of food production instability, especially in rainfed farming systems with limited irrigation. There has been little analysis of the impact of the changing frequency of extreme weather events on stability, particularly the interaction at the local level between relatively moderate impacts of climate change on overall agro-ecological conditions and much more severe climatic and economic vulnerability.

Utilization: Projected increases in risk of flooding of human settlements, especially in coastal areas from both sea level rise and increased heavy precipitation, are likely to increase the number of people exposed to vector-borne (e.g. malaria) and water-borne (e.g. cholera) diseases. This, in turn, lowers people's capacity to utilize food effectively, which compromises their food security status. Although there has been much research on the health impacts of climate change in terms of food stability, the utilization element of food security remains understudied.

Access: Access to food by all members of the population is arguably as important as food availability. Ensuring access to and the development of markets for food, especially in remote rural areas, is a crucial response to enable greater food security in the face of climate shocks and stresses. Access to food is also likely to be influenced by complex secondary impacts of climate change including conflict, human insecurity, migration and soaring food prices. These will have relevant implications for the design of adequate and diversified humanitarian responses that combine different modalities of resource transfers for food, cash, inputs, etc.

Conceptual frameworks and tools to advance understanding of impacts of climate extremes on food security

Overall, an increase in understanding of the local and national impacts of increased extreme climate events will require a more in-depth analysis that combines the socio-economic drivers of vulnerability with hazard profiling that also factors in projected changes. Vulnerability analysis,

[8] IDS, op. cit., page 10

[9] The complexity of interactions among these factors implies a high degree of unpredictability and that impacts are going to be highly context dependent. This point has also been stressed in a number of publications, e.g. P. Walker, *Climate Change, Humanitarian Action and Complexity*, Feinstein International Center/TUFTS University 2008; and ODI, *Exploring the science of complexity: ideas and implications for development and humanitarian efforts*, 2008

which was developed for studies of poverty and food security, is becoming a unifying framework for the climate change adaptation and disaster risk management communities. This is based on the recognition that:

- *disaster risk* results from the combination of a potential damaging event (hazard) and the degree of susceptibility of the elements exposed to that source (vulnerability);
- *hazard exposure* is determined by the combination of hazard frequency and potential severity and the number of people and value of assets exposed;
- *vulnerability* is determined by physical, social, economic and environmental factors or processes such as precarious settlements, dependence on fragile ecosystems, unsafe buildings and uncertain livelihood options.

The focus on vulnerability highlights that exposure to physical phenomena is embedded in, and mediated by, the particular human contexts – social, economic, political, institutional – in which they occur. While physical phenomena are necessary to produce a natural hazard, their translation into risk and potential for disaster is contingent upon human exposure and the lack of capacity to cope with the negative impacts that such exposure might bring to individuals or human systems. This explains why countries experience very different levels of mortality from a similar level of hazard exposure. For example, Haiti and Dominican Republic share a similar hazard profile, yet the impact of natural hazards between 2000 and 2007 was significantly different with an average of 121 000 people affected annually in Haiti and 38 000 in Dominican Republic.

Planning risk reduction and response requires an understanding of vulnerability in terms of identifying who is vulnerable, where they are and why they are vulnerable. Having this information improves targeting and addresses the key drivers of vulnerability.

The different conceptions of vulnerability (biophysical and social) have led to the development of a variety of assessment tools and methods. Typically, analysis of biophysical vulnerability focuses on top-down modelling of global impacts, while analysis of social vulnerability tends to take a more bottom-up approach focused around case studies[10]. Sustainable livelihoods and entitlements analysis frameworks have often informed assessments and analyses of local-level impacts of extreme climate events on livelihoods and food security.

Linking the adaptation and disasters communities

There are clear inter-relationships between tackling climate change and disasters. Effective disaster risk management needs to consider changing climate risk patterns, and given that one of the major threats posed by climate change is an increase in extreme climate events, disaster risk management is a natural entry point for adaptation[11]. Yet, two distinct communities of researchers and practitioners have evolved, one dealing with long-term environmental impacts of climate change and the other dealing with impacts of hazards/disasters on human society.

[10] More details on vulnerability assessment tools and indicators are provided in the IDS Issues Paper, pp 12-15.

[11] Disaster risk management focuses on building the institutional basis for risk reduction; increasing scientific and popular understanding of risk; strengthening early warning systems; improving natural resource management and construction practices; promoting preparedness for emergency response; and mobilizing resources for and implementing emergency response and rehabilitation operations. The UN ISDR definition of 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 activity, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards*".

