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Item 3 of the provisional agenda
Nairobi work programme on impacts, vulnerability and adaptation to climate change

Relevant programmes, activities and views on the issues relating to climate related risks and extreme events

Submissions from relevant organizations

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its twenty-fifth session, invited relevant organizations to submit to the secretariat, by 23 February 2007, information on their relevant programmes, activities and views on the following issues:[*]

(a) Experience with assessment and management of current and future climate related risks and impacts, including those related to extreme events and in specific sectors;

(b) Ability, gaps, needs, opportunities, barriers and constraints to predicting climate variability, impacts and extreme events across regions and hazards;

(c) Contribution of traditional knowledge to understanding and managing climate related risks;

(d) Implications for sustainable development in relation to sub-paragraphs 1 (a) to (c) above;

(e) Promoting understanding of impacts of, and vulnerability to, climate change.

2. The secretariat has received nine such submissions. In accordance with the procedure for miscellaneous documents, these submissions are attached and reproduced[**] in the language in which they were received and without formal editing.

[*] FCCC/SBSTA/2006/11, paragraph 46.

[**] These submissions have been electronically imported in order to make them available on electronic systems, including the World Wide Web. The secretariat has made every effort to ensure the correct reproduction of the texts as submitted.

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PAPER NO. 1: FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

On invitation of SBSTA to submit to the Secretariat, by 23 February 2007, information on the relevant programmes, activities and views on the issues listed under item 34 of the Conclusions of the Nairobi work programme on impacts, vulnerability and adaptation to climate change

Context and mandate of FAO to work on Climate related Risks and Extreme events

The Strategic Framework for FAO 2000-2015 provides an overall framework for FAO programmes related to climate risks and extreme events. Under strategy A3, namely "Preparedness for, and effective and sustainable response to, food and agriculture emergencies". The challenge is to increase the resilience and capacity of countries and their populations to cope with the impacts of disasters that affect national and household food security and, when disasters do occur, to contribute to emergency operations that foster the transition from relief to recovery of the food and agricultural sectors. The components include:

- Strengthening disaster preparedness and the ability to mitigate the impact of emergencies that affect food security and the productive capacities of the rural population;
- Forecasting and providing early warning of adverse conditions in the food and agricultural sectors, and of impending food emergencies, including monitoring plant and animal pests and diseases;
- Assessing needs and formulating and implementing programmes for agricultural relief and rehabilitation, and formulating policies and investment frameworks favouring the transition from emergency relief to reconstruction and development in food and agriculture; and
- Strengthening local capacities and coping mechanisms through guiding the choice of agricultural practices, technologies and support services, to reduce vulnerability and enhance resilience.

The Committee on Agriculture (COAG) in 2001 stressed the need for the Organization to continue to be a neutral forum on this issue. It underlined that the role of the Organization is to provide technical inputs, focusing on such issues as data, definitions and methodologies related to agriculture and climate change. Caution should be exercised when dealing with subjects such as carbon sinks, where differing positions were expressed by the Members.

COAG supported the proposal to develop an integrated climate change programme based on current activities, within Regular Budget provisions, and consistent with the legal and political framework of the UN Framework Convention on Climate Change (UNFCCC) and the technical work of the IPCC. This includes the promotion of practices for climate change mitigation, the adaptation of agricultural systems to climate change, the reduction of emissions from the agricultural sector, as far as it is carefully considered within the major objective of ensuring food security, the development of practices aimed at increasing the resilience of agricultural production systems to the vagaries of weather and climate change, national and regional observing systems, as well as data and information collection and dissemination.

The Committee called on FAO to assist Members, in particular developing countries, which are vulnerable to climate change, to enhance their capacities to confront the negative impacts of climate variability and change on agriculture. An Interdepartmental Working Group on Climate Change was established and mandated to coordinate FAO's cross

departmental, multi-disciplinary work on climate change, crosscutting all technical departments.

The issues of climate change mitigation and adaptation were specifically addressed and prioritized as a key area of FAO's future work by FAO's governing bodies at sessions of the Committee on Agriculture (COAG), the Committee on Food Security (CFS), and the Committee on Forestry (COFO). In the context of FAO's internal reform 2006/07, a new division "Environment, climate change and bioenergy" was created reflecting the importance given to the subject in FAO's new structure.

According to the outline provided by UNFCCC we report on FAO programmes and activities relating to the 5 sub-heading provided by SBSTA under the main topic "Climate change risks and extreme events":

a) Experience with assessment and management of current and future climate-related risks and impacts, including those related to extreme events and in specific sectors

The knowledge and technology required for adaptation includes understanding the patterns of variability of current and projected climate, seasonal forecasts, hazard impact mitigation methods, land use planning, risk management, and resource management.

Adaptation practices require extensive high quality data and information on climate and on agricultural, environmental and social systems affected by climate, with a view to carrying out realistic vulnerability assessments and looking towards the near future. Vulnerability assessment observes impacts of variability and changes in mean climate (inter-annual and intra-seasonal variability) on agricultural systems. However, agricultural production systems have their own dynamics and adaptation has a particular emphasis on future agriculture.

Early warning and risk management systems are obvious and efficient contributors that can facilitate adaptation to climate variability and change, including:

- A historical climate data archive; an archive on climate impacts on agriculture;
- Monitoring tools using systematic meteorological observations;
- climate data analysis (to determine the patterns of inter-annual and intra-seasonal variability and extremes);
- Information on the characteristics of system vulnerability and adaptation effectiveness such as resilience, critical thresholds and coping mechanisms (this information is required to identify opportunities for adaptation measures, and the potential of particular practices);
- Crop weather insurance indices to reduce the risk of climate impacts for lower-income farmers.

FAO has built up a strong knowledge in crop forecasting and monitoring technology based on field data, satellite based indices and software. Since 1974, FAO Agrometeorology has developed and improved its crop forecasting methodology to supply updated information on crop conditions mainly in sub-Saharan countries through the Global Information and Early Warning System on Food and Agriculture and to various national Food Security Information and Early Warning Systems worldwide. Building from such national systems, which are known and used by countries is a more effective starting point than trying to launch new, possibly improved but largely untested, analytical tools.

FAO has been a leader in the use of new data types (in particular rainfall, crop phenology and remotely sensed data) and specific tools (methods and software) such as crop specific water balance, data interpolation in time and space and analysis tools either at continental/regional level or national, district and local levels. FAO agrometeorological tools are designed with scale independence in mind, to monitor patterns of climate variability at global, continental, regional, national, sub-national and farm level. They have been tested and used extensively by countries and are appropriate for vulnerability risk assessment and to define best practices for climate change adaptation.

Adaptation activities need also to focus on securing agricultural productivity in a sustainable manner. The improved use of Early Warning and Information Systems (EWIS) and Disaster Information Management Systems (DIMS), the short- and long-term impact of (extreme) events on agriculture livelihoods can be assessed while contributing to disaster preparedness and mitigation of potential risks.

Accurate information and forecast systems, as well as impact analysis in the aftermath of a disaster, is a critical building block for well targeted and demand driven emergency responses, as well as for longer term adaptation programmes. FAO is investing in a number of initiatives to improve pre and post hazard needs assessments and the design of rehabilitation programmes to translate the principle of *building back better* into improved agricultural practices. In the case of response to disaster-related climate hazards, this includes piloting and replication of tested adaptive agricultural practices, identification of livelihood diversification strategies and institutional capacity-building.

Information systems, early warning and food insecurity forecast systems

FAO has gathered a comprehensive assortment of data and information for the Agricultural, Forestry and Fisheries sectors. Examples are the Global Information Early Warning System on Food and Agriculture (GIEWS), information and data under the Global Terrestrial Observation System (GTOS) and the Terrestrial Carbon Observation Initiative (TCOI), the Agro-ecological Zoning (AEZ), the Global Forest Resources Assessment (FRA) which is now repeated every five years, the Forest Products Yearbook, ECOLEX, the databank on national laws and regulations on food, agriculture and renewable natural resources, FAOSTAT, FAOCLIM, AGDAT and other databanks, CLIM-FO and AGROMET-L listservers on different aspects of climate change, and the website, to name only a few. (*A more detailed report on these information systems will be provided to SBSTA in September 2007, related to the NWP topic "Data and observation").*

Impact assessment tools for agriculture

FAO has been assessing and modelling climate-related risks and impacts on crop yields for several decades. FAO has been developing several tools to assess the influence of weather and weather variability on crop yields. The tools were originally designed to carry out agrometeorological crop-yield forecasts: they proved to be capable of describing the link between weather and crop yields for many different climate regimes in many countries world-wide on the basis of observed meteorological data and the FAO crop-specific soil water balance model.

Droughts are the most common agronomic weather-related extremes. The impact of a meteorological drought on agriculture depends on a combination of factors, specifically crop type, weather, soil and farm management. FAO has the experience to deal with this combination of factors under real-world conditions. A range of information gathering tools are being developed by FAO to enhance its role in crisis response. Information collected

within this process may be highly relevant for improved understanding of impact of extreme climate related events on the agriculture based livelihoods and agriculture production.

Rapid Agricultural Disaster Assessment Routine (RADAR)

Agricultural disaster impact analyses are based mainly on empirical in situ analysis, and are largely dependent on access to the area affected and expert professional experience. Evaluation of disaster impact follows no defined methodology in most cases. This is due to several factors, among others, the fact that disaster impacts are difficult to model, and because emergency situations prevent sufficiently detailed and geo-referenced information to be collected, that would allow the calibration of impact models. Somehow, the urgency of relief operations prevents necessary normative tools to be developed.

RADAR proposes to move from empirical assessments towards model approaches. Once an event strikes a region, the user of the procedure should rapidly collect all available geo-referenced and quantitative data on the event and the region. Then, using a Disaster Information Management System (DIMS), the short- and long-term agricultural impact of the event can be assessed with the help of a conceptual model for structuring the impact assessment.

The procedure combines model analysis, based on physical simulation of the disaster, and empirical analysis, using the people's record of the environmental disruption after the event. Both analyses may be used alone or concurrently; they can be updated in real time to improve the assessment. The output of the analyses is the **map of the intensity of the event**, which is then used to compute the impact (the loss) to agriculture produced by the disaster.

Integrated Rapid Livelihood Assessment Guidelines (IRLAG)

This is a collaborative effort between FAO and the ILO to provide timely and accurate information about how the ability of people to make a living after a disaster has been affected by sudden onset natural disasters (climate-related or geological hazards).

Integrated Food Security and Humanitarian Phase Classification Scheme (IPC)

The IPC tool is a standardised scale that integrates food security, nutrition and livelihood information into a clear statement about the severity of a crisis and implications for response. Based on clear indicators, situations are classified into one of five main phases: (1) Generally Food Secure (2) Chronically food insecure (3) Acute food and livelihood crisis (4) Humanitarian Emergency and (5) Famine/ humanitarian catastrophe. The IPC is being applied in countries affected by extreme drought events in the Horn of Africa.

Sector specific emergency needs assessment tools

FAO provides a set of specific assessment tools, including seed systems, fisheries, livestock, pesticides management etc which improve the understanding of how disasters affect specific elements of the agriculture production systems.

b) Ability, gaps, needs, opportunities, barriers and constraints to predicting climate variability, impacts and extreme events across regions and hazards

Long time series of crop yields under climate change conditions are needed to assess the effect of agricultural production variability and extreme events on food security. If only short observed records of meteorological variables are available, a stochastic weather

generator must be resorted to create an artificial time series of weather variables with the same statistical/climatic features as the observed records, and subsequently derive corresponding crop yields. This allows performing a crop-yield risk assessment based on the empirical experience acquired under current climate conditions. A stochastic weather generator (SWG) is currently under development at FAO. It is an improvement of an already existing weather generator which proved to be adequate for the purposes under discussion.

SWG provides a long time series of a complete set of weather data required to run the crop-specific soil water balance model of FAO. This allows for the transformation of local weather statistics into local crop-specific yield statistics. It therefore extends the classical FAO approach to transform some observed weather realizations to crop yield. The output of the SWG will be used in statistical crop forecasting. In order to investigate potential effects of natural and anthropogenic climate change in the frame of climate change adaptation applications, the software will allow the user to change the estimated statistical features of all weather variables.

The combination of tools available/currently under development at FAO allows carrying out of significant work on local crop-specific climate change impacts, as well as coping strategies of vulnerable groups and the role of local institutional mechanisms and structures in climate-induced hazards throughout the disaster management cycle (including preparedness, response, rehabilitation and development).

As regards crop aspects, next to crop-specific sensitivity studies, changes in average crop yields and risk analyses can be performed on the basis of local climate change scenarios. The latter can be taken from outputs of combined global atmospheric-oceanic circulation models (GCMs).

The overall methodology: (i) derives and validates weather-yield functions based on current local conditions and farmers' management practices; (ii) generates "future weather" based on current weather, climate change scenarios; and (iii) uses "future" weather with the yield functions to assess the variability of future food production outputs and their impact on food security. The major advantages of this strategy are listed below:

- It is based on existing, well-known and well tested FAO tools and methods that are actually used operationally for weather impact assessments on food security;
- Actual local observations of crop management and crop yields as well as local weather are used in order to establish the weather-yield relations;
- It does not deal with pure weather-based indices (like standardized precipitation index, SPI) but with crop-soil specific water balance indices (like the water requirements satisfaction index, WSI) and crop yields;
- It has a proven record of good performance in the major agroclimatic zones;
- It can be used to compare the sensitivity of different crops to climate change;
- It can be used to interpret different scenarios of climate change in terms of impacts on food security due to changes in crop-yield statistics, risk of bad harvests and crop losses.

c) Contribution of traditional knowledge to understanding and managing climate-related risks

Vulnerable groups often living in areas highly exposed to the impacts of extreme climatic events have often developed complex indigenous coping strategies. However a rapid change of the vulnerability context does not always allow for traditional coping mechanisms to take place and results often in an overall loss or severe ineffectiveness in the adaptive capacity of the communities. Ongoing monitoring, documentation and dissemination of good

agricultural practices, indigenous and newly developed ones, is an essential part of FAO's work.

Examples

- The FAO crop-specific soil-water balance model is flexible and suited to describe local agricultural conditions. Important information on traditional adaptation strategies of farmers can be described in terms of planting dates and their variability, irrigation practices, treatment of false starts of growing seasons, choice of varieties with different lengths of growing cycle. The FAO model is usually tuned to the local conditions by national staff participating in crop forecasting projects. This optimizes the use of information on local peculiarities and traditional knowledge. The FAO model allows for experiments not only under different climatic conditions but also under different crop management practices.

- Within the context of a Comparative Study on the Role of Local Institutions in Reducing Vulnerability to Recurrent Natural Disasters, FAO has been collecting concrete examples of local knowledge and experiences of local action before, during and after extreme climate events in nine different countries (Argentina, Burkina Faso. Honduras, Iran, Mozambique, Niger, Philippines, South Africa, Vietnam). Key findings of the study are being shared and applied in the design of community-based disaster risk management initiatives for the agricultural sector. In the Caribbean, FAO is facilitating, through a regional project, the identification, sharing and adaptation of good agricultural practices for improved climate risk preparedness in agriculture, fishery and forestry.

- FAO has also undertaken initiatives to improve the understanding of, and support to, the adaptation of traditional pastoral systems in arid and semi-arid regions. Traditional pastoral systems used to cope effectively and in an environmentally sustainable manner with the prevailing harsh and erratic ecological conditions of those regions. However, a numbers of factors, including changing climatic patterns, are constraining traditional coping strategies, resulting in an increased need for changes in pastoral production systems. Among others, this issue is being tackled by the Livestock, Environment and Development Initiative, which promotes research on livestock environment interactions, and creates awareness of the complex interactions of human needs, animal production and the sustainability of global natural resources.

- FAO has also gained knowledge on positive and negative traditional coping strategies, in particular through work on:
  - Regional plan-of-action for drought mitigation in the Horn of Africa;
  - Response to drought in the Sahel (regional consultation);
  - E-conference on pastoral mobility;
  - Pastoral risk management planning in several countries, e.g. Mongolia, China, Niger, Somalia, Syria, Jordan etc.

d) Implications for sustainable development in relation to (a) to (c) above

Global data show that disasters related to climate hazards are increasing in frequency and intensity. Recurrent natural disasters such as droughts, floods, and tropical storms have devastating impacts on agriculture, livestock and fisheries, threatening the livelihoods of hundred thousands of rural people. FAO has the technical and operational capacity to actively contribute to streamlining disaster risk reduction into national agriculture and food development policies and a key role to play in reducing the vulnerability of agricultural-based livelihoods to extreme climatic events.

Examples of ongoing FAO programmes aiming at the interface between climate risk management, disaster risk reduction and sustainable development

- FAO has developed a cross-departmental programme to enhance natural hazard risk management capacities and approaches in the agriculture, fisheries and forestry sectors. The programme builds on the premises that the sound understanding of existing institutional capacities is crucial for shifting from reactive emergency relief operations towards long-term disaster risk prevention and preparedness strategies. The key entry points of the proposed programmes are the two closely interrelated questions of what are the best operational and technical practices to strengthen existing DRM and linkages with the agricultural sectors, and who (actor) within national and local contexts has comparative strengths and would be best placed to act on and coordinate between specific aspects of DRM relevant for the agricultural sectors. The programme focuses on climate-related hazards (such as floods, tropical cyclones and storm surges, droughts) and their impacts on agricultural-based livelihoods. Country level activities implemented within the framework of this umbrella programme include:
    - Local capacity-building for disaster risk management in agriculture for the Department of Agriculture and Extension in Bangladesh;
    - Strengthening disaster preparedness in the agricultural sector in Juye County, Shandong Province of China;
    - Flood management and micro regional planning related land use and environmental planning in North East Hungary;
    - Assistance to restore winter wheat crop production and strengthen capacities to cope with the effects of adverse climatic events in Moldova;
    - Projects on pastoral risk management in Mongolia and China;
    - Regional project on exchange of good practices on climate risk management in agriculture and forestry in the Caribbean;
    - Project about to start in Pakistan to implement a post-earthquake livelihoods-based rehabilitation strategy.

- In Bangladesh FAO is piloting adaptive measures to climate variability and change including agricultural practices, livelihood diversification strategies and institutional capacity-building to enhance the adaptive capacity of rural livelihoods systems and to integrate these actions into rural development planning. Within this context, an operational approach to work with farmers on climate change has been designed and tested; a set of tools have been developed jointly with the Asian Disaster Preparedness Centre (ADPC) including:
    - Training Modules for climate & Food applications in agriculture. Enhancing early warning systems for disaster preparedness and mitigation in the agriculture sector;
    - Vulnerable groups profiling and livelihood adaptation options development, to increase community resilience against climate hazards in drought prone areas;
    - A Plan of Action to strengthen the role and capacities of the Department of Agricultural Extension as partner in Climate Change Adaptation and Natural Hazard Risk Reduction.

- The FAO crop-specific soil water model is a versatile tool that has been implemented for actual crop forecasting under many different climatic conditions.

Together with a stochastic weather generator it can be used to perform multiple runs under different climate and agricultural conditions. It therefore is an adequate empirical tool to assess the vulnerability of food security to climate change on the basis of different scenarios, and to derive adequate strategies from an economic and socio-economic point of view.

e) Promoting understanding of impacts of, and vulnerability to, climate change

The current local climate is the statistics of the current local weather. Local climate change means a change in the statistical features (averages, variances, shapes of distributions, co-variances, etc.) of the local weather. Therefore, climate change can be transformed into weather change if the changed climate features are fed to a stochastic weather generator. The weather generator of FAO is specially designed to allow for changes in the statistical features of the variables and thus allows to model weather under different climate-change scenarios. Together with the FAO crop-specific soil water model, it constitutes the bridge between climate change and crop-yield change.

Conclusion

Many FAO activities are directly or indirectly in line with the objective of “Promoting understanding of impacts of, and vulnerability to, climate change, current and future climate variability and extreme events, and the implications for sustainable development”.

FAO’s work on climate change mitigation has been complemented during 2006 by significant activities related to climate change adaptation in agriculture, forestry and fisheries, combined with institutional strengthening as core aspects of the latter. FAO has a long-standing experience in natural hazard risk management and in all phases of the emergency cycle.

PAPER NO. 2: THE INTERNATIONAL STRATEGY FOR DISASTER REDUCTION

Submission from the ISDR system to the UNFCCC secretariat on climate-related risks and extreme events

As stated at the twenty-third session of SBSTA, the International Strategy for Disaster Reduction (ISDR) system is ready to actively support and contribute to the activities of the Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change.

This submission is made by the UN/ISDR secretariat on behalf of the ISDR system and presents a broad perspective on relevant programmes and activities on the issues addressed in the Nairobi Work Programme. It should be noted that the activities proposed in this submission require discussion with the ISDR system's national, regional and international partners. Further specific and/or technical submissions on experience with assessment and management of climate-related risks and impacts will be made as appropriate by the ISDR system partners. The ISDR secretariat looks forward to discussing with SBSTA, the UNFCCC secretariat and other partners the working modalities needed to deliver expected outcomes under the Nairobi Work Programme.