This divergence has been attributed to differing time and spatial scales of activity by the two communities. The climate change community tends to focus on the longer term while the disasters community has typically focused on the short term. In addition, climate change science works primarily at the global level with models reflecting the global nature of the atmospheric and oceanic circulation, while those working in the disaster field have tended to focus on the local and national level where weather extremes are manifest, perhaps overlooking the root causes of vulnerability at the international level. The consequences of these different foci have led to the development of different language and terminology to refer to similar concepts and phenomena, and cemented the divide.

Table 2 General characterization of climate change adaptation and disaster risk reduction communities[12]

Climate change adaptation	Disaster risk reduction
Approach	
• risk management • strong scientific basis • environmental science perspective • highly interdisciplinary • vulnerability perspective • long-term perspective • global scale • top-down	• risk management • engineering and natural science basis • traditional focus on event and exposure and on technological solutions • shift from response and recovery to awareness and preparedness • short term but increasingly longer term • local scale • community-based
Organisations and institutions	
• United Nations Framework Convention on Climate Change (UNFCCC) • Intergovernmental Panel on Climate Change (IPCC) • Academic research • National environment and energy authorities	• United Nations (UN) • ProVention Consortium (World Bank) • International Federation of Red Cross and Red Crescent Societies (IFRC) • International, national and local civil society organisations • National civil defence authorities
International conferences	
• Conference of the Parties (COP)	• World Conference on Disaster Reduction
Assessment	
• IPCC Assessment Reports	• IFRC Vulnerability and Capacity Assessment (VCA) • IFRC World Disasters Report • International disasters databases: * EM-DAT * NatCatSERVICE (Munich Re) * Sigma (Swiss Re)
Strategies	
• National communications to the UNFCCC • National Adaptation Plans of Action (NAPA) for Least Developed Countries	• UN International Decade for Natural Disaster Reduction (IDNDR) • Yokohama Strategy and Plan of Action for a Safer World • UN International Strategy for Disaster Reduction (ISDR) • Hyogo Framework for Action 2005–15
Funding	
• Special Climate Change Fund • Least Developed Countries Fund • Kyoto Protocol Adaptation Fund	• National civil defence/emergency response • International humanitarian funding (for instance, UN Office for the Coordination of Humanitarian Affairs (OCHA) • Multilateral banks • Bilateral aid

[12] F. Thomalla, *et al.*, Reducing hazard vulnerability: towards a common approach between disaster risk reduction and climate adaptation, *Disasters.* 2006 30(1) p 40.

There have been multiple calls for greater integration of the two communities and – as knowledge of climate change and the negative effects of disasters increase – there are signs that the two communities are beginning to come together[13]. Policy and operational implications of enhanced linkages between climate change and disaster risk management for food security and livelihoods protection are described in the following section.

Implications of climate change for effective disaster risk management and food security protection

Challenges

As shown, climate change will increase the number and scale of disasters that need to be managed and modify geographical distribution of natural hazards. In addition, climate change affects local vulnerability to shocks through:

- increased food insecurity and malnutrition due to decline in agriculture production and erosion of vulnerable groups' assets;
- changes in morbidity patterns and potential declines in human health;
- scarce resources (water, land, fisheries) potentially leading to conflict and population displacement.

Adjustments will need to take into consideration present risk through additional investment in risk reduction and a renewed emphasis on preparedness to manage more frequent and intense disasters. It will also require increasing capacities and flexibility to plan for future changes. Management of climate risk will be instrumental in protecting livelihoods and food security from evolving and less predicable natural hazards and shocks. More specific implications for effective disaster risk management include:

- combining historical trends with scenario modelling when undertaking gender-sensitive risk and vulnerability assessments;
- using existing food security and livelihoods assessment tools that improve understanding of local impacts of climate hazards by considering differential vulnerabilities within countries; communities and households, including those due to gender, age and socio-economic factors;
- adapting traditional coping strategies, since climate change alters patterns of risk and might erode the assets on which they are based;
- considering linkages between climate change mitigation and risk reduction by ensuring that low carbon emission risk reduction solutions and mitigation efforts do not increase exposure of populations and economic assets to climate hazards;
- considering longer term perspectives to address secondary impacts of disasters, such as wider scale migrations, temporary or seasonal migration that turn into permanent migrations flows, and their implications for conflict and security issues;
- revising land-use planning schemes to include evolving hazard profiles and subsidized relocation schemes in high risk areas;
- renewing emphasis on sustainable natural resource management practices (water, soil, fisheries, forestry) which constitute the baseline for all risk reduction and adaptation options;