This submission comprises two parts and one annex. Part I begins by introducing the framework that guides disaster reduction efforts and its links to climate change adaptation, as well as the concept of disaster risk reduction. It then provides a brief summary of the state of disaster reduction as assessed by the Yokohama Review and offers a summary of the Hyogo Framework for Action. Part II briefly analyses activities suggested for implementation of the Hyogo Framework and identifies their relevance to the work to be undertaken under the Nairobi Work Programme. The annex contains a table contrasting activities proposed in an UN/ISDR guidance document on Hyogo Framework implementation with the mandate of the Nairobi Work Programme.

I. Background

I.a. Introduction to Disaster Risk Reduction and Links to Climate Change Adaptation

The adoption of the *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*[1] has given impetus to disaster reduction activities worldwide. Governments, UN agencies and regional organizations have already embarked on redefining national plans and strategies and in setting up educational campaigns and institutional arrangements to reduce vulnerability to natural hazards. Moreover, the agreement of 168 Governments to reduce underlying risks by integrating risk reduction measures and climate change adaptation under the Hyogo Framework for Action will enable efforts to adapt to climate change to benefit from practical experience in disaster risk reduction. There is growing recognition that the practical application of adaptation to climate change is risk reduction.

The ISDR system believes that the Hyogo Framework provides a strongly endorsed framework for taking action now to reduce people's vulnerability to climate-related hazards. As stated in the forthcoming IPCC Fourth Assessment Report, reducing vulnerability to current climatic variability can effectively reduce vulnerability to increased hazard risk associated with climate change.

The Hyogo Framework stems from decades of experience in all aspects of disaster risk management. Currently over 75 percent of disasters are hydro-meteorological in origin, which includes floods and wave surges, storms, droughts and related disasters (extreme temperatures and forest/scrub fires),

[1] Please see http://www.unisdr.org/eng/hfa/hfa.htm

landslides and avalanches. These hazards will be altered and exacerbated by climate change, which will also affect vulnerability patterns.

Disaster risk reduction measures will also have to take new climate change risks into account. Although experience in responding to climate variability will be useful in adapting to climate change, it is recognised that increased and new efforts will be necessary to meet the unparalleled and unprecedented challenge of climate change.

Greater investment is urgently needed in disaster risk reduction and management to save lives and promote early and cost-effective adaptation to, and reduction of, climate change risks. Macro-level assessments show that disaster risk reduction (DRR) measures have a high benefit-to-cost ratio. The US Geological Survey and the World Bank estimated that an investment of USD 40 billion would have prevented losses of USD 280 billion in the 1990s (Stern Review 2006[2]).

The forthcoming IPCC Fourth Assessment Report of Working Group II defines the concept of *disaster risk management* as the systematic management of administrative decisions, organisations, operational skills and abilities to implement policies, strategies and coping capacities of society or individuals to lessen the impacts of natural and related environmental and technological hazards. This includes measures to provide not only emergency relief and recovery, but also *disaster risk reduction*; *i.e.*, the development and application of policies, strategies and practices designed to minimize vulnerabilities and the impacts of disasters through a combination of technical measures to reduce physical hazards and to enhance social and economic capacity to adapt. Disaster risk reduction is conceived of as taking place within the broad context of sustainable development and can be seen as an extension of good development practice.

Disaster risk reduction to climate variability and extremes operates at the same levels as adaptation to climate change, that is:

- Creating the conditions to support adaptation planning and actions (institutional and organizational arrangements, information provision, including risk assessments and early warning, resource mobilization);
- Implementing concrete steps that reduce vulnerability to climate risks (investment in measures to reduce underlying risk factors and disaster preparedness and response).

[2] Please see:
http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm

I. b. Accomplishments in disaster risk reduction over the decade 1994-2004: Review of the Yokohama Strategy and Plan of Action for a Safer World[3]

The conclusions of the Yokohama Review provide insights into the challenges linked to the assessment and management of climate-related risks and impacts.

The Yokohama Review was an analytical process covering the period from 1994 to 2004 carried out at the request of the General Assembly in its resolution 57/256. It resulted in a document reflecting the current state of awareness and accomplishments, limitations and constraints, and presenting consolidated observations about global disaster risk reduction.

The review noted the many international agreements, resolutions, declarations and initiatives related to disaster risk reduction that call for international and regional commitments and national action to reduce vulnerability, undertake risk assessments and pursue comprehensive disaster and risk management strategies.

The review identified major challenges for the coming years in ensuring more systematic action to address disaster risks in the context of sustainable development and in building resilience through enhanced national and local capabilities to manage and reduce risk.

The review stressed that disaster risk reduction is underpinned by a pro-active approach to informing, motivating and involving people in all aspects of disaster risk reduction in their own local communities. It also highlighted the scarcity of resources allocated specifically from development budgets for the realization of risk reduction objectives, at the national and the regional levels or through international cooperation and financial mechanisms. It also noted the significant potential of better use of existing resources and established practices for more effective disaster risk reduction.

Specific gaps and challenges were identified in the following five main areas[4]:

(a) Governance: organizational, legal and policy frameworks;
(b) Risk identification, assessment, monitoring and early warning;
(c) Knowledge management and education;
(d) Reducing underlying risk factors;
(e) Preparedness for effective response and recovery.

Accomplishments in disaster risk reduction 1994-2004

The following were identified as accomplishments in disaster risk reduction in the Yokohama Review:

- Near to universal understanding that disaster risk reduction is essential for sustainable development as well as growing awareness that developmental activities may in some instances also create or worsen vulnerabilities.
- Expanded understanding of the relationships between poverty, sustainable environmental practices, the management of natural resources and global risks, such as concerns associated with climate variation and urban growth. Approaches to disaster and risk management are being validated as new strategic policies and implementation approaches are being adopted in a growing number of countries.
- Positive, if partial, progress has been made towards mainstreaming disaster risk reduction into national planning and development strategies. Progress is currently more evident at international and some regional levels.

[3] Please see http://www.unisdr.org/wcdr/intergover/official-doc/L-docs/Yokohama-Strategy-English.pdf

[4] These are the key areas on which the Hyogo Framework for Action for the decade 2005–2015 was structured.

- Particular regard is shown for the important motivational and sustaining values of regional/sub-regional political, technical, educational and information institutions in helping to build, coordinate and support countries' disaster reduction strategies.
- In contrast to the earlier emphasis on largely scientific and technical approaches and the frequent employment of physical techniques to mitigate the effects of natural hazards on national populations, considerable progress is evident in the expanded and more inclusive focus on the social dimensions and multisectoral interests of human vulnerability.
- More interdisciplinary and organizational relationships are being developed, with a wider appreciation of the essential principle of partnership and equitably shared responsibilities and resources. Unless attention is paid to public risk exposure at local levels, individual countries' efforts risk being focused disproportionately on international outlooks or towards centralized national levels of responsibility.
- Considerable knowledge, skills and technical abilities exist to minimize the effects of hazards and to reduce people's vulnerability and exposure to disaster risks. These abilities are applied to significant beneficial effect in some countries, but very unevenly, occasionally or poorly in others, owing to a lack of international cooperation assistance and technology transfer, to the extent possible.
- Information focused on disaster risk reduction is a much-valued resource; its expanded availability, dissemination and use are widely considered an important accomplishment. Along with education more generally and capacity-building at all levels, knowledge management and the development of social capital should be viewed as priority investments in sustainability.

Gaps and challenges in disaster risk reduction 1994-2004

The following were identified as gaps and challenges in disaster risk reduction in the Yokohama Review:

Governance: organizational, legal and policy frameworks

1. Ensuring an established disaster reduction strategy that is linked to individual sectoral interests and integrated into national and local development planning and objectives.
2. Establishing or strengthening national platforms for disaster reduction, comprising actors from multiple sectors and sustained by sufficient resources to make progress, in addition to the recognition of the political will and practical action needed to support disaster risk reduction.
3. Ensuring that roles, responsibilities, opportunities and resources for the development of risk reduction strategies are based on partnerships, are grounded in local community interests and encourage wide public participation, including the engagement of disadvantaged people.
4. Judiciously allocating resources from emergency and development budgets, internationally, regionally and within countries, to enhance disaster risk reduction strategies in practice.
5. Advancing the use of commonly understood terminology for disaster reduction and using flexible policy frameworks that allow for a variety of implementation approaches.

Risk identification, assessment, monitoring and early warning

1. Establishing standards for the systematic collection and archiving of comprehensive national statistical records pertaining to the many related aspects of disaster risk reduction (including data related to built environments, lifelines and critical infrastructure; socio-economic aspects of vulnerability; and for hazard analysis and disaster operational requirements).
2. Evaluating country-wide assessments of risk status (including hazard maps and vulnerability trends) and conducting risk assessments, incorporating technical and socio-economic

dimensions; with analysis extended, where suited, to territorial or adjacent locations of shared exposure to disaster risks.
3. Building early warning systems that are centred on people at risk and that integrate the essential dimensions of risk assessment, warning generation, dissemination, preparedness and response capabilities.
4. Implementing the programmatic recommendations of the Second International Conference on Early Warning as endorsed by the General Assembly; particularly through the expansion of international coordination and the integration of early warning into development policy.

Knowledge management and education

1. Introducing disaster reduction subject matter into curricula at all levels of education and professional training, focusing on schools and other highly valued institutions.
2. Developing and supporting institutional capabilities for the collection, consolidation, and wide dissemination and use of current and traditional disaster reduction information and experience.
3. Emphasizing the benefits of experience through wider circulation and use of case studies, professional exchanges between countries, and institutionalized efforts to identify and incorporate lessons learned from prior events.
4. Pursuing research agendas that bring together multiple disciplines and professional interests, feeding into decision-making processes and leading to the implementation of disaster reduction at all levels.
5. Formulating multifaceted and continuous public awareness strategies for advancing and advocating policies, capacity development and public understanding; involving professional, public and private resources and abilities, including those of the media, in the process.

Reducing underlying risk factors

1. Relating risk reduction to environmental, natural resources, climate, and similarly related geophysical areas of interest, abilities and commitments.
2. Joining social and economic development principles and practices with technical abilities to protect crucial infrastructure and reduce conditions of poverty for vulnerable populations.
3. Developing or involving the wider collaboration of public and private interests, scientific and professional abilities, and related partnerships both within and beyond specific areas of sectoral concentration, including the encouragement of wider knowledge exchange and technology transfer among all countries.
4. Enhancing the availability and appropriate use of technical measures of land use planning, building and construction codes, and advanced technological skills and techniques by particularly disadvantaged and disaster-prone countries.
5. Identifying and encouraging local adoption of financial and related investment instruments to share, transfer or minimize risk exposure, particularly among the most vulnerable populations and within local communities.

Preparedness for effective response and recovery

1. Expanding public dialogue, official practice and professional involvement related to the entire range of shared and complementary disaster and risk management needs and responsibilities.
2. Identifying and allocating existing resources from the establishment, development and emergency budgets for disaster and risk management to greater effect in the realization of sustained risk reduction.
3. Evaluating the current suitability of all disaster and risk management policies, operational abilities and needs against present and emerging risks.

The Yokohama Review concludes by recognising that understanding of the importance of disaster risk reduction is illustrated by numerous individual examples and efforts. Many decision makers also know what needs to be done and in some cases have resources at their disposal. However, all stakeholders need to do much more to move from intention to action if people around the world are indeed to become safer from disasters.

The Yokohama Review provided the impetus for agreement on the need for further and strengthened action for disaster risk reduction, which resulted in the Hyogo Declaration and Hyogo Framework for Action. As stated above, the Hyogo Framework for Action provides a comprehensive and clear set of guiding principles, priorities for action, and practical means for achieving disaster resilience for vulnerable communities. A brief summary follows.

I.c. The Hyogo Framework for Action

The Hyogo Framework for Action's **expected outcome** is *the substantial reduction of disaster losses in lives and in the social, economic and environmental assets of communities and countries.*

To attain the expected outcome, **three strategic goals** were adopted:

1. Integration of disaster risk reduction into sustainable development policies and planning;
2. Development and strengthening of institutions, mechanisms and capacities to build resilience to hazards;
3. Systematic incorporation of risk reduction approaches into the implementation of emergency preparedness, response and recovery programmes.

To guide action in designing approaches to disaster risk reduction, **five priorities for action** each associated with **key activities** were outlined:

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; and
5. Strengthen disaster preparedness for effective response at all levels.

The ISDR system is ready to work with the SBSTA and all partners engaged in the Nairobi Work Programme to analyse in further detail how the Hyogo Framework can be adapted to the needs and constraints of the Nairobi Work Programme work on impacts, vulnerability and adaptation to climate change. Climate change concerns can be incorporated in risk assessments, the dissemination of technical knowledge and training, awareness raising, access to local knowledge and resources, and mobilisation of local communities undertaken by the disaster risk reduction community. The ISDR system is also ready to participate actively in the discussion on how to firmly cast climate-related risk management as a development issue.

II. Relating Hyogo Framework for Action structure and implementation activities to the activities of the Nairobi Work Programme on climate-related risks and extreme events

This section of the submission identifies activities proposed for the implementation of the Priorities for Action of the Hyogo Framework as suggested in the consultation document entitled "Words into Action: Implementing the Hyogo Framework for Action", released in November 2006. Each HFA Priority Area and its activities are briefly analysed against the Nairobi Work Programme to underline the many areas of common interest and possible collaboration.

II.a. HFA Priority for Action 1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation
NWP: Adaptation planning and practices; climate related risks and extreme events

The following tasks are recommended to implement HFA Priority Action 1:

1. Engage in multi-stakeholder dialogue to establish the foundations for disaster risk reduction;
2. Create or strengthen mechanisms for systematic coordination for disaster risk reduction;
3. Assess and develop the institutional basis for disaster risk reduction;
4. Prioritise disaster risk reduction and allocate appropriate resources.

Relevant activities to the Nairobi Work Plan under HFA Priority Action 1:

Tasks 1 and 2: The ISDR system believes that the above tasks, especially 1 and 2 should involve national climate change focal points and mechanisms set up to coordinate activities undertaken under the UNFCCC, including national communication and NAPA teams where appropriate. At the national level a "champion" on disaster and climate risk management efforts with influence on budgeting and planning processes could be identified to develop political momentum toward integration and place emphasis on vulnerability reduction. A national high-level policy dialogue could be organized to launch the preparation of an adaptation strategy, focusing on the benefits of taking action in an integrated manner with donors. Policy incentives to integrate risk management perspectives in economic planning and development policies should also include promote forums for discussion on how to facilitate the integration of policies and measures for disaster risk reduction and climate change adaptation and build climate-aware and -responsive development.

Task 3: National institutional arrangements for disaster risk reduction should integrate relevant provisions and decisions under the climate change regime, as well as pursuant national legislation, policy frameworks, organizational arrangements, plans and programmes of governmental and non-governmental organisations in all relevant sectors.

Task 4: Common assessments of needs and available resources could be developed. There is a need to strengthen awareness of existing funding mechanisms for disaster risk reduction and adaptation to climate change and improve accessibility to such funds. This is particularly relevant for the implementation of projects identified by NAPAs, most of which are disaster risk reduction projects. It would be desirable that funding approaches take a long-term time horizon to reduce vulnerability. It would also be important to harmonize related donor activities.

Relevant ISDR system activities to support HFA Priority for Action 1

The new World Bank-UN/ISDR Partnership, supported by the World Bank Global Facility for Disaster Reduction and Recovery (GFDRR)[5] will assist in the implementation of disaster risk reduction activities of relevance to the Nairobi Work Programme. Under track 1 operations, the Facility will enhance global and regional advocacy, partnerships and knowledge management through

[5] Please see http://www.unisdr.org/eng/partner-netw/wb-isdr/wb-isdr.htm

the UN/ISDR secretariat for mainstreaming disaster risk reduction in low- and middle-income countries at risk. Of particular relevance to the NWP, it will assist in the implementation of disaster risk reduction projects proposed in NAPAs by supporting countries with disaster risk reduction policy and technical expertise as well as access to funding sources. The UN/ISDR secretariat is establishing collaboration modalities with the UNFCCC NAPA focal point and awaiting consultations on the proposal with the Least Developed Countries Experts Group, while refining the proposal with World Bank counterparts. In addition, through the Partnership, the UN/ISDR plans to coordinate research on the costs and benefits of adaptation. The ISDR system partners and the UN/ISDR secretariat's regional offices are undertaking relevant work at regional and national levels, which is further detailed in the final section of this submission.

II.b. HFA Priority for Action 2: Identify, assess and monitor disaster risks and enhance early warning

NWP: Methods and tools; data and observations; socio-economic information

The following tasks are recommended to implement HFA Priority for Action 2:

1. Review the availability of risk-related data and the capacities for their collection and use;
2. Establish an initiative for countrywide risk assessment and analysis;
3. Assess capacities and strengthen early warning systems;
4. Develop communication and dissemination mechanisms for disaster risk information and early warning.

Relevant activities to the Nairobi Work Plan under HFA Priority Action 2:

These activities clearly relate to several of the areas of work of the Nairobi Programme of work, and particularly to sub theme a (iv) "Promoting understanding of impacts of, and vulnerability to, climate change, current and future climate variability and extreme events, and the implications for sustainable development".

Tasks 1 and 2: To address one of the disconnects between disaster risk reduction and climate change adaptation, in carrying out these tasks it will be important that collection of data and generation of high-quality information take a longer time horizon than dealt with until now for the purpose of disaster risk assessment and management. Adaptation options require consideration of risks over different timescales. Increasing policy awareness of the importance of continued climate data records and improved space and time coverage, as well as of the importance of using existing and alternative (traditional knowledge on changing hazards exposure and conditions of vulnerability) sources of data, for risk evaluation and prevention are tasks that should be planned jointly. Continuous monitoring and updating of risk information will enhance the flexibility required on both sides. For example, a guardian institution of physical and socio-economic information could be identified at national level for disaster risk reduction and climate change adaptation to enable a more integrative framework for risk assessment, establishment of baseline data and development of systems of risk and vulnerability indicators, as well as benchmarking of risks and resilience. In this regard, the importance of integrating climate and hazard data with social and economic data needs to be emphasized.

Two efforts that could be developed jointly by the ISDR system and UNFCCC partners are raising awareness of risk assessment tools and training for their use, as well as uniting research efforts. Greater support is needed for the application of user/sector-specific risk assessment tools for risk screening tools to rank adaptation options in relation to cost estimates. Innovative ideas such as risk governance deserve consideration as they try to link risk analysis with risk perception and social processing of risk, physical analyses with financial, economic and social analyses and risk theory with organizational capacity building and management competency. A fundamental question to address is

why people do what they do in relation to climate risk and what will influence them to do things differently. In this regard, community-based disaster risk assessment tools and best practices need to be promoted and applied. Please see the work of ISDR partner ProVention Consortium in this area.[6]

Another activity that would benefit from joint effort and coordination is investing in resources to relate scientific information on risk, vulnerability and adaptation options to disaster managers and longer-term adaptation specialists at local level. Systems that integrate climate information and advice on adaptation measures into local contexts and build trust in external information are needed.

The issue of *communicating* risk information appropriate adaptation options taking into account uncertainties and associated risks deserves special attention. The UN/ISDR secretariat and UNFCCC secretariat could collaborate on the development of a common communication strategy.

Tasks 3 and 4: Early warning plays a crucial role in preventing hazardous events from turning into disasters. The importance of early warning to save lives and assets is recognised in decision 5/CP.7 of the Marrakech Accords. Early warning systems are now indeed designed to achieve development outcomes. Work on early warning is directly linked to the theme of the Nairobi Programme of Work dealing with climate-related risks and extreme events.

Relevant ISDR system activities to support HFA Priority for Action 2

The GFDRR track 1 deliverables (see above) includes standardizing hazard risk management tools and methodologies (e.g., developing country-driven and country-owned risk assessment methodologies, country-based damage and needs assessment techniques).

The Global Risk Identification Program (GRIP) is a multi-stakeholder initiative designed to improve the evidence base for disaster risk management decision-making. The GRIP consists of a set of coordinated projects prepared by expert institutions in disaster risk assessment and loss estimation. These projects are designed to strengthen disaster prone countries' capacity to identify the factors that cause disasters. This information can then be used to prevent losses and prepare for disasters. The GRIP is nearing the end of a year-long preparatory phase that has been supported by the UNDP, the ProVention Consortium and the Swiss Agency for Development Cooperation.

The Inter-Agency Task Force for Disaster Reduction (IATF/DR) Working Group 3 led several activities of relevance to Priority for Action 2. It made available online a disaster risk assessment portal to exchange tools and case studies related to disaster risk assessment[7]. Two other activities dealt with reviewing the quality and coverage and accuracy of disaster databases and reviewing indexes relevant for risk and vulnerability indexing. The IATF/DR Working Group on Climate Change and Disaster Risk Reduction presented at COP 11 a variety of tools used for disaster risk reduction, including risk assessment tools, and prepared a paper that could be included in the UNFCCC Compendium on Methods and Tools to Evaluate Impacts of, Vulnerability and Adaptation to, Climate Change. The UN/ISDR proposes that under the developing Global Platform for Disaster Risk Reduction, the two secretariats and its partners collaborate on expanding the compendium, enhancing its usefulness and visibility.

The ISDR system supports the work of The Platform for the Promotion of Early Warning[8], which started operations in 2004, and helps the development of early warning and preparedness systems by advocating for better early warning systems, especially in development assistance policy and programs, collecting and disseminating information on best practices, and stimulating cooperation among early warning actors and the development of new ways to improve early warning systems.

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[6] Please see http://www.proventionconsortium.org/
[7] Please see http://www.wg3dm.org/
[8] Please see http://www.unisdr.org/ppew/

PPEW supports the international action necessary to more systematically integrate technical early warning capacities into policy and practice, and improve early warning systems worldwide in order to facilitate the development of effective, people-centred early warning and preparedness systems. People-centred early warning systems comprise four key elements: (i) risk knowledge, (ii) monitoring and warning service, (iii) dissemination and communication, and (iv) response capability.

An International Early Warning Programme (IEWP) was launched at the World Conference on Disaster Reduction, January 2005. The programme is a vehicle by which partner organisations cooperate and develop shared and systematic approaches to advancing early warning systems worldwide.
IEWP aims to:

- Develop international dialogue and a common framework for action, and promote early warning in policy debates and as a development priority.
- Collate and disseminate good practices and other information on early warning systems.
- Define and support capacity building projects in priority areas of need, involving humanitarian and development communities.
- Develop improved tools and techniques, including guidelines and performance standards for early warning systems, and formulate priorities for further research and development.

The ISDR system wishes to collaborate with partners in the Nairobi Work Programme to address among others the issues of ability, gaps, needs, opportunities, barriers and constraints to predicting climate variability, impacts and extreme events across regions and hazards. It is also in early warning that the contribution of traditional knowledge is better documented[9] . Finally, early warning systems will truly reach and serve those at risk if its role in sustainable development is recognised, implying addressing weaknesses in knowledge of the risks faced, including environmental risks and changing human vulnerability.

Much of the conceptualisation and implementation of early warning systems is still focused on rapid-onset disasters or individual sectoral interests. Reaching out to the climate change community will broaden the prior focus of early warning to incorporate less explored issues linked to longer-term hazards and phenomena, including climate change, El Niño/La Niña, fire hazards, communicable diseases and social processes. Disasters must be considered in a comprehensive approach and as multi-factoral events with a potential slow-onset period. Research is needed to bridge the gap between daily or near-term weather and seasonal forecasts and longer-term predictions.

The Global Survey of Early Warning Systems[10] requested by the UN Secretary-General assesses capacities, gaps and opportunities towards building a comprehensive global early warning system for all natural hazards. It provides relevant information on capacities and gaps relating to risk knowledge, monitoring and warning services, dissemination and communication, response capability and cross-cutting issues. The sections on risk knowledge and on monitoring and warning services are of particular relevance to NWP 34 (b): “Ability, gaps, needs, opportunities, barriers and constraints to predicting climate variability, impacts and extreme events across regions and hazards” The Survey’s matrix of international organizations involved in early warning systems can be helpful as well in identifying partners for the implementation of the NWP’s mandate on climate-related risks and extreme events.

[9] Please see Living with Risk, pages 358-381 at http://www.unisdr.org/eng/about_isdr/bd-lwr-2004-eng.htm
[10] Please see http://www.unisdr.org/ppew/info-resources/ewc3/Global-Survey-of-Early-Warning-Systems.pdf

3. The publication 'Developing Early Warning Systems: A Checklist'[11] aims to help governments and communities implement people-centred early warning systems and was developed as an outcome to the Third International Conference on Early Warning, held in Bonn, Germany, 27-29 March 2006. The checklist lists main elements and actions that national governments or community organizations can refer to when developing or evaluating early warning systems. Of particular relevance to the NWP is the section on risk assessment for early warning, which can provide guidance toward implementation of NWP paragraph 34 (a) "Experience with assessment and management of current and future climate-related risks and impacts, including those related to extreme events and in specific sectors."

A searchable database of peer reviewed projects that aim to develop effective people-centred early warning systems for natural hazards is available online[12]. From this database a compendium of proposals for early warning projects[13] was created containing over one hundred individual projects, representing a rich vein of initiative, expertise and capacity to secure early warning systems. As a starting point to a desirable collaboration to support the development and strengthening of early warning systems in countries having expressed such needs, the UN/ISDR secretariat could add to its early warning portfolio, early warning project proposals submitted through the NAPA process. Working modalities could then be worked out among stakeholders to maximize efficiency and reduce costs in delivering assistance and support. As mentioned, the UN/ISDR has already initiated discussions with UNFCCC NAPA focal points for collaboration to assist countries to implement specific NAPA projects, such as the development of early warning systems.

II.c. HFA Priority for Action 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels

NWP: Climate-related risks and extreme events; research

The following tasks are recommended to implement Priority for Action 3:

1. Develop a programme to raise awareness of disaster risk reduction and empower all levels of society;
2. Integrate disaster risk reduction in the education system and research community;
3. Develop disaster risk reduction training for different groups of stakeholders;
4. Enhance the compilation and dissemination and use of disaster risk reduction information.

Relevant activities to the Nairobi Work Plan under HFA Priority Action 3:

Disasters can be reduced substantially if people are well informed about measures they can take to protect themselves. The ISDR system is of the view that making disaster risk reduction an accepted value among opinion makers/shapers and the general public can go hand in hand with building awareness of climate change and related climatic disasters and of measures to adapt to changing climatic conditions and patterns in extreme events. This priority action requires *inter alia* strengthening networks and promoting dialogue and cooperation among disaster experts, technical and scientific specialists and other stakeholders, as well as strengthening research capacity for multi-risk assessment, socio-economic cost-benefit analysis and risk monitoring.

Such networks and partnerships should include climate change practitioners, researchers and other stakeholders. Social webs for risk management to facilitate activities in climate-related risk reduction

[11] Please see http://www.unisdr.org/ppew/info-resources/ewc3/checklist/English.pdf
[12] Please see http://unisdr.unbonn.org/ewpp/
[13] Please see http://www.unisdr.org/ppew/news/compendium-ewp.pdf

that are needs driven should complement technical and scientific networks and partnerships. As such they would become key elements to create enabling policy and legal frameworks, strengthening institutions, supporting collaborative programmes, sharing and linking knowledge, mobilizing public action and providing public services to better manage climate-related risks. They could also be a key resource to develop and deploy innovations for managing climate-related risks.

Relevant ISDR system activities to support Priority for Action 3

The GFDRR track 1 will support partnerships in disaster risk reduction particularly with universities, scientific and technical institutions, private sector, research organizations and professional bodies. A virtual clearinghouse for disaster risk reduction will be developed.

The UN/ISDR and partners are developing a global framework for drought risk reduction, as well as a network to exchange information and good practices and to identify mechanisms for implementation of the framework, such as an international programme of action and an associated ISDR system platform. The network includes Governments, UN and non-UN actors, experts and practitioners.

Currently, three networks are being built with the help of the UN/ISDR secretariat:

- Global Media Network for Disaster Risk Reduction
- Global Network of NGOs for Community Resilience to Disasters, and
- A global partnership of universities, academic institutions and research organizations for disaster risk reduction for community resilience to disasters with the support from the GFDRR.

The ISDR system invites partners in the Nairobi Programme of Work to discuss needs to build an efficient and sustainable knowledge management system.

A thematic platform/cluster on knowledge and education was created in 2005. UNESCO convenes the thematic platform and the interim organizing committee and includes the following members (based on the actors that provided inputs for the matrix on Commitment and Initiatives): ActionAid International, Council of Europe, FAO, IFRC, ITU, ProVention Consortium, UNCRD, UNDP/BCPR, UN/ECE, UNESCO, UNICEF, UNU/EHS, UNV, WMO, and regional entities ADRC, AU, CRED. The cluster is reviewing current initiatives, gaps and opportunities; works in close collaboration with States active and committed to the subject; and shares lessons leaned and enables network exchanges among national, NGOs, school associations, national boards of education and the private sector. The active platform includes in its work plan the preparation of an international conference on education and disaster risk reduction to be held in 2008. It also published *Let Our Children Teach Us: A Review of the Role of Education and Knowledge in Disaster Risk Reduction* (Wisner, 2006), which examines good practices to reduce disaster risk through education, knowledge and innovation. It looks critically and strategically at current activities in order to identify gaps, opportunities in the form of synergism and partnerships.

The theme of the 2006 - 2007 World Disaster Reduction Campaign is “disaster risk reduction begins at school”. The campaign aims to inform and mobilize Governments, communities and individuals to ensure that disaster risk reduction is fully integrated into school curricula in high-risk countries and that school buildings are built or retrofitted to withstand natural hazards. The campaign’s key partners include UNESCO, UNICEF, ActionAid International, the IFRC, and the ISDR’s thematic cluster on knowledge and education. The campaign was launched during the International Symposium on “Progress and proposals regarding education for sustainable development,” organized by the French Government, under the auspices of UNESCO, the Council of Europe and the Francophone International Organization (OIF), which gathered over 300 participants and media representatives including children from France, Iran, Japan and the United Kingdom who exchanged their experiences of how they learned to protect themselves in the event of a natural hazard. The ISDR has also just released the online game “Stopdisasters” to teach children and others in an interactive, fun

way how to reduce disaster risk. The ISDR secretariat would be interested in developing climate change information to improve and expand "Stopdisasters" in collaboration with the UNFCCC secretariat.

Preventionweb is an internet-based gateway to disaster risk reduction activities worldwide being developed by the UN/ISDR secretariat for the system. It will provide a common platform for institutions to connect, exchange experiences and share information on disaster risk reduction. It will include aggregated and summarized information, as well as maps and visual information. Preventionweb will be available online as its components are developed. The first phase is expected to be completed in mid 2007.

Capacity Development for Disaster Reduction Initiative (CADRI) is conceived as the basis for developing a thematic platform on Capacity Development of the UN/ISDR Global Platform for Disaster Risk Reduction. Conceived jointly by UNDP/BCPR, UN-OCHA, and ISDR secretariat, CADRI will work to promote the ownership and process for the development of disaster reduction policy within countries; to advance academic education (e.g. formal and higher level) and professional/practitioner networks; and to promote consistency and quality standards of materials (tools, methodologies, curricula) for institutionalising the DRR disciplines. CADRI will draw upon the combined interests and professional resources of governments; UN agencies and other international organizations; regional institutions or collaborative centres; academic, technical or professional bodies; relevant NGOs and concerned communities of practice to achieve these ends.

II.d. Priority for Action 4: Reduce the underlying risks
NWP: Adaptation planning and practices; climate-related risks and extreme events; technologies for adaptation

The following tasks are recommended to implement priority action 4:

1. Environment: Incorporate disaster risk reduction in environmental and natural resource management and programmes
2. Social needs: Establish mechanisms for increasing resilience of the poor and most vulnerable
3. Physical planning: Establish measures to incorporate disaster risk reduction in land-use practices and human settlements
4. Technical engineering: Strengthen mechanisms for securing building safety
5. Financial/economic instruments: Creating opportunities for private sector involvement in disaster risk reduction
6. Recovery: Develop a disaster recovery plan

Relevant activities to the Nairobi Work Plan under HFA Priority Action 4:

Task 1 Environment: Reducing disaster risk and protecting the environment are complementary and often identical in practice. It is under this priority for action that the Hyogo Framework for Action specifically asks Governments 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 risks, the design of specific risk reduction measures and improved and routine use of climate risk information by planners, engineers and other decision-makers'. As much as environmental impact assessments need to take climate change adaptation into account, they should integrate hazard identification and vulnerability assessment. Major new development projects should undergo screening to assess the likely impact of climate change on the project and the project impact on vulnerability and its contribution to adaptation.

UN/ISDR and UNFCCC partners could collaborate on the publication of a 'how to" manual to support the integration of climate change adaptation and disaster risk reduction into development. Such a guide would be conceived as a practical resource to change procedures and guidelines, offering hands-on advice on useful strategies and good practices from both communities, drawing on illustrative examples. The guide would not only address the top-down approach relating to governance but also the bottom-up approach based on enhancing the capacity of local communities to adapt to and prepare for disaster.

Relevant ISDR system activities to support HFA Priority for Action 4

Task 1 environment and climate change: The ISDR system started work to explore the linkages between disaster risk reduction and adaptation to climate change several years ago. The UN/ISDR secretariat participates actively in the work of the SBSTA at each of its sessions and organized several well-attended side events.

The working group on climate change and disaster risk reduction under the IATF/DR:

- Facilitated consultations that led to the discussion paper 'Disaster Risk Management in a Changing Climate'[14].
- Produced 'On Better Terms: A Glance at Key Climate Change and Disaster Risk Reduction Concepts[15],
- Produced *DR+CC Infolink*[16], a newsletter on disaster reduction and climate change. The newsletter is used as a cross-fertilization vehicle to exchange information on events, intergovernmental and policy processes, research and publications, initiatives, online and Internet resources. Guest articles are welcome by those who wish to reach out to a wider audience, and are looking for partners, resources or advice or want to share experience and knowledge. The ISDR system invites the SBSTA and all partners in the Nairobi Programme of Work to actively contribute and use the newsletter. The ISDR system welcomes any suggestions to widen the audience to partners in the development community
- Presented a side-event on disaster reduction tools useful for adapting to climate change at COP-11 and developed a supporting paper.

As the IATF/DR has ceased to exist and the Global Platform for Disaster Risk Reduction is not yet in place, the IATF/DR Working Group on Climate and Disaster Risk Reduction has not been operational. At the first session of the Global Platform for Disaster Risk Reduction (in Geneva June 5-7, 2007) the Working Group should be replaced by a thematic platform with modalities that will ensure active participation from its members. The ISDR system invites any suggestions and ideas on issues and modalities that the Global Platform should consider to strengthen the integration of climate change adaptation and disaster risk reduction through concrete actions and projects.

The UN/ISDR secretariat has engaged in discussions with the UNFCCC secretariat to plan for the workshop on climate-related risks and extreme events asked for under the Nairobi Programme of Work. Given the closeness of the issues to be considered by the Global Platform and the UNFCCC workshop, the events will be organized so as to make use of synergies and make sure that events inform each other.

The ISDR system believes that it would be of great value to share early on meeting calendars and work plans so as to systematize collaboration and maximize use of resources, staff and consultant time, elaboration of technical products, as well as public information material.

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[14] Please see http://www.unisdr.org/eng/risk-reduction/climate-change/DRM-CC.pdf
[15] Please see http://www.unisdr.org/eng/risk-reduction/climate-change/on-better-terms/On-better-terms.pdf
[16] Please see http://www.unisdr.org/eng/risk-reduction/climate-change/rd-cch-infolink7-06-eng.htm

The ISDR system has also enabled the participation of disaster reduction experts in hands-on CGE training workshops, regional adaptation workshops, and NAPA training workshops.
National communications and the national reporting process of the Hyogo Framework for Action are existing sources of information. Efforts to include both issues into each process are taking place. However the results are still sparse in terms of coverage and quality of data provided. The practical guide proposed above could clarify what should be reported and how this information can be obtained.

Under Priority Action 4, the HFA not only mandates the integration of climate change and disaster reduction measures but also calls for the sustainable use and management of ecosystems, and implementation of integrated environmental and natural resources management approaches such as integrated flood management.

Task 2 Social needs: A key adaptive measure lies in livelihood resilience and protection, as is the case of drought, for example. The impacts of climate variability and extremes and climate change that will fall mostly on the poor and more vulnerable can be reduced through programmes that promote asset enhancement, protection and diversification, a safe built environment, social protection and engagement through empowerment of the more vulnerable and not merely participation. In order not to exacerbate existing inequalities by limiting the ability of poor people to afford insurance cover or to pay for defensive actions, social safety nets that function in emergencies could be of great importance, such as cash or food for work schemes.

The 2005 world disaster reduction awareness campaign focused on reducing risk using micro-finance tools and safety nets and promoted dialogue with the micro-finance community on the possibility of using such tools to reduce disaster risk and increase community resilience to disasters[17].

The ISDR system will endeavour to ensure that local solutions to current disaster risks take climate change into account. Assessing the potential role of traditional practices in managing climate-related disaster risk would be desirable so as to establish an inventory of traditional knowledge in disaster reduction suited for longer-term climate change adaptation and of workable options based on local contexts. An illustrative guide for managing risks in response to local constraints and opportunities could emerge of such a study.

One of the steps that can be undertaken to implement this task is to address disaster risk reduction in Poverty Reduction Strategy Papers (PRSPs) and Common Country Assessment (CCAs)[18]. This will also respond to the need to integrate disaster risk reduction in economic planning and development policies. Guidelines for integrating disaster risk reduction into CCA and United Nations Development Assistance Framework (UNDAF) [19] have been published. These guidelines apply to all countries where development efforts are likely to be challenged by disaster impacts. ISDR system partners UNDP and World Bank are undertaking implementation at country level.

Task 3 and 4 Physical planning and technical engineering: The adoption of land use planning measures and building codes and standards to reduce both current and future vulnerability is well recognised and documented. It is important to include local land use and urban planners in participatory processes so that past experiences can be included in the study of (and the planning for) future climate change and development pressures. Investment in buildings, long-lived capital and infrastructure as well as urban planning needs to take climate change into account. Here again disaster risk reduction and climate change actors should work hand in hand to make sure that today's actions take impending climate-related risks into account and that future actions are rooted in existing knowledge and experience. This holds true for human settlements and infrastructure planning, as

[17] Please see http://www.unisdr.org/eng/public_aware/world_camp/2005/2005-announcement.htm
[18] Please see http://www.unisdr.org/eng/risk-reduction/sustainable-development/cca-undaf/cca-undaf.htm
[19] Please see http://www.unisdr.org/eng/risk-reduction/sustainable-development/cca-undaf/cca-undaf.htm

showed by the disaster caused by Hurricane Katrina and reported in the Stern Review on the economics of climate change.

Activities foreseen under the Hyogo Framework for Action include:

- Incorporating disaster risk assessments in urban planning and management of disaster–prone human settlements, as well as in rural development planning and management;
- Mainstreaming disaster risk considerations into planning procedures for major infrastructure projects;
- Use of guidelines and monitoring tools in the context of land use policy and planning;
- Development of building codes, standards, rehabilitation and reconstruction practices and reinforcing of the capacity to implement, monitor and enforce such codes.

As a practical example, the ISDR Regional Office for Africa published in 2004 a publication entitled *Land use, disaster risk and rewards: a community leader's guide*[20]. The purpose of the publication is to offer insight and practical applications of land use planning and management and to illustrate how these activities can positively contribute to disaster risk reduction.

Task 4: Strengthen mechanisms for securing building safety: the first session of the Global Platform for Disaster Risk Reduction will highlight two high-level panels, one on climate change adaptation and one on urban risk. The sessions will be organized as to enable discussion on areas of cross-interest and relevance.

Task 5 Financial/economic instruments: It is recognised that public sector financing is not sufficient to reduce vulnerability to disaster and climate-related risks. As foreign direct investment is much larger than official development assistance, it is important to attract new sources of funding for short and long-term adaptation that cannot be funded by public expenditure. Funding should start with 'no-regret' measures, such as risk assessment, early warning and reducing vulnerability to current floods and storms. The private sector should be fully engaged to foster a culture of prevention and allocate resources for risk assessment and early warning.

Investment is needed to quantify the economic impact of climate variability and change but also the benefits of climate information services. Understanding the potential of climate information services to improve the management of risks and promote sustainable development will create new products and services.

Additionally, a strong business case for disaster risk reduction and climate change adaptation needs to be made. Clear answers are needed on the economic benefits for the private sector to engage in these efforts and which factors contribute to the success of public-private partnerships. A corporate social responsibility perspective on disaster reduction and adaptation to climate change should be considered. An agenda for increasing private sector involvement in both areas of work should be defined. The World Bank is leading work in this direction.

The financial sector has taken responsibility in disaster and climate risk management through risk transfer and savings and credit schemes. Insurance products, especially weather index insurance systems, can play a role when tied to vulnerability reduction. Risk-based insurance schemes can reduce costs and risks by encouraging good risk-management behaviours and

[20] Please see http://www.unisdr.org/africa/af-publications/land-use-community.pdf

meeting of standards in construction. The insurance sector is also a great provider of risk information. The private sector could usefully engage with governments and donors to consider new financial instruments thinking beyond aid. Such instruments include weather derivatives, weather market, weather securitisation, reinsurance and micro-insurance. Experience with remittances should also be considered.