[13] For example, the *Stockholm Plan of Action for Integrating Disaster Risks and Climate Change Impacts in Poverty Reduction* and the *Oslo Policy Forum on Changing the Way We Develop: Dealing with Disasters and Climate Change.*

- investing in management and dissemination of climate information that recognizes that the targets have different access to information and abilities to respond or act because of their gender, age, ethnicity and socio-economic groups;
- investing in further preparedness so all levels (local communities, governments, regional and international organizations) can respond more effectively to humanitarian consequences of climate change;
- ensuring that food security contingency plans consider multiple global and local climate and market shocks and diversified responses (production, trade, stockpiling, food and cash transfers);
- increasing investment in social protection and risk transfer, since the increase in frequency of hazards may erode peoples' abilities to recover and the increase in magnitude of hazards will result in additional pressure on national social protection systems and humanitarian aid;
- formulating better communications and awareness-raising methodologies and strategies to ensure that climate information reaches end users and that communities and policy-makers are mobilized at all levels to initiate preventive action;
- thinking of disaster risk management as a continuum (from prevention to building back better) rather than in separate phases (prevention, mitigation, early warning preparedness, response, recovery, rehabilitation);
- investing in education to allow new generations to develop the new skills necessary for non-agriculture-based livelihoods in recognitions that opportunities in climate-sensitive sectors might change dramatically because of ecosystems stress.

Example of investment in climate risk reduction

Bangladesh disaster preparedness saves million of lives
in areas hit by cyclone Sidr in November 2007

Bangladesh has a high level of vulnerability to natural disasters. It faces regular occurrences of floods, tropical cyclones, tornadoes and tidal bores. Even if no single event can be attributed uniquely to climate change, the scientific community agrees that global warming will increase the frequency and intensity of hydro-meteorological disasters in the country. In addition, Bangladesh is considered one of the countries most at risk of climate change as a consequence of rising sea levels leading to loss of land and production, and migration.

Cyclone Sidr (Category IV) hit Bangladesh on 15 November 2007 with wind speeds up to 250 km per hour. Sidr caused extensive damage in 31 districts (out of 64), left 4 234 people dead, thousands injured, and more than one million houses entirely or partly destroyed. Despite these dramatic numbers, the extent of the disaster was limited as a result of prevention efforts. For instance, the less powerful cyclone that hit Bangladesh in 1970 caused 300 000 deaths. Such enormous losses did not recur in the case of Sidr as a consequence of extensive dialogue and long-term efforts undertaken jointly by humanitarian and development actors, national and local authorities, and civil society that had resulted in:

- a simple early warning system – local volunteers shouting through megaphones to warn people about the cyclone saved thousands of lives;
- shelter capacity – people residing in the cyclone's path could be evacuated to temporary settings;
- coordination – a national platform, the Disaster and Emergency Response Group set up under government leadership, included government and donor representatives, UN agencies, NGOs, Bangladesh Red Crescent Society and international financial institutions.

Based on presentation by F. Gentiloni (OCHA)

Opportunities

As climate change acquires an increasingly high profile in the political agenda, it offers an opportunity for disaster risk management to gain the recognition it deserves as a key instrument for protecting development gains and food and livelihood security from natural hazards. For example, it offers increased opportunities for:

- mainstreaming risk management in climate-sensitive sectors including agriculture, fisheries, water, infrastructure and health;
- systemizing disaster risk management operations across administrative levels, from local to international;
- enhancing linkages and synergies between the humanitarian and environment communities;
- renewing interest in preparedness and contingency planning to manage more frequent and less predictable multiple hazards;
- accessing new or additional financial instruments[14].

Example of investment in climate risk reduction

Improving long-lead forecast products customized for local use

Improved use of climate information is a key instrument for addressing existing climate risks while, at the same time, building capacity to manage future threats induced by climate change.

Lessons from the Asian Disaster Preparedness Center's (ADPC's) work in a number of Asian countries show a generalized need to produce climate information that is understandable and usable by policy- and decision-makers, intermediary service providers (such as extension services) and communities at risk. Current gaps include:

- insufficient networks of climate stations;
- inadequate data on climate impacts (damage and loss);
- overly generic climate information in terms of space and time that seldom matches end-user needs at local level;
- lack of understanding because of unclear language;
- lack of technical capacity to interpret the information, develop impact outlooks and communicate to the end users within the extension departments.