As mentioned above, the Hyogo Framework of Action strongly supports the establishment of Private-Public Partnerships (PPPs) to implement risk reduction and risk financing in high-risk countries. The GFDRR is supporting joint efforts of the UN/ISDR, the World Economic Forum (WEF) and the World Bank to foster PPPs at all levels, particularly in countries prone to multiple disaster risks. Identifying opportunities and incentives for such partnerships, learning from past experiences and exchange of good practices in such partnerships are some of the initial steps that can provide a basis for risk reduction dialogues among the key stakeholders. Among the ongoing efforts, a dialogue on PPP in disaster risk reduction was held on 22nd February 2007 to achieve the following:

- A business case paper for guidance on greater private sector engagement in disaster risk reduction is developed that takes into account related policy, financing and institutional considerations in its analysis;
- A program for promoting multi-stakeholder risk reduction dialogues which brings together public and private sectors to develop a common framework for disaster risk mitigation and risk financing;
- Developing modalities for catalysing private public partnership for risk mitigation and risk financing; and
- Increased collaboration with sectors and companies interested in reducing their disaster risks, particularly through private public partnerships.

The GFDRR track 2 deliverables include ex-ante disaster recovery financing mechanism established in middle-income countries (e.g., insurance and reinsurance, catastrophe bonds, weather derivatives, contingent credit, reserve fund etc), as well as developing frameworks for national catastrophic risk financing programmes.

Task 6 Recovery: Shared concerns related to the UN approach and processes for post-disaster recovery at the World Conference on Disaster Reduction held in January 2005 have resulted in the formulation of a joint initiative named "International Recovery Platform (IRP)" by the UN System and partners, with the encouragement and support of the Government of Japan, Hyogo Prefecture Government, Asian Disaster Reduction Center (ADRC) and other countries. Consequently, the IRP opened on 11 May 2005 in Kobe, Hyogo, in order to support a more coordinated UN system approach and methodologies so that the recovery process helps transform disasters into opportunities for sustainable development. The UN/ISDR secretariat will encourage relevant partners of the system to explore areas of work to make recovery more resilient to climate change.

II.e. HFA Priority for Action 5: Strengthen disaster preparedness for effective response at all levels

NWP: Adaptation planning and practices; climate-related risks and extreme events

The following tasks are recommended to implement Priority for Action 5:

1. Develop a common understanding and activities in support of disaster preparedness
2. Assess disaster preparedness capacities and mechanisms
3. Strengthen planning and programming for disaster preparedness

Relevant activities to the Nairobi Work Plan under HFA Priority Action 5:

The importance of preparedness and contingency planning is recognised in decision 5/CP.7 under the activities related to vulnerability and adaptation. Being prepared, including conducting risk assessments, before investing in development at all levels of society will enable people to become more resilient to natural hazards. The subject of disaster risk reduction as seen today draws its relevance from earlier contributions and practices in the field of crisis and disaster management. Therefore the experience of the disaster risk reduction community in dealing with extreme events, i.e. preparing and improving operational practices for more timely and effective response to an impending event, or the provision of urgent services to restore basic requirements of the public if a disastrous event has already occurred, is immense.

The ISDR system would like to mention here the work on community-based approaches to disaster preparedness and response of one of its major partners on climate-related work: the Red Cross/Red Crescent Centre on Climate Change and Disaster Preparedness[21].

II.f. Regional and International Initiatives and Partnerships

The Hyogo Framework for Action also outlines the variety and diversity of actors and their core responsibility in implementation and follow-up. The ISDR system would like to emphasize the importance of activities at the regional level. Organizations are called upon to:

- Promote regional programmes, including programmes for technical cooperation, capacity development, the development of methodologies and standards for hazard and vulnerability monitoring and assessment, the sharing of information and mobilization of resources;
- Undertake and publish regional and sub-regional baseline assessments;
- Coordinate reviews on progress towards the implementation of the Hyogo Framework for Action;
- Establish regional collaborative centres;
- Support the development of regional early warning mechanisms.

To facilitate disaster risk reduction activities at the regional level, three UN/ISDR secretariat regional offices have been established in Africa, Latin America and the Caribbean and in Asia and the Pacific. These offices contribute actively to the work needed to integrate disaster risk reduction with climate change strategies. The ISDR Latin American and Caribbean office, based in Panama, with the Inter-American Institute for Global Change Research (IAI) held in December 2006 a workshop bringing together disaster reduction and climate change experts from the region to accelerate the development of joint work. The ISDR Africa office, based in Nairobi, participated in the UNFCCC Regional Adaptation Workshop in Accra, Ghana, 2006, and recently sponsored the participation of African NAPA focal points to a workshop on climate outlook for agriculture organized by the IGAD Climate Prediction and Applications Centre (ICPAC). The Asia-Pacific Office similarly supported the participation of a disaster reduction specialist at the UNFCCC Regional Adaptation Workshop in the Cooks Islands.

The ISDR system is responsible for developing and regularly updating a matrix of commitments and initiatives related to the implementation of the Hyogo Framework for Action. The matrix contains information of interest to partners in the implementation of the Nairobi Work Programme, for instance, as a resource for identifying relevant organizations for preparing the workshops to be held under the Programme. The matrix is available online[22] and the ISDR invites the SBSTA and all

[21] Please see http://www.climatecentre.org/
[22] Please see http://www.unisdr.org/eng/hfa/isdr/Matrix-commitment-and-initiatives.xls

partners to contribute information to enhance the content of the matrix as well as suggestions to improve its readability and user-friendliness.

The ISDR system also calls the attention of the SBSTA and partners in the Nairobi Work Programme to the national reports on the implementation of the Hyogo Framework. The UN/ISDR secretariat is interested in exploring ways to add value to the information contained in these reports as well as streamline reporting requirements on adaptation and vulnerability under the UNFCCC and Hyogo Framework implementation processes. Eventually such discussion should involve other relevant multilateral environmental agreements with a view to ease the reporting burden of Governments.

By way of conclusion, the UN/ISDR would like to stress the two critical steps to integrate climate change adaptation, disaster risk reduction and development:

(i) the identification and appreciation of information, experience and methodologies that disaster risk reduction, climate change and development experts can provide and the design of a sustainable system to share such experience and link knowledge, and

(ii) (ii) the need to overcome the institutional barriers (structural, managerial, informational, financial) to facilitate the integration of knowledge, experience and information as well as establish working relationships between climate change, disaster risk management and development experts.

On behalf of the ISDR system the UN/ISDR reiterates its interests in collaborating toward the joint implementation of the Nairobi Work Programme and the Hyogo Framework for Action.

Annex I

The following table juxtaposes the mandate and areas of work of the Nairobi Work Programme on the left with suggested activities for implementing the Hyogo Framework for Action on the right, as proposed in the consultation version of "Words into Action: Implementing the Hyogo Framework for Action." The aim of this presentation is to outline the many areas of possible collaboration.

Nairobi Work Programme	**Hyogo Framework for Action Implementation Activities suggested in "Words into Action" (WA)**
Methods and tools	
Promote the development and dissemination of methodologies and tools for impact, vulnerability and adaptation assessments, including as they apply to sustainable development	WA[23] 2/Task 2: Establish an initiative for country-wide risk assessment and analysis: carrying our risk assessments, identifying risk knowledge gaps and developing systems to continuously update risk information and analysing risks to support decision-makers WA 3/Task 2: Integrate disaster risk reduction in the research community At the regional level: Development of methodologies and standards for hazard and vulnerability monitoring and assessment At the national level: Develop procedures to review progress including systems for cost-benefit analysis and ongoing monitoring of risk
Promote the development and dissemination of methods and tools for assessment and improvement of adaptation planning, measures and actions, and integration to sustainable development	WA 2/Task 3: Assess capacities and strengthen early warning systems WA 2/Task 4: Develop communication and dissemination mechanisms for disaster risk information and early warning WA 3/Task 2: Integrate disaster risk reduction in the research community to promote applied research in disaster risk reduction practices WA 5/Task 1: Develop a common understanding and activities in support of disaster preparedness WA 4/Task 1: Develop a strategy and programmes to incorporate disaster risk reduction in environmental and natural resources management Task 3: Establish measures, improve practice and standards to incorporate disaster risk reduction in land-use practices and human settlements

[23] WA stands for Words into Action, which is divided into five chapters directly relating to the five Hyogo Framework Priorities for Action. Each chapter includes several tasks, described in the text of the submission.

Disseminate existing and emerging assessment methodologies and tools (cost-benefit); facilitate sharing of experiences and lessons learnt from application; opportunities, gaps, needs, constraints, barriers	WA 2/Task 4: Develop communication and dissemination mechanisms for disaster risk information and early warning WA 3/Task 4: Identify, compile and disseminate information and knowledge about disaster risk reduction At regional level: Promote sharing of information on methodologies and standards Establish specialized regional collaborative centres ISDR system: Stimulate exchange, compilation, analysis and dissemination of best practices, lessons learnt: periodic review of progress
Training opportunities	WA 3/Task3: Develop disaster risk reduction training for different groups of stakeholders At regional level: capacity development IGOs: adapt and strengthen inter-agency disaster management training for disaster risk reduction and capacity building
Data and observations	
Improving collection, management, exchange, access to and use of observational data and other relevant information on current and historical climate and its impacts, and promoting improvement of observations, including the monitoring of climate variability Identification of gaps and deficiencies in data and observations, stakeholders data and capacity needs, improve technical infrastructure Exchange of information on observed climate change impacts, including those observed through traditional knowledge	WA 2/Task 1: Review the availability of risk-related data and the capacities for their collection and use WA 2/Task 4: Develop communication and dissemination mechanisms for disaster risk information and early warning WA 3/Task 4: Identify, compile and disseminate information and knowledge about disaster risk reduction At regional level: Technical cooperation and capacity development, regional collaborative centres, reporting on support needs, sharing of information IGOs: Network and platform support for data collection and forecasting on natural hazards and risks, early warning systems, full and open exchange of data
Climate-related risks and extreme events	
Promote understanding of impacts of, and vulnerability to, climate change, current and future climate variability and extreme events' implications for sustainable development Experience with assessment and management of current and future climate-related risks and impacts, including extreme events and in specific	WA 2/ all tasks 1. Review the availability of risk-related data and the capacities for their collection and use; 2. Establish an initiative for countrywide risk assessment and analysis; 3. Assess capacities and strengthen early warning systems;

sectors Ability, gaps, needs, opportunities, barriers, constraints to predicting climate variability, impacts and extreme events across regions and hazards Traditional knowledge to understand and manage climate-related risks Share and use information on, and analysis of, experiences in climate risk assessment and management Promote use of tools and systems for climate risk assessment and management	4. Develop communication and dissemination mechanisms for disaster risk information and early warning. WA 4/ all tasks: 1. WA 4/ all tasks: Environment: Incorporate disaster risk reduction in environmental and natural resource management and programmes 2. Social needs: Establish mechanisms for increasing resilience of the poor and most vulnerable 3. Physical planning: Establish measures to incorporate disaster risk reduction in land-use practices and human settlements 4. Technical engineering: Strengthen mechanisms for securing building safety 5. Financial/economic instruments: Creating opportunities for private sector involvement in disaster risk reduction 6. Recovery: Develop a disaster recovery plan WA 5/ all tasks 1. Develop a common understanding and activities in support of disaster preparedness 2. Assess disaster preparedness capacities and mechanisms 3. Strengthen planning and programming for disaster preparedness At regional level: Technical cooperation, capacity development, development of methodologies and standards for hazard and vulnerability monitoring and assessment, sharing of information, support needs, regional collaborative centres, development of regional mechanisms and capacities for early warning IGOs post-disaster recovery with disaster risk reduction approaches Integrate disaster risk reduction in development assistance frameworks such as CCA/UNDAF, PRSP Networks and platforms for data collection & forecasting, early warning systems, data exchange Exchange, compilation, analysis and dissemination of best practices, lessons learnt Cross-cutting issues: community and volunteers participation; gender perspective and cultural diversity; capacity building & technology transfer
Socio-economic information	
Promoting the availability of information on the socio-economic aspects of climate change and	WA 2/Task 1-2-4 1. Review the availability of risk-related data and

improving integration of socio-economic information into impact and vulnerability assessments and for understanding adaptive capacity: Existing approaches and available data Needs, gaps, barriers and constraints Ways & means to improve availability and access to relevant information, including on costs & benefits, and integration into impact & vulnerability assessments	the capacities for their collection and use; 2. Establish an initiative for countrywide risk assessment and analysis; 4. Develop communication and dissemination mechanisms for disaster risk information and early warning. WA 3/Task 1-3-4: 1. Develop a programme to raise awareness of disaster risk reduction and empower all levels of society; 3. Develop disaster risk reduction training for different groups of stakeholders; 4. Enhance the compilation and dissemination and use of disaster risk reduction information. National level: Procedures to review progress including systems for cost benefit analysis and monitoring on risk Regional level: Regional & sub-regional baseline assessments
Adaptation planning and practices	
Collecting, analysing & disseminating information on past and current practical adaptation actions & measures, including adaptation projects, short- and long-term adaptation strategies, and local and indigenous knowledge Facilitating communication & cooperation among and between Parties & relevant organizations, business, civil society, and decision-makers, and other stakeholders Information on adaptation approaches, strategies, practices and technologies for adaptation at regional, national and local levels in different sectors, as well as on experiences, needs & concerns Exchange information on experiences, lessons learnt, constraints, barriers of past and current adaptation measures & actions, implications for sustainable development Promote ways & means for information sharing enhancement of cooperation among Parties and relevant sectors, institutions & communities, including in disaster risk reduction and management Promote understanding of response strategies, including early warning systems and local coping strategies, and of lessons learnt that can be	WA 2/ all tasks 1. Review the availability of risk-related data and the capacities for their collection and use; 2. Establish an initiative for countrywide risk assessment and analysis; 3. Assess capacities and strengthen early warning systems; 4. Develop communication and dissemination mechanisms for disaster risk information and early warning. WA 4/ all tasks: 1. WA 4/ all tasks: Environment: Incorporate disaster risk reduction in environmental and natural resource management and programmes 2. Social needs: Establish mechanisms for increasing resilience of the poor and most vulnerable 3. Physical planning: Establish measures to incorporate disaster risk reduction in land-use practices and human settlements 4. Technical engineering: Strengthen mechanisms for securing building safety 5. Financial/economic instruments: Creating opportunities for private sector involvement in disaster risk reduction 6. Recovery: Develop a disaster recovery plan WA 5/ all tasks

applied elsewhere Assess ways & means to support adaptation and address barriers and constraints to implementation	1. Develop a common understanding and activities in support of disaster preparedness 2. Assess disaster preparedness capacities and mechanisms 3. Strengthen planning and programming for disaster preparedness Regional level: Technical cooperation, capacity development, development of methodologies and standards for hazard and vulnerability monitoring and assessment, sharing of information, support needs, regional collaborative centres, development of regional mechanisms and capacities for early warning IGOs post-disaster recovery with disaster risk reduction approaches Integrate disaster risk reduction in development assistance frameworks such as CCA/UNDAF, PRSP Networks and platforms for data collection & forecasting, early warning systems, data exchange Exchange, compilation, analysis and dissemination of best practices, lessons learnt Cross-cutting issues: community and volunteers participation; gender perspective and cultural diversity; capacity building & technology transfer
Technologies for adaptation	
Promoting research on adaptation options & development & diffusion of technologies, know-how, and practices for adaptation, addressing adaptation priorities & building on lessons learnt from current adaptation projects & strategies	WA 2/Task 3: Assess capacities and strengthen early warning systems; WA 3/Task 4: Enhance the compilation and dissemination and use of disaster risk reduction information WA 4/Task 3 & 4: Physical planning: Establish measures to incorporate disaster risk reduction in land-use practices and human settlements Technical engineering: Strengthen mechanisms for securing building safety WA 5/Task 2: Assess disaster preparedness capacities and mechanisms

PAPER NO. 3: WORLD METEOROLOGICAL ORGANIZATION

WMO participation in the Nairobi Programme of work

Specific topic: Climate risks and extreme events

Introduction

In response to the UNFCCC Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change, WMO submitted a "Concept paper: on the role of WMO and National Meteorological and Hydrometeorological Services (NMHSs) in the Implementation of the Nairobi Work programme", in November 2006. This report addresses more specifically the focus area "Climate Risks and Extreme Events".

A number of WMO programmes including co-sponsored activities contribute significantly to the issue of climate risks. Furthermore, Intergovernmental Panel On Climate Change (IPCC), a WMO-UNEP joint body has just recently released the Physical Science Basis Summary for Policymakers of its Fourth Assessment Report including a number of updated information on observed and predicted evolution of climate-related extreme events. The World Climate Programme is dealing with the general issue of climate data. It has developed the mechanism of "climate watches" for the observation and record of climate extremes, the Climate Information and Prediction Services (CLIPS) project for the provision of climate information, products, predictions and services adapted to the needs of users, and is dealing with climate risk management and impacts in a number of domains, with a large part given to agriculture and more recently health issues. The Hydrology and Water Resources Department develops a whole range of actions related to climate related risks in hydrology, the Natural Disaster Prevention and Mitigation Programme (DPM) strengthens the international collaboration in disaster risk management, the Tropical Cyclones Project assists Members in all forecast and risk-management aspects in relation to tropical cyclones, the Global Climate Observing System (GCOS, co-sponsored by ICSU, IOC and UNEP) defines the optimal strategy for climate monitoring including extreme events, the WMO Space Programme contributes more specifically to the coordination of space-based observations, the World Climate Research Programme (WCRP, co-sponsored by ICSU and by the IOC of UNESCO) is developing a specific research strategy on climate extremes.

The present note is articulated along the five items under the present focus area as part of the Nairobi Work Programme. However the answer to one specific item can sometimes be of interest to one or several other items, or refer to activities more directly related to other focus areas.

(a) Experience with assessment and management of current and future climate-related risks and impacts, including those related to extreme events and in specific sectors

The assessment of current climate-related risks and impacts, including those related to extreme events, and their observed year to year evolution is a major activity for WMO, in close coordination with NMHSs: this includes efforts to observe and make available adequate data, to ensure specific watches for extreme events and assessments of their occurrence worldwide, and to develop information and prediction services. WMO is also directly concerned with the impact of those events in a number of domains, in close association with the user communities, more specifically in hydrology and water resources issues, as well as agriculture and more recently health. With the establishment of its new DPM programme, WMO along with NMHSs is developing a comprehensive strategy on risk management for natural hazards.

Observations and data

Lack of adequate and reliable climate data is considered to be a major constraint in developing an accurate understanding of the current and future climate variability and change, particularly in the developing and least developed countries. NMHSs, through the WMO, coordinate their efforts in capacity building, training, research and development to address this gap and provide reliable climate observations, which can be transformed into useful products for stakeholders to make use in the development of their adaptation strategies. NMHSs contribute significantly through the development and use of Modern Climate Data Management Systems (CDMSs) and through 'rescue' of historical records that are at risk of deterioration, in order to secure complete and safe long-term climate records. Through its various programmes WMO provides a platform for a coordinated global framework for obtaining climate data needed for climate change detection and its impacts on vulnerable sectors, research, policy information and national economic development.

GCOS will outline its contribution to the Nairobi Work Programme under the topic "data and observations" (for the due date of 21 September 2007). The main thrust of GCOS is to enable high quality, long-term climate observations at all scales, and it is acknowledged by potential users of climate information that healthy observing systems at global, regional, and national levels are of fundamental importance for the development of climate services and effective climate risk management that will be required for adaptation to climate variability and change, and more generally for sustainable development. Having adequate global networks is critical to begin consideration of adaptation. The monitoring, detection and attribution of changes in climate extremes requires daily, or preferably hourly, resolution data. However, the compilation, provision, and update of a globally complete and readily available full resolution daily dataset are very difficult tasks, in part, because not all NMHSs have the capacity or mandate to freely distribute the daily data that they collect. The GCOS Implementation Plan recommends that, when requested for the purposes of impact studies and extreme events, daily and/or hourly observations of the climate variables should be provided to the appropriate international Data Centre.

WMO, under its "Space Programme" and the Coordination Group for Meteorological Satellites (CGMS), in accordance with a request from the WMO Commission for Basic Systems at its extraordinary session in November 2006, have undertaken to review the baseline of the space-based global observing system with two particular objectives:

- To optimize it through global cooperation and ensuring data quality, consistency and accessibility
- To address the need for sustained observations of climate parameters.

This initiative will be further developed under Area N°2, data and observations. It should be however pointed out that, through integrating in a common approach the observing systems for climate monitoring and for operational weather warning and prediction, all timescales from Nowcasting to long-term climate trends are covered, as required for the assessment of climate risks and extreme events.

In the area of extreme events and related risks, WMO through Disaster Prevention and Mitigation Programme (DPM), with International Charter on Space and Major Disasters and cooperates with NMHSs as national focal points.. The International Charter on Space and Major Disasters, initiated in 2000 by French National Centre for Space Studies (CNES) and European Space Agency (ESA) and now signed by most major space agencies, offers a unified system of space data acquisition and timely delivery to those affected by natural or man-made disasters through Authorized Users. An Authorized User can now call a single number to request the mobilization of the space and associated ground resources of the member agencies to obtain data and information on a disaster occurrence. Data acquisition and delivery takes place on an emergency basis. The Charter was activated more than a hundred times since its implementation,

mainly for two types of disasters: hydro-meteorological (hurricanes, floods, etc.) or seismic (earthquake, tsunamis, etc.). The activation process is well established, effective, timely and efficient. It relies on civil protection agencies as national focal points. However, the analysis of activations also highlights that the utility of Charter products could be further enhanced if NMHSs work with the civil protection agencies to provide value-added products based on combining the high-resolution satellite images provided by the Charter with various hydro-meteorological forecast output.

Climate Watches and climate monitoring

Weather extreme events such as hurricanes, thunderstorms, tornadoes, etc. require weather watches for which most NMHSs issue early warnings and undertake special monitoring. In a similar manner, 'climate watches' deal with climatic extremes like heavy monsoons, flooding, cold waves, heat waves, droughts, etc., which require long-term monitoring with historical observations and its integration into the context of global climate patterns. By incorporating recent climate analysis as well as outlooks, climate watches serve as advisories and forewarnings of climate anomalies, therefore enable continuous and timely climate related risk assessment and management to avoid damages to life and property. The necessary mechanisms have already been put in place in some parts of the world, e.g. the North American Drought Monitor, the ICPAC (Inter-Governmental Authority on Development Climate Prediction and Applications Center) and SADC (Southern African Development Community) Drought Monitoring Centers in Africa. WMO works with NMHSs and many institutions in the world to issue regional climate watch bulletins. Through its programmes, the World Climate Data Management Programme (WCDMP) and DPM in collaboration with the Commission for Climatology (CCl) and NMHSs, WMO has planned for the coming four years period 2008-2011 to establish and implement climate watch systems at national levels. The main focus for these efforts is to improve preparedness and reduce socio-economic vulnerability to climate hazards in developing and least developed countries. Through DPM Program, other agencies are expected to be part of the implementation process of climate watches including resource mobilization, partnership for an integrated early warning system as well as the outreach of the decision makers at regional and national levels.

Through the Commission for Climatology (CCl) and in cooperation with Members, WMO has been issuing Annual Statements on the Status of the Global Climate since the last 13 years. These Statements document the extreme weather and climate events in the regional context, and provide a historical perspective on the variability and trends of surface temperatures that have occurred since the nineteenth century. It has also developed through CCl a plan to monitor climate extremes on national, regional and global level, and has assigned a special rapporteur on climate extremes.

The WMO Commission for Climatology, WCRP and the Joint Commission for Oceanography and Maritime Meteorology (JCOMM) jointly run an Expert Team for Climate Change Detection, Monitoring and Indices (ETCCMDI), which develops and publicizes indices and indicators of climate change and variability using daily climatological data, including particularly indices of daily to seasonal extremes (see Annex 1). Software developed at this occasion enables all interested parties to calculate indices the same way, so that their analyses fit seamlessly into the global picture. Part of the efforts of the Expert Team includes planning and organization of climate extremes seminars and hands on training workshops to compute climate extreme indices in various countries in the world: six of such seminars/workshops were organized in Africa, South America, Asia and Middle east to cover as much as possible the existing gaps in developing countries. These workshops provided an optimal opportunity to produce peer-reviewed papers contributing to the IPCC studies (see Annex 2). The Expert Team recently set a plan for the period 2006-2009, including the coordination of important science issues in relation with indices, the identification of new indices related to heat stress and drought, and marine indices from the surface and subsurface ocean.

Climate Information and Prediction Services

The 12th World Meteorological Congress (1995) considered that the provision of climate information and predictions would improve economic and social decision making, and that this would support sustainable development, and established a Climate Information and Prediction Services (CLIPS) project within the World Climate Applications and Services Programme. This is an end-to-end approach linking research, data, analysis, products including climate predictions, and services, through to end users in key socio-economic sectors such as renewable energy, health, tourism, water resource management, agriculture and urban management. Capacity-building including training is a key aspect of CLIPS implementation, and a number of training workshops were held by WMO across the world to create local capacities in developing and delivering user-targeted climate information. The global network of CLIPS Focal Points assists in national and regional coordination and information sharing in climate activities.

As part of the CLIPS project activities, WMO has actively supported the development of consensus-based approach to climate prediction, both at the global and regional levels. With the help of the leading experts around the world, WMO regularly prepares and issues El Niño/La Niña Updates. These products reflect a global consensus on the present and expected evolution of ENSO-related conditions and, with the national-scale advice and support of National Meteorological and Hydrological Services (NMHSs), help users in anticipating regional impacts associated with major ENSO-related anomalies. Depending on the nature of regional impacts of El Niño/La Niña, these updates provide handles for early warning of extreme climatic events such as droughts and floods. WMO has also formulated a plan to develop a global atlas of El Niño/La Niña impacts to help in identifying regions affected by such global-scale climatic anomalies and assess the associated risks, and another to promote demonstrations and implementation of Heat Health warning Systems (HHWS) in several regions where deadly heatwaves are serious and frequent extreme events of consequence. Resource mobilization is a major constraint in undertaking such projects, and WMO is exploring several potential resources in this regard.

Regional Climate Outlook Forums (RCOFs) are one vehicle for development of user-driven products and services, which were successful in various regions in attracting the interest and support of sectoral user groups in development and dissemination of seasonal climate predictions and related products. RCOFs constitute an important vehicle in developing countries for providing advanced information on the future climate information for the next season and beyond, and for developing a consensus product from amongst the multiple available individual predictions. RCOFs are regularly convened twice a year in the sub-regions Western Africa, Greater Horn of Africa, Southern Africa, Southeastern South America, West Coast of South America and Central America, and once a year in Asia. The RCOFs have also developed partnerships with the core sectors like agriculture, health, water, etc. with active media participation.

Risk Management

WMO and the National Meteorological and Hydrological Services (NMHSs) contribute to different stages of disaster risk reduction, including prevention, preparedness, response and recovery and reconstruction, through monitoring, detecting, analysing, forecasting, and the development and issuance of warnings for weather-, water- and climate-related hazards. In recognition of the critical role of NMHSs and WMO in disaster risk reduction, Congress XIV (May 2003) through its Resolution 29 decided to establish WMO Natural Disaster Prevention and Mitigation (DPM) Programme with the vision to enhance the contributions of National Meteorological and Hydrological Services, in a more cost-effective, systematic and sustainable manner, towards the protection of lives, livelihoods and property.

Traditionally, disaster risk management in majority of countries has focused on post-disaster emergency response and relief activities. Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disaster (HFA), which was adopted by 168

nations during the second World Conference for Disaster Reduction (WCDR, Kobe, Japan, January 2005), aims to shift the disaster risk reduction paradigm from the traditional post disaster response to a more comprehensive approach involving prevention, preparedness and contingency planning as well as emergency response and recovery. HFA is the basic framework for implementation of disaster risk reduction capacities at national, regional and international levels. On the basis of this new paradigm, climate information could play a critical role in supporting preventive and preparedness strategies in disaster risk management.

As part of their commitment to satisfy the needs of their users concerning weather and climate information, the NMHSs and WMO maintain permanent relations with the various sectors impacted by climate–related events, and provide the meteorological and hydrological information necessary to assess the impacts in sectors such as marine, aviation, agriculture, health, water, energy and civil engineering. In an effort to put a clear focus on risk management with regard to floods, drought and integrated water resources management, WMO prepared for the Fourth World Water Forum held from 16 to 22 March 2006 in Mexico City, Mexico, the Baseline and Thematic Documents on Risk Management. Likewise, WMO – in collaboration with ISDR – authored the chapter on “Managing Risks – Securing the Gains of Development” for the second edition of the UN-wide World Water Development Report.

As a step to further enhance this activity, the International WMO Conference on "Living with Climate Variability and Change: Understanding the Uncertainties and Managing the Risks ", held at Espoo, Finland, 17-21 July 2006, set up some principles to serve as a basis for action. This conference was unique in the sense that the user sectors took the lead to review opportunities and constraints in integrating climate risks and uncertainties into the mainstreams of decision-making where sensitivity to climate variability and change is but one among many factors to consider. The focus was on risk assessment and decision-processes in real-world contexts, and the conference came up with the “Espoo Statement” (http://www.livingwithclimate.fi). It recommended that collaborative mechanisms be developed that facilitate needs and requirements driven activities in climate-related risk management, and that they be used to improve the quality of climate-related risk management to the benefit of all.

These mechanisms could promote:

- Evaluation of current climate-related risk management in all relevant sectors
- Better assessments of the value of climate-related risk management
- Establishment of data sets necessary to inform decision making
- Research to improve climate-related risk management
- Development of decision-support tools
- Capacity building in climate-related risk management
- On-going evaluation of outcomes
- The use of suitable financial mechanisms in support of climate-related risk management.

Impact in Hydrology and Water Resources

WMO’s climate related hydrological activities are initiated/implemented through the World Climate programme – Water Component (WCP-Water) that is chaired by a member of the Advisory Working Group of the Technical Commission for Hydrology (CHy). Main thrust relates to facilitating the development of science-based tools to detect signals of climate trends and change in hydrological time-series and to foster the actual use of climate information by water managers. Priority is on the use of climate information with regard to variability and trends primarily for water resources assessment including decision making with regard to planning, operation and management of water resources infrastructure with a focus on adaptation choices.

The impact of climate variability and change on water resources depends not only on changes in the volume, timing, and quality of streamflow and recharge but also on system

characteristics, changing pressures on the system, how management of the system evolves, and what adaptations to climate change are implemented. In the framework of the WCP-Water, WMO is promoting the implementation of several demonstration projects on the impact of climate variability and change on water resources in specific regions, by providing seed funding for the creation of multidisciplinary teams that would demonstrate in practical terms the application of methodologies to regionalize Global Climate Models and study the impacts of climate variability and change specifically on the scale of regional and large basins water resources. Furthermore, efforts are under way to enhance the utility of RCOFs in water resources management. National Meteorological Services are encouraged to upgrade their climate prediction capability in such a form that it can be utilized by National Hydrological Services in providing climate-oriented predictions for improved water resources management including providing information that allows to dealing with extreme hydrometeorological events outside the range already experienced by countries/regions. One of the major reasons why predictive climate information is at present not fully utilized by water managers is the lack of a generally agreed conceptual framework for the use of climate predictions/scenarios. Milestones to address these issues are the conclusions of an expert meeting between climate specialists and water managers held in WMO Secretariat, Geneva, December 2006

Most studies in this domain relate to present climate and climate variability. It is expected that they can be extended to future climatic conditions, following improvements in climate predictability. The following are examples of on going projects:

- Hydrological sensitivity to climate conditions
  (Expert meeting on hydrological Sensitivity to Climate Conditions, WMO/TD-No. 1242, Geneva, August 2004)

- Stream-gauging stations appropriate for climate studies
  (see: http://www.wmo.int/web/homs/Hydroclimate/hydroclimate.html)

- Project concept: “Bringing climate Information to Water Managers”, December 2006, to be published after review

Impacts in Agriculture

The Commission for Agricultural Meteorology (CAgM) of WMO has always been paying a lot of attention to climate related risks and impacts, including those related to extreme events, in the agriculture sector. Several working groups established by CAgM over the years and their reports have been published by WMO (see Annex 3*)*.

CAgM established an Expert Team on the Reduction of the Impact of Natural Disasters and Mitigation of Extreme Events in Agriculture, Forestry and Fisheries, which held a meeting in Beijing, China in February 2004. The proceedings of this Expert Team Meeting was published as a book entitled “Natural Disasters and Extreme Events in Agriculture” by Springer in 2005.

In many parts of the world climate change and extreme climatic events such as severe droughts, floods, storms, tropical cyclones, heat-waves, freezes and extreme winds are one of the biggest production risk and uncertainty factors impacting agricultural systems performance and management. Coping with agro-meteorological risk and uncertainties is the process of assessing agro-meteorological risks and uncertainties and then developing strategies to cope with these risks. To address these issues, WMO, in collaboration with a number of co-sponsors organized an International Workshop on Agro-meteorological Risk Management: Challenges and Opportunities from 25 to 27 October 2006 in New Delhi, India. The workshop, hosted by the India Meteorological Department (IMD) and the Ministry of Science and Technology and Earth Sciences of the Government of India, was attended by 188 participants from 78 countries. In the workshop sessions, firstly weather and climate events and risks to farming from droughts, floods, cyclones and high winds, and extreme temperatures were identified and characterized.

Papers on approaches to dealing with risks highlighted preparedness planning, risk assessments and improved early warning systems, which can lessen the vulnerability of society to weather and climate risks. Enterprise diversification, contract hedging, crop insurance, weather derivatives and weather index insurance play a key role in developing agricultural risk management strategies. A special session examined the use of crop insurance strategies and schemes to reduce the vulnerability of the farming communities to risks posed by weather and climate extremes.

A number of strategies were identified to cope with risks. These include the use of seasonal forecasts in agriculture, forestry and land management to assist alleviation of food shortages, drought and desertification. The use of integrated agricultural management and crop simulation models with climate forecasting systems give the highest benefits. Strategies to improve water management and increase the efficient use of water include crop diversification and better irrigation. Especially important is the application of local indigenous knowledge. A combination of locally adapted traditional farming technologies, seasonal weather forecasts and warning methods were important for improving yields and incomes. Challenges to coping strategies were many and identified in several papers. Particularly important is the impact of climate variability and change on the frequency and magnitude of extreme events. Lack of systematic data collected from disasters impedes future preparedness, as does the need for the timely delivery of weather and climate information to enable effective decision making. Finally a range of policy options to cope with such risks were presented. These included contingency planning, use of crop simulation modelling, and use of agro-meteorological services. Proceedings of the workshop will be published by Springer.

Impacts on health

There is an excellent and longstanding collaboration between WMO and World Health Organization (WHO), which was recently reinforced through a series of workshops on climate change and health held in different sub-regions of the world. The WMO Commission for Climatology Expert Team on Climate and Health, in partnership with the WHO is in advanced stages of developing theoretical framework and guidance for HHWS, for publication in 2007. The Expert Team agreed to develop a position paper on the utility of climate prediction to health decisions and to develop an on-line virtual library of relevant research on this topic.

(b) Ability, gaps, needs, opportunities, barriers and constrains to predicting climate variability, impacts and extreme events across regions and hazards

Research on climate predictability

This issue is the object of particular attention by WCRP. There is a general consensus within the climate research community that any change in the mean climate is likely to feature significant changes in frequency or severity of extreme climate events and that this would have profound impacts on nature and society. It is thus very important to analyze and model extreme events. Indeed, the recent Report of the Steering Committee for the “International Symposium on the Stabilisation of Greenhouse Concentrations – Avoiding Dangerous Climate Change” (Exeter, UK, 1-3 February 2005) emphasizes that in assessing the consequences of increased levels of greenhouse gases “we should not focus on temperature change alone but, on anticipated shifts in climate variability, for example, with increase in the frequency and severity of extreme events”. It notes that many climate impacts, particularly the most dangerous ones, will be associated with an increased frequency or intensity of extreme events and identifies this as an important area for further work since many impacts studies do not explicitly take the effects of extremes into account, although it is well known that such extremes pose significant risks to human well being. It quotes the heat wave that affected Europe in 2003 as an example.

The Fourth Assessment Report of the IPCC contains quite elaborate statements regarding already observed and expected changes in climate extremes, the latter based on analyses of the outputs of a WCRP model archive specifically developed for AR4. A workshop planned jointly between IPCC, GCOS and WCRP in October 2007 will consider the climate research challenges and observing system implications from the IPCC Fourth Assessment, the topic of climate extremes being one of those challenges.

A working paper entitled “climate extremes-what WCRP should be doing” will be presented in March 2007 to its governing body, the Joint Scientific Committee, and more precise recommendations for a work-plan in this domain should be available after this date. A WCRP-sponsored workshop designed to formulate a coordinated international strategy for the study of climate extremes is tentatively proposed for the beginning of 2008.

The objectives, tentatively set for WCRP, are as follows:

- To summarize, compare and assess definition(s) of climate extremes and develop a common language amongst researchers and end users;
- To design an inter-comparison framework through which both observations, climate model representations of extremes and projections of climate can be assessed and by which changes in climate extremes can be better evaluated;
- To accelerate progress on the prediction of climate extremes with a focus on developing capabilities and products which facilitate practical applications for stakeholders and regions around the world;
- To assess the observational and dataset framework for study of global extremes;
- To determine how extremes are changing and varying and why (including their relationship to mean variables, physical factors, shape of pdf etc).

The issue of “extremes” in the hydrological cycle has been the object of particular attention by the “Global Energy and Water cycle Experiment” (GEWEX) project of WCRP, which has established in 2005 a working group aimed at a better understanding of hydrological extremes, and of the feedback mechanisms which give rise to extended wet and dry periods. With the help of a unique data set produced as part of the “Coordinated Energy and water cycle Observation Project (CEOP)”, it addresses issues such as trends in the occurrence of extreme events, the predictability of extremes and the role of extremes in the climate system.

Major impediments for water managers to use climate information are scales and uncertainties and the reliability of climate signals in currently available observations. There is need to improve on spatial and temporal downscaling of climate information to the catchment scale and also to quantify and ultimately reduce uncertainties in climate predictions.

Support to regional and national climate prediction initiatives

WMO, through its World Climate Applications Programme, supports the development of climate prediction capabilities at the regional and national levels. Most of the extreme climate events, by nature, operate on small space and time scales, and therefore high-resolution climate models and other sophisticated downscaling strategies are essential for their prediction. While the technologies for such strategies does exist, many developing countries and almost all least developed countries do not have the required human and infrastructural resources to take up such activities. It is important to work towards local ownership of such capacities to develop sustained prediction capacities and their expected impacts.

WMO is also developing the concept of Regional Climate Centres (RCCs), which can provide regionally focused climate prediction products using state-of-art climate models to the

developing and least developed countries, by optimizing the available resources. However, local expertise and adequate infrastructure at the national level are still needed to adapt such predictions to the national/sector context. WMO is developing a comprehensive CLIPS curriculum, which can be integrated into the national and regional training programmes to address this need.

Lack of adequate model skills at the regional level and uncertainties in the model predictions continue to be major challenges. While modelling research is making rapid strides to address these issues, approaches to make optimal use of the available information by integrating the uncertainties in decision making need to be promoted. As an example of this approach, WMO has sponsored a workshop on "Development of Regional Capacity for the Generation and Use of Regional Climate Change Scenarios in Africa" in Nairobi, Kenya, March 2007. The workshop is organized by ICPAC for ten countries in the Greater Horn of Africa to enable them to undertake effective climate change adaptation studies as well as assessments of the impacts.

Impact on Agriculture and forestry

Climate variability affects all economic sectors, but agricultural and forestry sectors are perhaps two of the most vulnerable and sensitive activities to such climate fluctuations. Climate change and variability, drought and other climate-related extremes have a direct influence on the quantity and quality of agricultural production and in many cases, adversely affect it, especially in developing countries, where technology generation, innovation and adoption are too slow to counteract the adverse effects of varying environmental conditions. For example, inappropriate management of agro-ecosystems, compounded by severe climatic events such as recurrent droughts in West Africa, have tended to make the drylands increasingly vulnerable and prone to rapid degradation and hence desertification. Even in the high rainfall areas, increased probability of extreme events can cause increased nutrient losses due to excessive runoff and water logging. Projected climate change can influence pest and disease dynamics with subsequent crop losses. Improved adaptation of food production, particularly in areas where climate variability is large, holds the key to improving food security for the global population.

Agriculture and forestry are currently not optimally managed with respect to today's natural climate variability because of the nature of policies, practices and technologies currently in vogue. Decreasing the vulnerability of agriculture and forestry to natural climate variability through a more informed choice of policies, practices and technologies will, in many cases, reduce the long-term vulnerability of these systems to climate change. For example, the introduction of seasonal climate forecasts into management decisions can reduce the vulnerability of agriculture to floods and droughts caused by the ENSO phenomena.

It is with this background that WMO had organized the International Workshop on Reducing Vulnerability of Agriculture and Forestry to Climate Variability and Climate Change in conjunction with the 13th Session of the Commission for Agricultural Meteorology of WMO. The workshop reviewed the latest assessments of the science of climate variability and climate change, and their likely impacts on agriculture and forestry in different agro-ecological regions during the 21st century. It also surveyed and presented a range of adaptation options for agriculture and forestry and recommended appropriate adaptation strategies required to reduce vulnerability of agriculture and forestry to climate variability and climate change (cf. proceedings referred to in Annex 3)

Disaster Prevention and Mitigation

With the potential link between climate variability and climate change to the changing patterns of extreme events, climate related products and services such as climatological databases and customized seasonal to inter-annual climate forecasts can contribute significantly to disaster prevention and preparedness:

(i) Climatological databases of hydro-meteorological hazards are needed for hazard analysis and mapping, which is a critical input for risk assessment and medium to long-term sectoral planning for reduction of risks. Furthermore, Climatological and real-time data are critical for development of new Risk Transfer Markets and design of risk transfer financial tools (e.g., weather derivatives, Cat Bonds, crop insurance) that enable distribution of risks;

(ii) Seasonal to inter-annual climate forecasts, are now providing valuable sources of information for drought warning. Climate Watch Products bring outcomes of these models together with other relevant information to produce products that can be used more directly in decision-making. However, there is need for extension of these probabilistic models to resolve hazards that occur at shorter time and spatial scales (floods, tropical cyclones, etc). These models are critical for development of warning systems with longer lead-times, which can be critical for medium-term prevention and preparedness strategies.