Key elements of bottom-up processes that can address the above gaps and deliver climate information customized to end users' needs should:

- assess user needs – requires understanding of the agricultural system, agricultural calendars and what kind of information is needed and when;
- assess relevance of existing climate information to meet needs – requires short-, medium- and long-term forecasting products;
- promote institutional networking and partnerships – requires involvement of key service providers, line departments and representatives of end-user groups;
- improve forecast products and enhance linkages with global centers;
- build capacity for effective application of climate information in the agriculture, livestock and fisheries sectors;
- broaden risk management options at local level – requires focusing on the multi-hazard context;
- support community participation in risk assessment and preparedness and contingency planning;
- develop technology and test products with end users;
- promote mainstreaming by showing measurable improvements;
- attract policy attention for scaling-up.

Based on presentation by S. Ramsey, ADPC/FAO

[14] See Section 4.

Emerging trends in disaster risk management: local, national and international strategies to address the consequences of Climate change on Food security

Community Based Strategies

Community-based approaches to risk management and climate change adaptation have much in common and are increasingly recognized as key instruments in risk reduction. The approaches are based on participatory risk and vulnerability assessments and planning processes. Support often focuses on facilitating dialogue about local concerns and helping people define risk reduction priorities combined with capacity building and training. Community-based climate risk reduction measures might include practical disaster mitigation measures, such as building dams or dykes, forming emergency response committees, developing community-based early warning systems and practising response and evacuation, advocating at the local or national government level for policy change in favour of preventive action; and enacting measures to reinforce the livelihoods of most vulnerable groups.

New approaches are being developed to factor climate risk management into development and humanitarian programmes; for example, though combining food aid with promotion of financial risk management tools and use of weather information (IFRC) or using food-for-work programmes for community afforestation (WFP).

A number of key elements for processes aiming at supporting disaster risk management and climate change adaptation at the local level are emerging from FAO's work with farmers, fishers, extension services and line departments. They include:

- assessing existing situations and training needs including in-depth assessments of livelihoods strategies, natural resource management practices, farming systems and institutional set-ups;
- organizational strengthening within the agriculture sector, but also linkages across sectors;
- identifying and validating risk management and adaptation options and related technical capacity building on a per-demand basis;
- promoting local empowerment processes such as community mobilization, awareness raising and policy dialogue;
- sharing knowledge;
- advocating for scaling-up based on lessons learned.

Some additional issues to take into consideration include:

- communications and awareness raising – need to simplify complicated climate change concepts, use appropriate media (traditional or modern) and translate into local languages;
- modelling and forecasting – need to ensure that people understand the uncertainty of climate change projections, in order to ensure community ownership of response actions;
- technology and information – need to simplify tools to ensure they will be manageable at local level and to improve targeting, because resources normally allocated at national level can fail to reach the most vulnerable groups;
- investment in education and migration – need to recognize this has become a key coping strategy for young generations in households dependent upon ecosystems that are under high stress;
- risk mitigation approaches – need to promote and implement approaches through existing community institutions such as health points, religious institutions, schools and elders.

National Strategies

Disaster risk management, climate change and food security are addressed at national level within different policy frameworks such as disaster risk management legislation, national adaptation plans of action and national strategies for food security. In addition, they are managed through different line departments that often have no cross-sectoral coordination. For example, the ministry of interior or civil protection normally is responsible for disaster risk management while the ministry of environment is responsible for climate change.

To address underlying factors of vulnerability and protect food security and livelihoods from increasing climate risk, DRM and climate change adaptation should be linked and embedded in development (Poverty Reduction Strategy Papers, food security strategies) and sectoral strategies (agriculture, forestry, fisheries, health infrastructure).

This will require additional political commitment and financial resources to address risk reduction together with elements of institutional innovation that include:

- enhanced cross-sectoral coordination at all administrative levels – including disaster risk management, climate change and food security committees with representation of climate-sensitive sectors and vulnerable groups;
- enhanced chains of vertical local-district-provincial-national linkages and clear lines of command – combining bottom-up and top-down approaches[15];
- increased capacity building within climate-sensitive sectors – including adjustments to institutional set-up and staff training;
- renewed emphasis on awareness raising, information sharing, communication and outreach – consolidating and simplifying messages;
- increased promotion of synergies among academia and research institutes, policy-makers and end users – particularly in areas that need substantial investment in new technologies such as improved use of climate information and early warning systems;
- adjusted mandates of middle-level service providers such as extension services – to enable them to deliver sector-specific advisory services related to climate risk.

[15] Good lessons have been developed by the fire management community.

Example of capacity-building for climate risk management in vulnerable sectors

Development of a plan of action for the Bangladesh Department of Agriculture Extension to strengthen disaster prevention and preparedness in the agriculture sector

In 2003, the Government of Bangladesh adopted the Comprehensive Disaster Management Programme (CDMP) with the support of UNDP and DFID. The CDMP has used a programme approach to facilitate the move from a single agency response-and-relief system to a broad multi-sectoral strategy that addresses the issue of community vulnerability. Within the above context, FAO was requested to assist the Ministry of Agriculture (MoA), particularly the Department of Agricultural Extension (DAE), in designing, implementing and monitoring risk-reduction activities and facilitating coordination and collaboration with other stakeholders.

Activities included the development of the Department of Agriculture Extension Plan of Action to strengthen disaster prevention and preparedness in the agricultural sector. The plan provides an overview of the institutional set-up, policy frameworks, and strengths and weaknesses of the Ministry of Agriculture. It suggests a set of concrete actions organized under seven main result areas:

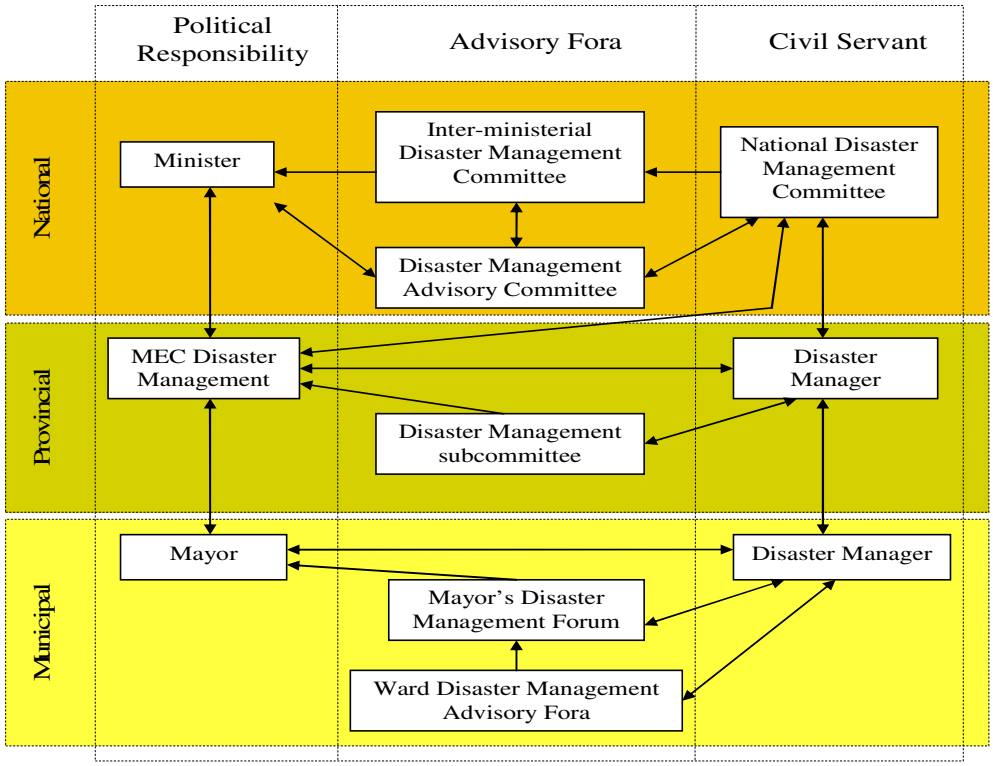
- institutional set-up in DAE for disaster risk management – establishing and empowering a disaster risk management (DRM) cell within DAE and involving DAE staff in community-level DRM committees;
- policy framework for DRM in agriculture – integrating DRM issues into MoA policy and agriculture issues into standing orders for disasters, and updating DAE field manuals;
- capacity building and awareness creation – institutionalizing training within agriculture training institutes on DRM modules and methodology developed within the project;
- instruments and methodologies to address DRM in agriculture – organizing community risk assessments, vulnerability maps, databases on disaster losses;
- technical options for DRM in agriculture, livestock and fisheries – stocktaking and establishing collaboration with research institutes;
- collaboration and coordination;
- sustained application of early warning systems at community level – building capacity for better use of early warning systems, agricultural impact outlooks and management plans for various anticipated flood and climate scenarios.