(iii) Furthermore, a number of key research questions relevant to climate and risk management decision-making remain unanswered. For example, the linkage between climate change and ENSO, PDO and NAO cycles, and subsequently, the linkages between ENSO, PDO and NAO with the changing patterns of hydro-meteorological hazards (floods, tropical cyclones, droughts, heat waves, etc.). Furthermore, the current climate models do not resolve temporally or spatially hazards, with exception of droughts. Progress in these areas is critical in development of probabilistic models, and information products that would be used in medium to long-term preventive strategies.

To this end WMO has initiated identification of requirements for linking climate and disaster risk management decision processes, with the view to establish priorities for more coordinated activities in both research and application areas that would result in development of climate products and services that can be utilized by Members in enhancing capacities for climate related risk management. These activities will be built upon strong partnerships with other agencies such as IFRC, the World Bank, UNDP, UNEP, among others. In parallel to these activities, WMO is working to strengthen early warning system capacities of it Members for hydro-meteorological hazards and working towards enhanced integration of the NMHSs warnings in disaster preparedness and emergency response planning.

(c) Contribution of traditional knowledge to understanding and managing climate-related risks

WMO has experience in two areas where traditional knowledge remains essential to manage climate-related risks: water related risks, and agriculture and forestry.

If one takes the example of water-related risks, traditional knowledge is related closely to presently used adaptation techniques for hydro-meteorological extremes, such as floods and flood management practices. These practices that are in use to cope with currently occurring extremes and singular events are the cornerstone for the improvement of knowledge and practices to adapt under conditions of climate change.

WMO also pays special attention to the traditional knowledge and techniques in the management of climate risks for agriculture, especially in the semi-arid and sub-humid regions of the world. Intercropping, relay cropping and crop mixtures have been traditionally used by the farmers in the semi-arid regions to cope with climate risks. Experts from CAgM have been studying the radiation use efficiency, water balance and water use efficiency in the intercropping, relay cropping and crop mixtures to better understand the scientific basis for the adoption of such systems and to make further improvements in these systems for improved agricultural productivity. The range of adaptation options for managed systems such as agriculture and forestry is generally increasing because of technological advances, thus opening the way for reducing the vulnerability of these systems to climate change. However, some regions of the world, particularly developing countries, have limited access to these technologies and appropriate information on how to implement them. Here successful traditional technologies used over the centuries should be maintained. Incorporation of climate change concerns into resource-use and development decisions and plans for regularly scheduled investments in infrastructure will facilitate adaptation.

More generally, WMO facilitates the assimilation of traditional knowledge into modern climate related risk management strategies, as illustrated by the Regional Climate Outlook Forums in their close liaison with end-users in the various communities.

(d) Implications for sustainable development in relation to (a) and (c) above

Most of the sustainable development issues, as reflected in Agenda 21 and the Johannesburg Plan of Implementation of World Summit on Sustainable Development (WSSD), are directly related to Climate Change and Variability or influenced by climate related events. In this regard, WMO assists NMHSs of developing countries, including the Least Developed Countries, to mainstream their activities into sustainable development processes, in particular the policy debates and the formulation of National Sustainable Development Strategies (NSDS) at national and local levels.

Our developing appreciation during the 20th century of the fragility of the environment in which we live, including the sensitivity of the climate system to human impact, has thrown the political spotlight on a range of climate-related issues. The greenhouse effect and global warming, the destruction of the ozone layer, vulnerability to natural hazards, protection of land and water resources, and renewable energy are a few of the areas where WMO has prepared itself to play an important role. WMO puts emphasis on science, technology and applications of climate information that are important for sustainable use of the Earth's resources and the protection of the climate system.

Access to locally relevant climate information as well as capacity to package and interpret such information both by the climate providers and users is crucial for sustainable development. Development of user-targeted climate services is therefore most essential, for which training of climate experts as well as sector representatives needs to be taken up in a more intensive manner. Sustained and regular CLIPS training workshops and RCOF activities as well as implementation of effective Showcase projects, which need substantial extra-budgetary resources, strongly contribute to sustainable development.

Work done in WMO on assessment of climate change and impacts is key to the development of adaptation policies, strategies and plans, of direct relevance to sustainable development. Climate extreme indices constitute a practical tool for summarizing climate variability and changes at global, regional and national level and they offer the possibility for application in various sectors particularly in agriculture, water resources, health, and energy. NMHSs manage climate data and are in need to make use of these data to compute climate extremes and climate change indices. This knowledge has become accessible to all nations and provides a real opportunity for an international collaboration in monitoring and assessing regularly climate change and its impacts as well as contributing to various international efforts such as IPCC and UNFCCC.

Examples of important implications are in the areas of secured freshwater supplies and the management of floods and droughts all of these being basic pre-conditions for sustainable socio-economic societies of member countries. There is generally a need for institutional changes at the level of national meteorological and hydrological Services of member countries to improve their capabilities and services to provide critical information for decision-making under conditions of climate change.

In regards to agriculture, most of the activities of CAgM of WMO described in (a) to (c) are aimed at promoting sustainable activities, alleviate poverty and contribute to food security, especially in the developing countries. CAgM is organizing Roving Seminars on Weather, Climate and Farmers in different regions of the world to bring together farmers from several villages at a centralized location and appraise them of the important features of weather and climate in their cropping regions, especially those related to climate variability and climate change, and educate them about the need for applications of weather and climate information in their operational activities. Feedback from the farmers at these seminars will help refocus the efforts of agro-meteorologists to provide improved products and information to the farming community.

(e) Promoting understanding of impacts of, and vulnerability to, climate change

WMO supports the development, dissemination and use of climate information and products, including capacity building in the domains related to climate variability, trends and impacts. It is working with the NMHSs to develop climate change detection tools and software to compute indices that reflect the best estimate of climate trends within the countries. Through capacity building activities based on up-to-date knowledge and software, WMO assists Developing Countries and Least Developed Countries to follow quantitative and objective approaches for their contributions to the IPCC process and reporting to the UNFCCC. Through its DPM Programme, it is also developing a specific policy with respect to natural disasters. Examples of such initiatives are described below.

Climate observation and information

The issue of prominent global data gaps in developing nations is a focal issue for GCOS. It has completed a series of 10 Regional Workshops in developing nations to highlight observing system needs in those regions. There is now an increasing realization in the development community that climate data are essential to meeting development goals. GCOS organized a workshop entitled “Climate Information for Development Needs: An Action Plan for Africa” in Addis Ababa from 18-21 April 2006, in collaboration with the UN Economic Commission for Africa. The workshop was aimed at achieving the mainstreaming of climate information and services into development decisions as a crucial component of reaching the Millennium Development Goals for Africa. The workshop has led to the development of a strategy and implementation programme for “Climate for Development in Africa” that is now being finalized for consideration by international development assistance agencies who are committed to the effective use of climate for development in Africa.

In the same domain of climate observation, WMO has requested the parties to the UNFCCC convention to establish a trust fund to fill gaps in the global climate monitoring network and to support capacity building of ground-based atmospheric observing systems recognized by GCOS. These include networks measuring the classical Essential Climate Variables as well as the chemical variables, such as greenhouse gases and aerosols.

With respect to climate information, the above mentioned ETCCDMI Expert Team has developed a user-friendly analysis software adapted to the diagnosis of climate extremes, and has organized 5 capacity building workshops contributing to a global extremes indices paper as well as other peer reviewed papers which contributed to IPCC AR4. One of its objectives is to maintain plans for capacity building in developing countries, and to work closely with the joint WCRP IGBP

"global change System for Analysis Research and Training" (START) programme through its "Monitoring Extreme Climate Events" group.

Its main objectives include:

- The development of a guidelines document on best practices for detection and calculation of climate extreme indices, to be published in all languages and distributed to all NMHS. This guiding document is meant to assist NMHSs in accomplishing their advisory role for their governments and policy makers on the local assessment of climate change;

- The establishment of a Mechanism to inform NMHSs of availability of software and subsequent updates to keep them in the same wavelength with leading institutions in the field;

- The development of a website on climate change, allowing public information on indices and downloading methods, software and documentation for computing climate extreme indices.

In the specific area of space observation, a Memorandum of Understanding was signed between the World Meteorological Organization (WMO) and the United Nations Institute for Training and Research Operational Programme on Satellite Applications (UNOSAT) on 25 October 2005. The goal of UNOSAT is to make high-resolution satellite imagery and geographic information easily accessible to the humanitarian community and to experts worldwide working to reduce disasters and plan sustainable development. To do this, UNOSAT acquires high-resolution satellite images from commercial providers. UNOSAT is a unique cooperation initiative between the UN, science and satellite industry that ensures low-cost and high quality solutions.

Impact of climate variability and change

The CCl intends to promote understanding of the climate impacts in a number of sectors, more specifically human health, energy, tourism, urban and building climatology, water and agriculture. WMO is developing strong partnerships with various UN and other international organizations in these activities, including scoping workshops, pilot projects and user liaison actions, with a regional approach. One example of such partnership is mentioned above in item a) and concerns the World Health Organization. The conclusions of the "Espoo Conference" mentioned above in a) can also be used as guidance in the domain of capacity building. The Espoo Statement noted that the practice of climate-related risk management is not widespread within many sectors and that there is a lack of awareness of climate-related risk management opportunities among numerous communities that would benefit from climate-related risk management. This requires multidisciplinary collaborations and the cross-disciplinary exchange of information and agreed on-going collaboration at national and regional scales between sectoral partners and climate information providers. Furthermore, the CCl is compiling an updated version of the WMO Guide for Climatological practices. The Guide will be translated into all working languages to assist countries in their daily climatological operations.

In hydrology, under WCP-Water, activities are under way to develop and implement demonstration projects in various countries to promote understanding of impacts of climate variability and change on water resources and hydro-meteorological extremes, assessing vulnerabilities and to facilitate the development of adequate coping and adaptation strategies.

In agricultural meteorology, CAgM established in 2002 an Open Area Programme Group (OPAG 3) on Climate Change/Variability and Natural Disasters in Agriculture. It has the responsibility to maintain an active and responsive overview of all the activities related to improve short-, medium- and long-term weather forecasting for agriculture; determining the impact of climate change/variability on climate forecasting; research on the impact of natural climate

variability and the reduction of the impact of natural disasters on agriculture; and to help reduce the contributions of agricultural production to global warming. Experts in this programme area identified the following three potential pilot projects for implementation in different regions that would promote an understanding of the impacts of, and vulnerability to, climate change:

1) Assessment of Natural Disaster Impacts on Agriculture (ANADIA)
2) Climate Forecasts for User Communities in Agriculture
3) Contribution of Agriculture to the State of Climate (CONASTAC)

In view of the high complexity of communicating climate related information to non-professionals, as well as the multiplicity of end-users, OPAG 3 recommended the implementation of a number of actions that may significantly contribute to bridge the agricultural and climate science communities. These include:

(a) Efforts to accommodate the needs of the various end-users wherever possible;

(b) Timely production of forecast products;

(c) Need for climate information producers to classify/categorise end-users in order to feed them better;

(d) Regular provision of updated products and making them available to the broadest audience possible;

(e) Need for climate information producers to provide information on the characteristics of season types in terms of length, dates of onset and cessation, frequency of dry spells, chances of flooding, storms, etc.;

(f) Regular dissemination of weather information especially hazardous weather may help in confidence building;

(g) Education of end-users to distinguish between short- and longer-term predictions and how these are compiled.

Such a strategy can probably also be applied to other end-user communities.

Natural disasters and risk-management

In the domain of natural disasters, it is the ambition of the WMO and the Millennium Development Goals (MDGs) to halve the loss of life associated with natural disasters of meteorological, hydrological and climatic origin over the next 15 years. As a result, WMO is working towards the development of new products, programmes and partnerships that provide/facilitate information with longer lead-times on the state of the climate and associated natural hazards. Through its DPM Programme, WMO ensures the optimization of its global infrastructure and the integration of its core scientific capabilities and expertise into all relevant phases of disaster risk management at the international, regional and national levels, particularly related to risk assessment and early warning systems. WMO and NMHSs have the capability to develop and deliver critical products and services to the entire disaster risk management decision process. These include the multidisciplinary science to understand the vulnerability of communities to weather-, climate- and water-related hazards and hazards information for planning of emergency response and disaster mitigation/prevention. These systems operate alongside educational and capacity-building services that help ensure nations can better meet national needs for hazard information.

Annex 1

DEFINITIONS OF THE 27 CORE CLIMATE CHANGE INDICES

1. FD, *Number of frost days*: Annual count of days when TN (daily minimum temperature) < 0^{o}C.

2. SU, *Number of summer days*: Annual count of days when TX (daily maximum temperature) > 25^{o}C.

3. ID, *Number of icing days*: Annual count of days when TX (daily maximum temperature) < 0^{o}C.

4. TR, *Number of tropical nights*: Annual count of days when TN (daily minimum temperature) > 20^{o}C.

5. GSL, *Growing season length*: Annual (1^{st} Jan to 31^{st} Dec in Northern Hemisphere (NH), 1^{st} July to 30^{th}

6. TX_x, *Monthly maximum value of daily maximum temperature*:

7. TN_x, *Monthly maximum value of daily minimum temperature*:

8. TX_n, *Monthly minimum value of daily maximum temperature*:

9. TN_n, *Monthly minimum value of daily minimum temperature*:

10. TN10p, *Percentage of days when TN < 10^{th} percentile*:

11. TX10p, *Percentage of days when TX < 10^{th} percentile*:

12. TN90p, *Percentage of days when TN > 90^{th} percentile*:

13. TX90p, *Percentage of days when TX > 90^{th} percentile*:

14. WSDI, *Warm speel duration index*: Annual count of days with at least 6 consecutive days when TX > 90^{th} percentile

15. CSDI, *Cold speel duration index*: Annual count of days with at least 6 consecutive days when TN < 10^{th} percentile

16. DTR, *Daily temperature range*: Monthly mean difference between TX and TN

17. Rx1day, *Monthly maximum 1-day precipitation*:

18. Rx5day, *Monthly maximum consecutive 5-day precipitation*:

19. SDII *Simple precipitation intensity index*:

20. R10mm *Annual count of days when PRCP≥ 10mm*:

21. R20mm *Annual count of days when PRCP≥ 20mm*:

22. Rnnmm *Annual count of days when PRCP≥ nnmm, nn is a user defined threshold*:

23 CDD. *Maximum length of dry spell, maximum number of consecutive days with RR < 1mm*:

24 CWD. *Maximum length of wet spell, maximum number of consecutive days with RR ≥ 1mm*:

25. R95pTOT. *Annual total PRCP when RR > 95p*.

26. R99pTOT. *Annual total PRCP when RR > 99p*:

27. PRCPTOT. *Annual total precipitation in wet days*:

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- Peterson, T.C., and Coauthors: Report on the Activities of the Working Group on Climate Change Detection and Related Rapporteurs 1998-2001. WMO, Rep. WCDMP-47, WMO-TD 1071, Geneva, Switzerland, 143pp.

Annex 2

LIST OF MEETINGS RELEVANT TO CLIMATE APPLICATIONS AND SERVICES ORGANIZED BY THE WORLD CLIMATE PROGRAMME OF WMO SINCE 2004

Dates and Venue	Meeting / Workshop / Seminar
Date and place to be decided	Meeting of the CCl Expert Team on Research Needs (ET 3.1)
Date and place to be decided	CLIPS Training Workshop for Mediterranean parts of RA I (Africa) and RA VI (Europe)
Date and place to be decided	Meeting of the Expert Team on CLIPS Operations, Verification and Application Services
Date and place to be decided	Meeting of the CCl Expert Team, and Scoping Workshop, on Climate and Tourism
Date and place to be decided	Meeting of the Experts on Implementation and Demonstration of Heat-Health Warning Systems
Date and place to be decided	First Implementation-Coordination Team (ICT) Meeting of CCl
Date and place to be decided Honolulu? September?	Meeting of the CCl Expert Team on El Niño and La Niña, with Workshop on Common language for Communications and for scoping an atlas of ENSO Impacts
Date and place to be decided Costa Rica (September?)	WHO Workshop on Climate and Health
11-14 November 2007 Geneva, Switzerland	Fifteenth session of the CLIVAR Scientific Steering Group
1-5 October 2007 San Lorenzo de El Escorial, Spain	7th Annual Meeting of the European Meteorological Society (EMS) and the 8th European Conference on Applications of Meteorology (ECAM)
4-8 June 2007 Barcelona, Spain	WCRP Workshop on Seasonal Prediction
4 - 6 April 2007 Beijing, China	3rd Session of the Forum on Regional Climate Monitoring, Assessment and Prediction for Asia (FOCRA II)
22-23 March 2007 Bonn, Germany	Improving Public Health Responses to Extreme Weather/heat waves (Final EuroHEAT Meeting, WHO-Europe)
19-23 March 2007 Madrid, Spain	WMO International Conference on “Secure and Sustainable Living: Social and Economic Benefits of Weather, Climate and Water Services”
8-10 March 2007 Nairobi, Kenya	First Malaria Outlook for the Greater Horn of Africa
5 - 7 March 2007 Nairobi, Kenya	19th Climate Outlook Forum for the Greater Horn of Africa

Dates and Venue	Meeting / Workshop / Seminar
5 - 9 March 2007 Lima, Peru	2nd Alexander von Humboldt International Conference - The Role of Geophysics in Natural Disaster Prevention
28 February - 2 March 2007 Geneva, Switzerland	Authors' Meeting to Develop Guidelines for Heat-health Warning Systems
15 - 27 January 2007 Bangkok, Thailand	CLIPS Training Workshop for RA II (Eastern Asia)
11 - 14 December 2006 Amman, Jordan	WHO Workshop on Climate and Health
20 - 22 November 2006 London, UK	Meeting of the CCl Expert Team on Climate and Health
30 October -2 November 2006 Armenia, Colombia	6th Climate Outlook Forum for the Western Coast of South America (WCSA-6)
2 - 5 October 2007 Yerevan, Armenia	RA VI Training Seminar on Capacity Building in Climate-related Matters
27 - 28 September 2007 Asuncion, Paraguay	XXV Climate Outlook Forum for the Southeastern of South America
6-7 September 2006 Gaborone, Botswana	10th South African Region Climate Outlook Forum (SARCOF-10)
31 August-1 September 2006 Nairobi, Kenya	18th Climate Outlook Forum for the Greater Horn of Africa (GHACOF-18)
14 August-1 September 2006 Nairobi, Kenya	Capacity Building Workshop for Downscaling Climate Prediction Products for Agriculture and Food Security
17-21 July 2006 Espoo, Finland	WMO Conference on Living with Climate Variability and Change: Understanding the uncertainties and managing the risks (with FMI, IRI and EU)
12-16 June 2006 Göteborg, Sweden	Sixth International Conference on Urban Climate
22-26 May 2006 Geneva, Switzerland	CCl Expert Team on the Guide to Climatological Practices
17-19 May 2006 Niamey, Niger	Seasonal Outlook Forum PRESA-O/09 for West Africa (PRESAO-AO/09)
15-17 May 2006 Montevideo, Uruguay	RA III Working Group on Climate Matters
26 - 27 April 2006 Porto Alegre, Brazil	XXIV Climate Outlook Forum for the Southeastern of South America
18 - 21 April 2006 Belize City, Belize	XVII Climate Outlook Forum of Central America
6 - 8 April 2006 Beijing, China	2nd Session of the Forum on Regional Climate Monitoring, Assessment and Prediction for Asia (FOCRA II)
3-7 April 2006 Geneva, Switzerland	Workshop on Forecasting Adverse Health Impacts in Africa
1-3 March 2006 Nairobi, Kenya	17th Climate Outlook Forum for the Greater Horn of Africa (GHACOF-17)