The Plan of Action was prepared on the basis of a consultative process between government technicians and project staff. Additional activities included training of civil servants and extension officers, and design of a communications strategy to facilitate coordination with other partners and among the agencies and farmers at the local level.

Example of policy frameworks enhancing coordination and institutional linkages across administrative levels

Disaster risk management policy framework in South Africa

South Africa has actively embraced the paradigm change from disaster response to longer term integrated disaster risk management. The recent introduction of legislation and a new policy framework now means that, at least on paper, South Africa has one of the most advanced institutional frameworks for disaster management in the world. The process of policy formation began in the late 1990s, with legislation promulgated in 2002 and coming into force in 2003. It was introduced progressively to the three levels of political administration, from provincial to district and ending with municipality in 2004. Political responsibility has been assumed by existing institutions, a new cross-sectoral coordination mechanism – the advisory fora – has been established to implement the new legislation and policies, and a number of civil service positions with explicit responsibility for disaster management have been created.



from IDS issues paper

International Strategies

At international level, priorities have been set in the UN International Strategy for Disaster Reduction Hyogo Framework of Action (2005-2015) and the Nairobi Action Plan. The Hyogo Framework for Action, endorsed at the 2005 World Conference on Disaster Reduction, identifies five priority areas for action:

1. Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
2. Identify, assess and monitor disaster risks and enhance early warning.
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
4. Reduce the underlying risk factors.
5. Strengthen disaster preparedness for effective response at all levels.

The strategy stresses the need to *"promote the integration of risk reduction associated with existing climate variability and future climate change into strategies for the reduction of disaster risk and adaptation to climate change, which would include the clear identification of climate related*

disaster risks, the design of specific risk reduction measures and an improved and routine use of climate risk information by planners, engineers and other decision-makers" and to *"promote food security as an important factor in ensuring the resilience of communities to hazards, particularly in areas prone to drought, flood, cyclones and other hazards that can weaken agriculture-based livelihoods*.[16]".

The Nairobi Work Programme, developed within the framework of the implementation of the adaptation components of the UN Framework Convention on Climate Change (UNFCCC) helps countries:

- improve their understanding of climate change impacts and vulnerability; and
- increase their ability to make informed decisions on how to adapt successfully.

It is an international framework implemented by countries that have signed the UNFCCC convention, intergovernmental and non-governmental organizations, the private sector, community groups and other stakeholders.

Climate-Related Risk and Extreme climate events is among the nine areas of work the programme addresses to increase the ability of countries to adapt. Activities in this area are designed to promote the understanding of impacts of, and vulnerability to, climate change, current and future climate variability and extreme climate events, and the implications for sustainable development. However, food security issues are not taken into consideration. It is to be hoped that this will be addressed within the context of the post-Kyoto negotiations, under the UNFCCC.

To fulfil their responsibilities in implementing such frameworks, international agencies are increasingly integrating climate risk management into policy documents, supported where necessary by dedicated teams, programmes and funding windows.[17]. Both subregional and international organizations have key roles in: a) producing global statistics, monitoring tools, international protocols and standards; b) building capacity and sharing information; c) providing technical assistance in areas such as education, training, technical exchanges and projects; and d) supporting financial, technological and knowledge transfers.

The FAO Global Information and Early Warning System on Food and Agriculture is an example of a global monitoring tool. Since 1975, it has monitored the food supply-and-demand situation at global, regional and country levels and provided early warnings of food shortages. Food production, utilization, import requirements and food aid needs are regularly monitored and reported. Analysis of its 1986-2007 data reveals increases in countries facing food emergencies in Africa, increases in food emergencies determined by natural hazards and increases in emergencies caused by quick-onset hazards (typically floods and tropical storms).

Interagency and multi-stakeholder partnerships increasingly are being established for the development of such tools. The forest fire community, for example, is far advanced in the development of inter-agency and inter-governmental partnerships and processes to design hazard-specific monitoring and management tools. Partnerships include international organizations such as FAO and the UN International Strategy for Disaster Reduction (ISDR), global research centres such as the Global Fire Monitoring Centre, universities, national governments and local networks.