Dates and Venue	Meeting / Workshop / Seminar
22 - 24 February 2006 Dakar, Senegal	RA I Working Group on Climate Matters
13-14 February 2006 Geneva, Switzerland	Commission for Climatology Management Group Meeting
7-10 February 2006 Singapore	RA V Working Group on Climate Matters
7 February 2006 Geneva, Switzerland	Experts Meeting on Early Warning Systems
23-24 January 2006 Geneva, Switzerland	Ad Hoc Meeting of the LWCVC Core Group of the Scientific Organizing Committee (SOC)
5-7 December 2005 Santiago, Chile	5th Climate Outlook Forum for the Western Coast of South America (WCSA-5)
23-25 November 2005 Niamey, Niger	Workshop on Climate and Health: Climate and Environmental Information for Public Health Services in West Africa
7-18 November 2005 Kingston, Jamaica	IAI GAWTEC Training Institute on Climate and Health in the Americas
3-11 November 2005 Beijing, China	Commission for Climatology - fourteenth session
1-2 November 2005 Beijing, China	WMO Technical Conference on Climate as a Resource
October 2005 Montevideo, Uruguay	XXIII Climate Outlook Forum for the Southeastern of South America
3-7 October 2005 Nainital, India	Regional Workshop on Human Health Impacts from Climate Change and Variability in the Himalayas Region
19-23 September 2005 Toulouse, France	Expert Meeting on the Guide to Climatological Practices
16 September–28 October 2005 Oklahoma, USA	Fifth Training Workshop on Climate Prediction & Applications – Circum – Indian Ocean
7-8 September 2005 Harare, Zimbabwe	9th South African Region Climate Outlook Forum (SARCOF-9)
5-9 September 2005 Garmisch, Germany	17th International Congress of Biometeorology
31 August - 2 September 2005 Nairobi, Kenya	16th Climate Outlook Forum for the Greater Horn of Africa (GHACOF-16)
8-19 August 2005 Lima, Peru	CLIPS Training Workshop for Regional Association III
13-16 July 2005 Sao Paulo, Brazil	Regional Technical Meeting on CLIPS and Agrometeorological Applications for the MERCOSUR Countries
20-22 June 2005 Rome, Italy	Meeting on improving public health response to extreme weather

Dates and Venue	Meeting / Workshop / Seminar
23-25 May 2005 Geneva, Switzerland	Meeting of the Expert Team on Urban Climatology including Training
17 May -3 June 2005 Niamey, Niger	Seasonal Outlook Forum PRESA-O/08 for West Africa (PRESA-AO/08)
7 - 9 April 2005 Beijing, China	1st Session of the Forum on Regional Climate Monitoring - Assessment - Prediction for Asia (FOCRA II)
5 - 6 April 2005 Buenos Aires, Argentina	XXII Climate Outlook Forum for the Southeastern of South America
2-4 March 2005 Mombassa, Kenya	15th Climate Outlook Forum for the Greater Horn of Africa (GHACOF-15)
14-18 February 2005 Brasilia, Brazil	Training Workshop on Climate Early Warning Systems for Region III
2-4 February 2005 Tokyo, Japan	Meeting of the Expert Team on Verification
14-15 December 2004 Niamey, Niger	Consultative meeting on Climate and Health held at ACMAD
22-26 November 2004 Brazzaville, Congo	7th Technical Conference for Regional Association I
22-23 November 2004 Madrid, Spain	World Tourism Organization (WTO) UN Agencies Coordination Meeting on Tourism Matters.
15-17 November 2004 Guayaquil, Ecuador	4th Climate Outlook Forum for Western Coast of South America (WCSA-4)
10-12 November 2004 Nanyuki, Kenya	UNEP Design meeting for the fourth Global Environment Outlook (GEO-4)
9-12 November 2004 Guayaquil, Ecuador	Regional Association III Workshop on CLIPS and Its Application to the Health Sector
28 - 29 October 2004 Asuncion, Paraguay	XXI Climate Outlook Forum for the Southeastern of South America
25–27 October 2004 Tokyo, Japan	RA II Working Group on Climate related Matters including CLIPS (RA II-RCCs).
12-15 October 2004 Arusha, Tanzania	Meeting of Expert Team on CLIPS operations including Product Generation, with emphasis on countries in Need.
26 September - 7 October 2004 Doha, Qatar	CLIPS Focal Point Training Workshop for Western Regional Association II.
27-29 September 2004 Amsterdam, the Netherlands	International Conference ‘Climate Change: a challenge or a threat for water management’ and Meeting of the International Steering Committee of the Co-operative Programme on Water and Climate (CPWC)

Dates and Venue	Meeting / Workshop / Seminar
14-15 September 2004 Nadi, Fiji	Climate and Health Workshop
13-17 September 2004 Barcelona, Spain	World Urban Forum II
13-16 September 2004 Galapagos Islands, Ecuador	El Niño Early Warning for Sustainable Development in Pacific Rim Countries and Islands.
30 August - 02 September 2004 Harare, Zimbabwe	8th South African Region Climate Outlook Forum (SARCOF-8)
August 2004 Jeddah, Saudi Arabia	Seasonal Outlook Forum PRESA-NOR/02 for North Africa
23-27 August 2004 Nairobi, Kenya	14th Climate Outlook Forum for the Greater Horn of Africa (GHACOF-14)
27-29 July 2004 Geneva, Switzerland	African Climate Variations Workshop focusing on Eastern and Southern Africa
12-16 July 2004 Vientiane, Lao People's Democratic Republic	Workshop on Production of National Climate Monitoring Bulletins in the Indochina Region.
8-11 June 2004 Banjul, Gambia	Seasonal Outlook Forum PRESA-O/07 for West Africa
12 - 14 May 2004 Geneva, Switzerland	Meeting of Expert on End User Liaison
14 - 16 April 2004 Freiburg, Germany	Meeting of Experts to Develop Guidelines on Heat-Health Warning Systems
23-27 February 2004 Nairobi, Kenya	13th Climate Outlook Forum for the Greater Horn of Africa (GHACOF-13)
9 - 10 February 2004 Bratislava, Slovakia	Workshop on Extreme Weather Events and Public Health Responses

LIST OF WMO TECHNICAL NOTES AND PUBLICATIONS ON AGROMETEOROLOGY AND EXTREME EVENTS

1) Technical Note No. 202. Report of CAgM Working Group. 2004. Management Strategies in Agriculture and Forestry for Mitigation of Greenhouse Gas Emissions and Adaptation to Climate Variability and Climate Change. WMO No. 969.

2) Technical Note No. 201. Das, H.P., Adamenko, T.I., Anaman, K.A., Gommes, R.G, and Johnson, G. 2003. Agrometeorology Related to Extreme Events. WMO No. 943, 137 pp.

3) Technical Note No. 200. Salinger, M.J., Desjardins, R.L., Janzen, H., Karing, P,H., Veerasamy, S., and Zipoli, G. 2000. Climate Variability, Agriculture and Forestry: Towards Sustainability. WMO No. 928, 41 pp.

4) Technical Note No. 199. Salinger, M.J., Desjardins, R., Jones, M.B., Sivakumar, M.V.K., Strommen, N.D., Veerasamy, S., Lianhai, W. 1997. Climate Variability, Agriculture and Forestry: An Update. WMO No. 841, 51 pp.

5) Technical Note No. 196. Climate Variability, Agriculture and Forestry. Report of the CAgM-IX Working Group on the study of Climate Effects on Agriculture including Forests, and of the Effects of Agriculture and Forest on Climate. 1994. WMO N° 802. 152 pp.

PAPER NO. 4: THE INTERNATIONAL FEDERATION OF RED CROSS AND RED CRESCENT SOCIETIES

Contribution of the International Federation of the Red Cross and Red Crescent Societies (IFRC) to the Five-year programme of work on impacts, vulnerability and adaptation to climate change.

Climate change is a global problem with local impacts.
The International Federation of the Red Cross and Red Crescent Societies is a global organization with national societies and local branches in 185 countries. More than 20 million volunteers are dedicated to support vulnerable people, in times of disasters and crisis, all over the world.

Through its unique worldwide network the IFRC is in a position to link international and national policy making to concrete action on the ground, with the communities. And vice versa, we bring the stories, experiences and good ideas of the vulnerable people to the table when we talk with policymakers and experts at national an international level.

A key tool that we use in strengthening community resilience is the Vulnerability and Capacity Assessment, the VCA. Through this tool not only the vulnerabilities of communities are identified and assessed, but what is even more important, through this participatory process their capacities to address these risks are increased: The VCA leads to a plan of action to improve the resilience of the local community.

A key element of disaster risk reduction strategies is a good early warning system. Too often, after disaster strikes we become painfully aware that if the affected people had known of the looming danger and known what to do, many losses of life and property could have been prevented.
A key challenge for good early warning systems is to reach out to the marginalized and vulnerable people, ´the last mile´ of the system. In the context of community based disaster preparedness programs the Red Cross and Red Crescent include people centered early warning systems.

The Red Cross and Red Crescent Societies are auxiliary to government. In our operations and programs we work closely together with national and local authorities. These partnerships are crucial for the work of the RC/RC.

Climate change will severely affect the work of the Red Cross/Red Crescent. In particular, the projected increase of extreme weather events like floods and droughts, more intense hurricanes, the spread of diseases like malaria and dengue, and sea level rise is of great concern to the organization. Tens of millions of people, in particular the most vulnerable populations in developing countries, will be affected every year. And with the many record breaking extreme weather events of the last years we see the signs of what lies ahead of us.

In 2002 the Netherlands Red Cross and the International Federation of Red Cross and Red Crescent Societies (IFRC) established the Red Cross/Red Crescent Centre on Climate Change and Disaster Preparedness (RC/RC Climate Centre). The RC/RC Climate Centre supports national Red Cross and Red Crescent societies and others in understanding and addressing the risks of climate change, particularly in disaster risk reduction programs. It facilitates the cooperation between national RC/RC societies, climate scientists and policy makers in order to improve programs, research and policies that will strengthen the resilience of vulnerable people. The RC/RC Climate Centre is based in the Netherlands, but serves the whole RC/RC movement, especially those national societies in developing countries.
Developing countries, and particularly their poorest inhabitants, do not have the means to fend off floods and other natural disasters. To make matters worse, their economies tend to be based on climate-sensitive sectors such as agriculture and fisheries, which makes them all the more vulnerable. A better understanding of climate change and how extreme weather events could affect vulnerable people will eventually lead to stronger risk reduction programs.

All national RC/RC societies in developing countries can participate in the program *´Preparedness for climate change´*, with financial support from the Netherlands Ministry of Foreign Affairs, Directorate-

General for International Cooperation. The program supports the RC/RC national societies to better understand and integrate the risks of climate change in their work.
The program started in 2006, it involved 20-40 national societies to start with and contains a number of actions that can contribute to the implementation of the 5 year programme of work on impacts, vulnerability and adaptation to climate change.

1. Increased cooperation with other actors in the country on climate change.
Red Cross/Red Crescent national societies involved in this program will contact their governments, meteorological organizations and other climate change experts to start what we call a ´permanent dialogue´ to better understand climate change, and to inform the climate change partners about the disaster management and risk reduction programs with and needs of vulnerable communities.
The Red Cross/Crescent national society can moreover be instrumental in strengthening the cooperation between the disaster management structures and the climate change community in the country. Experiences in countries like Vietnam, Indonesia, Nicaragua, Colombia, Costa Rica, Samoa, Mozambique and others have been very good.

2. Raising awareness about climate change risks and adaptation options
Because of the vast network of the Red Cross and Red Crescent, the organization can contribute to raising the awareness on the risks of climate change and adaptation options among the population and the communities most vulnerable. This is likely to enhance the participation of the population in climate adaptation policies and programs.

3. Involvement in the policy dialogue on adaptation
The RC/RC national societies are interested to be involved in policy dialogue with national governments and experts to strengthen the work on impacts, vulnerability and adaptation to climate change.

By working closely together with the IFRC in Geneva and the regional IFRC delegations the RC/RC Climate Centre will coordinate the program and provide technical advice (where needed). Furthermore the RC/RC Climate Centre will document and share experiences in this process.

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PAPER NO. 5: THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

NAIROBI FIVE-YEAR PROGRAMME OF WORK ON IMPACTS, VULNERABILITY AND ADAPTATION TO CLIMATE CHANGE

At its 25th session, the Subsidiary Body for Scientific and Technological Advice (SBSTA) invited Parties and relevant organizations to submit information on their relevant programmes, activities and views on ***climate-related risks and impacts including those related to extreme events.*** In response to this request, the OECD would like to submit the information on its work that is relevant to the following issues, identified by SBSTA:

a) Experience with assessment and management of current and future climate-related risks and impacts, including those related to extreme events and in specific sectors;
b) Ability, gaps, needs, opportunities, barriers and constraints to predicting climate variability, impacts and extreme events across regions and hazards;
c) Contribution of traditional knowledge to understanding and managing climate-related risks;
d) Implications for sustainable development in relation to points (a) and (b) above;
e) Promoting understanding of impacts of, and vulnerability to, climate change.

Recent work from the OECD on these issues includes:

1) OECD (2006) *Climate Change in the European Alps. Adapting Winter Tourism and Natural Hazards Management*, edited by Shardul Agrawala.

OECD's recent book (in particular Chapter 3) examines the complex links between climate change and a variety of natural hazards and extreme events in the Alpine region. The book also discusses in-depth a range of strategies to deal with current hazards in France, Switzerland and Austria - and what adaptations might be needed in existing approaches to deal with climate change.

- Executive Summary : http://www.oecd.org/dataoecd/25/40/37909236.pdf Climate Change in the European Alps. Adapting Winter Tourism and Natural Hazards Management (ISBN: 9789264031692, published 18 January 2007).
- URL to the Alps book : http://www.oecd.org/env/cc/alps

2) The link between disaster risk management and climate change adaptation is also an area of interest for the Task Team on follow-up to the OECD Declaration on Integrating Climate Change Adaptation into Development Co-operation, adopted by OECD Environment and Development Co-operation Ministers in April 2006.

- Link to the ministerial Declaration : http://www.oecd.org/dataoecd/44/29/36426943.pdf

3) OECD - in conjunction with several bilateral and multilateral donors - has pursued work on links between disaster risk management and climate change adaptation through the Vulnerability and Adaptation Resources Group (VARG). The OECD was on the Steering Committee for this effort and co-sponsored an international workshop on this subject in Geneva in October 2006. Here is a link to this event on the VARG website:

- http://www.climatevarg.org/essd/env/varg.nsf/42ec25f6537f5eff85256dab0048d8e9/b603b3c185bee77485256dab0059aca8?OpenDocument

4) "Domestic Policy Frameworks for Adaptation to Climate Change in the Water Sector. Part I: Annex I Countries", by Levina E. and Adams H., (2006)

"Domestic Policy Frameworks for Adaptation to Climate Change in the Water Sector. Part II: Non-Annex I Countries. Lessons Learned from Mexico, India, Argentina and Zimbabwe" by Levina E., (2006)

In 2006 the OECD published these two papers on mainstreaming adaptation into the water sector policy frameworks in Annex I and non-Annex I countries. As part of the analysis, the papers examined climate change impacts on the water sector in 8 countries: Argentina, Canada, Finland, India, Mexico, UK, US, and Zimbabwe. The papers analysed how domestic and international water-related laws and agreements, institutional arrangements, water policies and management tools, traditional knowledge and practices, and status of infrastructure affect vulnerability of these countries' water sector to climate change. The papers also analysed the existing flood and drought management strategies and tools in the case-study countries and their ability to facilitate effective preparedness and response to these extreme events.

The papers can be downloaded from our website:

- http://www.oecd.org/dataoecd/46/15/37671630.pdf
- http://www.oecd.org/dataoecd/32/47/36835429.pdf

5) OECD Global Forum on Sustainable Development : Workshop on Economic Benefits of Climate Change Policies, 6-7 July 2006.

The themes approached in this international Forum on the economic benefits of climate policies were socio-economic impact assessment methods, metrics for measurement of climate change impacts, national/sectoral impact reports, climate change risk management tools and strategies, consumers' needs (with respect to information on climate change impacts) and provocative proposals to significantly advance the state of the art of impact assessment. Thirty-five experts and observers from around the globe participated in this forum, including experts from Africa and India. The website provides access to all background papers and presentations across these topics.

- http://www.oecd.org/env/cc/benefitsforum2006

6) OECD (2005) *Bridge Over Troubled Waters. Linking Climate Change and Development*, edited by Shardul Agrawala

This OECD publication is the product of a collaborative effort between the OECD Environment and Development Co-operation Directorates on mainstreaming responses to climate change in development planning and assistance. This volume synthesises insights from six country case studies that reviewed climate change impacts and vulnerabilities, analysed relevant national plans and aid investments in terms of their exposure and attention to climate risks, and examined in depth key systems where climate change is closely intertwined with development and natural resource management. These include the Nepal Himalayas, Mount Kilimanjaro in Tanzania, the Nile in Egypt, the Bangladesh Sundarbans, coastal mangroves in Fiji, and agriculture and forestry sectors in Uruguay.

- Executive Summary : http://www.oecd.org/dataoecd/16/4/36174361.pdf
- URL to Bridge Over Troubled Water : http://www.oecd.org/env/cc/bridge
- URLs to the following Case Studies :

  Egypt : http://www.oecd.org/dataoecd/57/4/33330510.pdf
  Uruguay : http://www.oecd.org/dataoecd/42/7/32427988.pdf

Nepal : http://www.oecd.org/dataoecd/6/51/19742202.pdf
Bangladesh : http://www.oecd.org/dataoecd/46/55/21055658.pdf
Fiji : http://www.oecd.org/dataoecd/46/58/21056315.pdf
Tanzania : http://www.oecd.org/dataoecd/47/0/21058838.pdf

7) "Metrics for Assessing the Economic Benefits of Climate Change Policies: Sea-Level Rise" by Robert Nicholls et. al. (ENV/EPOC/GSP(2006)3/Final).

In 2006, the OECD also published a report examining methods to estimate, in a consistent and comparable way, the impacts of sea-level rise change with different policy scenarios, in both monetary and non-monetary terms, across different locations and long-term time scales (2100 and beyond). It draws on scientific estimates of possible sea level rise and proposals for metrics based on literature reviews, surveys of experts and reviews of impact and economic valuation models at both local and global scales. It proposes a set of exposure and impact metrics with particular emphasis on how different measures may be useful to consider key questions related to local, regional and global risk-management decisions over time. For example, it explores how using a geographic information system combined with exposure analysis can generate information about the exposure of land, people and assets to sea-level rise under different mitigation scenarios. Impact metrics are also proposed and these take adaptation into account. A key challenge for assessing economic benefits of policy is coupling physical exposure metrics with socio-economic data and projections over long-time frames. A second challenge is doing this on a geographic scale that is meaningful for adaptation policy, and in turn relating our understanding about adaptation to global mitigation scenarios.

- http://www.oecd.org/dataoecd/19/63/37320819.pdf

8) "Metrics for Assessing the Economic Benefits of Climate Change Policies in Agriculture" by C. Rosensweig and F. Tubiello, forthcoming 2007 (draft paper: ENV/EPOC/GSP(2006)12)

Another forthcoming OECD paper in this series examines climate change impacts on agriculture. As with the paper on sea-level rise, this paper focuses on the agriculture sector to develop a framework and metrics for assessing the economic benefits of climate change policies based on the magnitude and timing of climate change impacts. The proposed framework covers regional, national and global scales characterizing short-term (20-30 years) and long-term (80-100 years) impacts of climate change. Examples of key metrics include crop-yield and variability, water stress indicators, production and land value, as well as a nutrition index for the number of people at risk of hunger. The proposed framework and proposed metrics can help decision makers to evaluate policy options versus the costs of inaction, to assess the long-term risks of climate change, and to identify thresholds beyond which patterns of vulnerability change significantly.

9) OECD (2004) *The Benefits of Climate Change Policies: Analytical and Framework Issues*, edited by Jan Corfee-Morlot and Shardul Agrawala

This book highlights the need to consider the regional avoided impact benefits of global climate policy decisions. It lays out a framework for the use of physical and monetary impact measures of change to assess the direct benefits of global climate policy. For any given global mitigation policy scenario, these indicators should include overlapping layers of sector-specific information on the nature of impacts, and on the potential for adaptation, at local, regional and global scales. The book concludes that conventional benefit-cost methods are inadequate on their own to assess global policy strategies, and should be complemented with risk-based methods that draw on a combination of monetary and physical metrics to consider change across different geographic scales, from local to global, and across different impact sectors. In addition to elaborating a framework for assessment, the book includes chapters on integrated assessment and modelling scenarios for impact assessment;

on how global impacts change in specific sectors (e.g. coastal zones and ecosystems) for different levels of climate change; on abrupt, non-linear change; on valuation methods for climate impacts; as well as on risk management approaches that link local and regional risk avoidance benefits to global mitigation scenarios.

http://www.oecd.org/document/35/0,2340,en_2649_34361_34086819_1_1_1_1,00.html

PAPER NO. 6: CARE CANADA

CARE Canada Submission to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC)
March 2007
Climate-Related Risks and Extreme Events

(a) Experience with assessment and management of current and future climate-related risks and impact, including those related to extreme events and in specific sectors

CARE has piloted an approach to community-level adaptation to climate change in Bangladesh and Tajikistan. The design of these projects was founded in a participatory Vulnerability Assessment which was undertaken at the beginning of the projects. These assessments identified priority areas of vulnerability such as flooding, increasing salinity and seasonal shifts, and examined how these issues were affecting the livelihoods of the target groups. The assessments were conducted separately with groups of men and women to ensure that gender differentiations could be analysed and addressed.