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[16] UN ISDR, *Hyogo Framework for Action 2005-2015: Building the resilience of nations and communities to disasters* (paragraph 19).

[17] The new WFP Strategic Plan (2008-2011), which includes investment in disaster preparedness and mitigation measures as a key strategic objective, was discussed at the expert meeting. Also discussed were new funding mechanisms to support developing countries in enhancing their climate risk management capacities, such as the WB/UNISDR Global Facility for Disaster Risk Reduction.

Financial instruments for Disaster Risk Management and Climate Change

A number of traditional and new funding instruments can be used to address climate risks and the consequences of food security:

- microfinance – microfinance tools support ex ante disaster risk management activities at the community and household levels (for household-level preparedness);
- private sector – in an expanded role, private sector provides technical know-how and funding, such as partnerships established by the insurance sector at the national and international levels to improve disaster data collection and analysis);
- foundations – resources mobilized by foundations are increasing and will become more involved in climate change adaptation;
- partnerships – international organization partnerships, such as the World Bank Global Facility for Disaster Reduction and Recovery, are investing in ex ante risk reduction measures and improved emergency response; ;
- adaptation funding – funds provided through the UNFDCCC processes include the Special Climate Change Fund, Least Developed Countries Fund and newly established Adaptation Fund;
- fundraising – use of new and innovative tools to support fundraising, such as solidarity cards, text messages, and celebrity involvement;
- bilateral and international organizations – new funding windows of bilateral and international organizations respond to climate change;
- Official Development Aid – climate risk management integrated in the context of Official Development Aid flows enable "climate proofing";
- carbon credit and market system – potential access for the rural poor to the carbon credit and market system to fund activities with mitigation and food security benefits;
- risk transfer mechanisms – increased use of combining weather risk insurance with social protection for the most vulnerable groups.

Summary of key messages

Human-induced climate change is resulting in increased intensity and frequency of hydro-meteorological hazards. However, these alone do not determine disasters. Disasters also depend on human vulnerability. Impacts on food security will result from negative effects of multiple shocks related to climate, markets and health combined with governance and socio-economic factors, and environmental degradation.

Although knowledge gaps exist in determining the possible present and future impacts of climate-related hazards on food and livelihoods security, the current level of expertise in risk reduction and response allows a move into action. A key step is undertaking in-depth vulnerability assessments in high risk areas, such as coastal, riverine and drought prone areas in the low-income food deficit countries.

Vulnerability reduction through climate risk management can be used as a unifying concept for the DRM, climate change and food security communities. Considering that climate risks exacerbate existing vulnerabilities, it may not serve the purpose to address climatic-induced vulnerability increases as a separate discipline.

Disaster risk management-related experience, knowledge and practical tools can inform climate change adaptation to address current threats. A wealth of experience is available for all aspects of disaster risk management, including risk assessment, risk reduction, preparedness response, recovery and rehabilitation. Knowledge from areas already affected by extreme climate events on a recurrent basis can be transferred to areas where risks will be increasing in the future. However, no blueprint approach is possible. Disaster risk management and climate change adaptation are highly context specific. Climate change will accentuate local variation and responses need to be locally nuanced.

Operationalization of disaster risk management concepts is often undertaken at project level. There is a need for up-scaling and mainstreaming into climate-sensitive sectors such as agriculture, health and infrastructure. Disaster risk management and climate change adaptation should be linked and better integrated into national development plans and strategies, starting from poverty reduction strategies and food security strategies.

Since climate risk management needs to become an integral part of development processes, institutional innovation and capacity building will be needed at all levels – from local to international. Key elements will include: improved forecasting products and capacities to use them; enhanced cross- sectoral collaboration, renewed emphasis on communications and knowledge management, and focus on outreach to vulnerable communities.

There is a need to bridge the current gap between science, policy and practice. For example, there has been a disconnect between research and end users. Relevant climate information is often inaccessible or not usable or understandable by end users and decision-makers. International organizations and responsible national line departments should be encouraged to be proactive in facilitating collaboration among environment research institutes working on climate change, service providers such as extension services and meteorological services, line departments and humanitarian actors.

No matter how much is invested in risk reduction, demands on humanitarian actors and social protection will increase. Preparedness is key to more effective response to the humanitarian consequences of climate change. More flexible funding mechanisms are needed to allow for development and humanitarian resources to be invested in preparedness.