The information gained from the participatory assessments was combined with climate data and predictions to determine priority areas for action to reduce vulnerability to climate risks. This information was used to design practical strategies which would address current climate challenges, while at the same time developing adaptive capacity to help communities face future climate scenarios. In identifying strategies, the projects focused on those priority issues that were directly linked to climate change and were seen by communities as having a significant impact on livelihoods.

The assessments revealed important linkages between climate risks, including extreme weather events, and food security, access to potable water, and the sustainability of rural livelihoods. The results also highlighted the differing priorities of men and women, and the need for customized approaches to developing adaptive capacity. The strategies promoted included agricultural initiatives, water supply infrastructure, income generating activities, and disaster risk reduction activities. Early results from both projects indicate that the strategies were successful in reducing vulnerability of livelihoods to climate risks, and that the model is appropriate and should be scaled up.

In both projects, as well as in our efforts to work directly with vulnerable households to increase adaptive capacity, CARE established partnerships to develop the capacity of local NGOs and local government agencies to understand climate risks and to support communities in their adaptation efforts. It was clear in the assessments that cooperation from NGOs and government agencies is key to developing adaptive capacity.

In addition to addressing climate change directly through our community-level adaptation projects, CARE has experience with managing climate risks through its regular programming in food security, livelihoods, water and health. For example, projects have addressed drought mitigation, flood protection, and coastal zone management. These efforts have increased resilience to both current and future climate risks, as well as providing important lessons for adaptation initiatives.

(b) Ability, gaps, needs, opportunities, barriers and constraints to predicting climate variability, impacts and extreme events across regions and hazards

Reliable access to climate information represents a constraint to effective climate risk management. In some cases, climate data is available, but is housed in the meteorological

and/or environmental agency and is not communicated to other agencies that may be able to use it, such as departments for planning and development, agriculture, health or water. Furthermore, mechanisms rarely exist to convey this information to the local authorities and the communities who need it.

CARE works directly with vulnerable communities, and therefore has access to community knowledge of climate risks. However, it is often difficult to find locally relevant climate data, both in terms of current observations and in terms of future scenarios. In order to assist communities in responding to current and future climate risks, local-level climate data must be made available in an accessible and useful way. Linking scientific data to local observations can build capacity to understand the risks and to plan appropriate responses. Organizations such as CARE can play a role in establishing mechanisms to disseminate climate information to the communities and in facilitating planning for resilience.

(c) Contribution of traditional knowledge to understanding and managing climate-related risks

Vulnerable communities are already living on the margins, and are often already employing strategies to manage climate risks. It is extremely important for this knowledge to be captured to inform the design of adaptation strategies. CARE's approach to community-level adaptation involves analysis of local climate observations and socio-economic information as well as existing approaches to managing climate risk. This information is used to design practical and locally relevant strategies for adaptation that build on existing knowledge and capacity.

In some cases however, climate change is exacerbating existing climate risks, which challenges traditional risk management strategies. In these cases, communities need support to identify new strategies and build capacity to implement them. This support is likely to come from local governments and NGOs; however it is important to ensure that the activities of these institutions are grounded in traditional knowledge. Efforts to document traditional knowledge can serve as a record of changes at the local level and can help to ensure that decision-making for climate risk management is grounded in the local context.

(d) Implications for sustainable development

CARE's vision is a world of hope, tolerance and social justice, where poverty has been overcome, and people live in dignity and security. Climate change represents a significant risk to this vision. It has implications for poverty reduction efforts in the areas of health, water, food security and livelihoods. Development organizations are struggling to understand the risks in an effort to increase the resilience of our programs and to better support the communities we work with in their efforts to adapt to current and future climate risks. It is clear that in order for our poverty reduction efforts to be sustainable, we must be integrating climate risk mitigation into our programming.

Humanitarian and development organizations such as CARE respond in the event of emergencies to provide people with food, water, shelter and health services. As natural disasters become more frequent and more extreme, resources and capacity to respond will be spread increasingly thin. Climate change provides an incentive for investment in disaster risk reduction approaches, but also calls for an integrated approach to managing risks which increases preparedness for disasters while at the same time addressing underlying causes of vulnerability.

(e) Promoting understanding of impacts of, and vulnerability to, climate change

CARE and its partners around the world work with vulnerable communities to reduce poverty and promote social justice. At the organizational level, CARE and other humanitarian groups are grappling with the challenge of climate change and what it means for our work. There is a need for capacity development for organizations who are already working with the most vulnerable to ensure that our efforts contribute to understanding of climate risks and to developing capacity to manage those risks.

At the same time, decades of experience working with vulnerable communities have yielded lessons and knowledge that can inform efforts to implement adaptation strategies. This experience must be captured and incorporated into the dialogue on adaptation.

The communities we work in are acutely aware of variations in their climate, but may need help in understanding the trends and in predicting seasonal variations. CARE's approach emphasizes local observations while corroborating these observations with available climate data. Communication of meteorological data at the community level in an accessible, meaningful and useful way remains a challenge; however CARE's experience has yielded some useful lessons. Ensuring the relevance of information communicated, valuing local knowledge and complementing this with scientific information, and customizing messages for the target audiences are key to successfully engage communities and local government agencies on climate change issues.

PAPER NO. 7: PRACTICAL ACTION

In response to the invitation from relevant organisations to submit on relevant programmes on climate related risks and extreme events, in relation to the Nairobi Work Programme. Practical Action has several programmes of work which are addressing these issues; these are running in Bangladesh, Nepal, Sri Lanka, Zimbabwe and Peru.

At this stage of the projects we do not have a great deal of documentation focusing on the areas identified. However, we are aiming to document our findings from community-based work on:

a) Contribution of traditional knowledge to understanding and managing climate-related risk.

With respect to

b) Promoting understanding of impacts of, and vulnerability to, climate change

We are carrying out hazard, vulnerability and capacity assessments at the village level, and are developing a training manual for this work. We are also carrying out awareness-raising activities with a wide range of local stakeholders - farmers, schoolchildren, local service providers and local government - on the causes, and likely local impacts of, global climate change.

In terms of

c) Implications for sustainable development,

we are adopting a sustainable livelihoods approach, so that we look at how climate related disasters will impact on livelihoods, and seek to mitigate that impact through activities to strengthen and/or diversify livelihoods.

PAPER NO. 8: GERMAN COMMITTEE FOR DISASTER REDUCTION

Proposal to UNFCCC in order to support disaster reduction in changing climate and vulnerability

Climate models forecasts quantify changes of long-term mean climate conditions and usually are expressed in trends per decade or century. With respect to air temperature these forecast changes reach quantities of some few degrees per century, while short term weather changes often exceed such changes in time spans of weeks, days or even hours. Climate comprises all weather events occurring within the time interval that forms the mean value. Therefore, a changing mean value unavoidably means changing frequencies of all weather events occurring within the climate time interval. These changes of frequencies include rare or extreme events. Social systems easily adjust to the most frequent weather conditions, and develop protective systems providing shelter from extreme ones. However, it is consensus that these protective systems only work up to a threshold value of the weather events. Such thresholds are quantified in a complicated decision process including information on size and frequency of the event itself but also on the whole spectrum of vulnerabilities. A typical example is the height of dikes, which are often built to protect from floods occurring with a frequency of less than one event per 100 years. In a changing climate it may be expected to find more frequent extreme events, i.e. that a hitherto 100-year event may in the future occur with an increased frequency. In most cases this means a newly arisen disaster for the population concerned. This is true, because, once the protection threshold is surpassed, the damage inflicted increases in a highly non linear manner with the size of the event, unless the protective systems are adapted to the forecast climate changes of the extreme weather events.

The inertia of the earth-atmosphere system are estimated to reach about 200 years with respect to the temperature stabilisation after the carbon dioxide will be stabilised (IPCC 2001). For some decades to come the current green house gas caused climate trends will continue, independent on the green house gas concentration in the atmosphere. This inertia includes the future frequencies of extreme weather events. As a consequence this means the necessity of an adaptation of the respective protective systems, and this adaptation needs to be begun immediately.

Other than the emission of green house gases adaptation always is a local process, and it is always connected with local protective systems. Therefore, adaptation to be optimised requires a different approach from the one taken with respect to carbon dioxide mitigation.

Climate forecasts come with uncertainty. The major proportion of this uncertainty arises from the atmospheric composition, which for future developments is introduced as scenarios into the models used to compute the climate forecasts. The scenarios base on different socio-economic developments, and these are most difficult to be forecast for decades into the future. There is however no doubt that the climate will change in the near future and that this change is closely related to green house gas concentration of the atmosphere.

When considering the adverse effects of extreme events and the expected and forecast future changes of these events occurring it becomes quite clear that decisions on the adaptation to the forecast frequencies of these events have to be taken immediately. This is the more true as protective systems and any adaptation of existing infrastructure is very costly and thus requires many years to implement. The life cycle of infrastructure usually exceeds 50 or even 100 years. To stand the loads of future extreme weather conditions it is necessary to start infrastructure adaptation today! This means that in particular disaster reduction needs immediate planning and adaptation.

The uncertainty of the climate forecasts however makes it necessary to most carefully scale that adaptation process applying to disaster reduction. It is generally advisable to only take action if the measures are as far as possible reversible or can later be continuously adjusted to an improved knowledge.

At this moment there is little systematic knowledge available in the field of optimisation of adaptation processes, in particular with respect to the effects of extreme events. Adaptation however being a major responsive tool to mitigate the negative consequences of climate change should be started right away. Therefore, it seems necessary to collect and coordinate the already existing partial approaches, measures and criteria. This also means to consider the different local and regional conditions, and the different types of loads. The starting point of such a coordinated collection should be set by a pilot task force that designs the criteria for the useful information, data and methods to be collected. Some of the work being already done within the ISDR framework by some of the national platforms may be used as a starting point.

PAPER NO. 9: GLOBAL FIRE MONITORING CENTER (GFMC) FOR UNISDR GLOBAL WILDLAND FIRE NETWORK AND UNISDR WILDLAND FIRE ADVISORY GROUP

Introduction: Climate Change and Vegetation Fires

Over the past decade, many regions of the world have experienced a growing trend of excessive fire application in the forestry-agriculture interface, land-use systems and land-use change, and an increasing occurrence of extremely severe fires. Some of the fire effects are trans-boundary, for example smoke and water pollution and its impacts on lives, human health and safety, livelihoods, material possessions, loss of biodiversity or site degradation at a landscape level leading to desertification or flooding. The depletion of terrestrial carbon by fires burning under extreme conditions in some vegetation types, including organic terrain in peat land biomes, is one of the driving agents of disturbance of global biogeochemical cycles, notably the global carbon cycle. Observed and modelled consequences of regional climate change suggest an alteration of fire regimes with consequences on ecosystem degradation and depletion of terrestrial carbon.

Although this trend is revealed by a wealth of scientific knowledge on the cultural, social, economic and environmental dimension of fire in the Earth system, the gaps in fire management capabilities from local to global levels are evident.

The current situation and the expected trends are challenging the international community to address the problem collectively and collaboratively.

In recognition of the significant impacts of vegetation fires on the global environment, on economies and society, and the role of natural and anthropogenic fire as an important factor in maintaining stability, biodiversity and functioning of some ecosystems, several international consultations during the 1990s, including the 2nd International Wildland Fire Conference (1997), recommended that a group and mechanisms be formally established under the auspices of the United Nations to facilitate international cooperation in addressing global fire needs.[1] In 2001 a Working Group on Wildland Fire was established under the auspices of the Inter-Agency Task Force for Disaster Reduction, UN International Strategy for Disaster Reduction (UNISDR). The Working Group provided an international platform and forum with the overall aim of bringing together the technical members of the fire community and the authorities concerned with policies at national to international levels to realise their common interests in fire management at global scale. Among other activities the Working Group initiated the establishment of the UNISDR Global Wildland Fire Network (GWFN) under which Regional Wildland Fire Networks would play a key role in developing partnerships and cooperation in fire management between countries. The UNISDR Wildland Fire Advisory Group (WFAG) is serving as a liaison between the GWFN and its Regional Networks on the one side, and the UN system and other international bodies on the other side. Most of the international actors (UN, non-UN) are represented in WFAG, including liaison to the Secretariats of UNFCCC, CBD and CCD.

The Global Fire Monitoring Center (GFMC) is serving as secretariat of the GWFN and WFAG. The GFMC is a contribution of Germany to the UNISDR.

Expert consultations on forest fire policies and on fire management (hosted by FAO, ITTO and the GFMC between 1998 and 2006) examined action related to international collaboration, capacity building and human resource development; to review mechanisms to support cooperation in forest fire management at bilateral, regional and international levels; the establishment of inter-country agreements

[1] http://www.fire.uni-freiburg.de/summit-2003/Wildlandfire-97%20Outputs.pdf

aimed at sharing resources, personnel and equipment; and to examine components of such inter-country agreements, including overall logistical, policy and operational level considerations.

Given the complexity of the relationships between vegetation fires, human influences and the role of extreme weather events, climate variability and climate change, the information provided in the following does not provide an in-depth review of state-of-the art and expertise. It rather focuses on **programmes, activities and views of the Global Wildland Fire Network** and its linkages to the relevant science and international actors.

Global Fire Monitoring Center (GFMC):
http://www.fire.uni-freiburg.de/

UNISDR Global Wildland Fire Network (GWFN):
http://www.fire.uni-freiburg.de/GlobalNetworks/globalNet.html

GFMC Review of International Cooperation in Fire Management:
http://www.fao.org/docrep/009/J9406E/J9406E00.htm

a) Vegetation Fires: Experience with assessment and management of current and future climate-related risks and impacts, including those related to extreme events and in specific sectors

Note: The vast majority of vegetation fires are set or caused by humans, i.e. fire applied as tool in land use and land-use change. Unwanted human-caused vegetation fires are a consequence of negligence or arson. Occurrence, extent and impacts of human-caused fires are influenced by weather conditions ("fire weather") and increasing under extreme weather conditions and climate variability, i.e. droughts and extreme wind. However, the ignition risk by human activities is rather independent of climate variability, although intentional burning is more successful during dry spells or droughts. Occurrence, extent and impacts of natural (lightning-caused) fires are determined by weather. The intensity and severity of human- and lightning-caused fires, i.e. the behaviour, controllability and impacts, are determined by vegetation characteristics, notably the dryness of vegetation and the amount of available combustible materials (fire hazard).

Assessment of current climate-related risks of vegetation fires:

In some countries and regions fire danger rating or early warning systems are available and can be found on the GFMC Wildland Fire Early Warning Portal:

http://www.fire.uni-freiburg.de/fwf/fwf.htm

The majority of countries does not have a fire-danger rating or forecasting system in place. In many countries where fire danger rating systems are available, there is little to none connectedness between the system and those causing of or being affected by vegetation fires.

Assessment of future climate-related risks of vegetation fires:

A number of models have been developed to predict fire risk and severity in climate-change scenarios. These models are driven by length of droughts. Other models are based on climate-driven changes of vegetation characteristics / vegetation cover. Non of the fire risk models are based on the human factor, i.e. those developments that will determine human-caused fires to be realistically expected.

There is general consensus that prolonged droughts and regional warming will alter ecosystems, notably in the northern hemisphere, and in particular in the global circumboreal zone. Melting of permafrost, desiccation of wetlands and organic terrain, such as peatlands, will make these ecosystems susceptible to fire. The fire-induced release of terrestrial carbon will accelerate under these scenarios. The observed trend is confirming the predictions of the mid- to late 1990s.

Management of current climate-related risks of vegetation fires:

There is a general trend of an increasing occurrence of fire and fire impacts globally, which cannot be fully controlled. This trend is determined by:

- Climate variability and most likely consequences of human-induced climate change already impacting regions
- Land-use change involving increasing application of fire for converting natural or degraded vegetation to agricultural crop lands, pastures or tree plantations, including those created for bio energy (e.g., sugar cane, palm oil plantations);
- High fire hazard and fire risk in plantations, notably in tree plantations such as eucalypts or pines;
- Observed trends of fires burning in drained or otherwise desiccated wetlands / peatlands between the tropics and the boreal zone;
- Rural exodus and land abandonment in some regions as a consequence of urbanization, resulting in less intensive, traditional utilization of plant biomass (fuelwood, grazing intensive farming etc.), thus resulting in increased availability of phytomass to be burned by uncontrolled fires (wildfires);
- Ex-urban trends in other regions, where people are building homes and infrastructures in the natural vegetation surrounding urban areas; these structures at the so-called Wildland-Urban Interface (WUI) are embedded in flammable vegetation and increasingly vulnerable to fire

Management of future climate-related risks of vegetation fires:

Based on the observed trends it is expected that there will be an acceleration / increase of fire severity and fire impacts globally. These are fires, which will be extremely difficult to control, e.g.:

- Extremely intense and severe fires in natural or semi-natural vegetation in all continents, which – as consequence of human-increased fire hazard and extreme weather – will become uncontrollable (“megafires”);
- Extremely long-lasting and uncontrollable fires burning in organic terrain, resulting in unprecedented release of terrestrial carbon to the atmosphere and feeding the climate-change feedback loop.

b) Vegetation Fires: Ability, gaps, needs, opportunities, barriers and constraints to predicting climate variability, impacts and extreme events across regions and hazards

To mitigate these fire-related problems, forest and land management agencies, as well as land owners and communities, require an early warning system to identify critical time periods of extreme fire danger in advance of their occurrence. Early warning of these conditions with high spatial and temporal resolution incorporating measures of uncertainty and the likelihood of extreme conditions allow fire managers to implement fire prevention, detection and pre-suppression plans before fire problems begin. Considering the fact that the majority of uncontrolled and destructive wildfires are caused by humans as a consequence of inappropriate use of fire in agriculture, pastoralism and forestry, it is crucial that international wildland fire early warning systems are developed to complement relevant national fire

danger warning systems where they exist, to provide early warning where national systems do not exist, and to enhance warnings applied or generated at the local (community) level **(people-centered early warning systems** – as requested by the UN Secretary General and as laid down in the Hyogo Framework for Action 2005–2015 (HFA): "Building the Resilience of Nations and Communities to Disasters"). This will ensure delivery of targeted information reflecting specific local conditions and allowing the involvement of local communities in wildland fire prevention.

Theoretically all countries should be in the position to determine (a) future fire hazard determined by vegetation cover, its use or changes (land-use planning, mapping, modeling); (b) future wildfire risk caused by humans (application of logistic models to predict human-caused wildfires) and lightning (lightning models); and (c) future fire danger determined by climate change (fire weather).

The international community should be in the position to support countries in developing these tools. The ultimate goal of the wildland fire component in the "Global Multi-Hazard Early Warning System", as postulated by the HFA.

For details on the "Global Wildland Fire Early Warning System", as presented to the 3rd International Early Warning Conference (Bonn, 2006), see the project outline and follow-up details at

http://www.fire.uni-freiburg.de/fwf/EWS.htm

The promotion of the system and its implementation is an element of GEOSS (GEO Task DI-06-13 "Initiate a globally coordinated early warning system for vegetation fires (wildland fires), including the development of improved information products and risk assessment models":

http://www.earthobservations.org/index.html
http://www.earthobservations.org/docs/GEO_2007-2009_Work_Plan.v3.pdf (pp. 5-6)

c) Vegetation Fires: Contribution of traditional knowledge to understanding and managing climate-related risks

The contribution of traditional knowledge in successful fire management is generally recognized. It should be noted, however, that traditional local, culture-based inherited knowledge in fire risk and hazard reduction and in fire management is generally becoming lost and replaced by hybrid approaches in which advanced fire ecology and management knowledge and reconstructed historic cultural practices are merged.

During 2005-2007 and international multi-stakeholder group, coordinated by FAO, developed "Fire Management Voluntary Guidelines"

http://www.fao.org/forestry/site/35488/en/
http://www.fao.org/docrep/009/j9255e/j9255e00.htm
http://www.fire.uni-freiburg.de/programmes/un/fao/fao.htm

in which several principles and proposal for implementation are referring to indigenous and traditional practices – see following extract:

Principle 3 Traditional Uses of Fire

The traditional uses of fire on the lands of indigenous peoples and traditional rural communities should remain as a practice for those communities and be adapted to the current environment.

Aspects of the Principle include but are not limited to:

- *Continuing the traditional use of fire providing that any potential negative impacts on communities and resources can be prevented or mitigated;*
- *Gathering and maintaining the traditional lore and knowledge of the indigenous and traditional people and integrating their practices into the modern fire management programme; and*

Maintaining a diversity of landscapes and environments that provide a diversity of habitats, species, resources, and opportunities for recreation, commerce, community enjoyment, and cultural and religious practices

Principle 9: Multi-stakeholder Approach

Successful fire management requires participatory approaches for leadership and management appropriately shared between public and private land holders, the fire services, and communities of interest.

Aspects of the Principle include but are not limited to:

- *Minimizing the incidence of unwanted human-caused fires;*
- *Meeting integrated land management objectives such as safety, environmental and resource management;*
- *Recognizing the leadership role of land managers in fire and other land use issues;*
- *Ensuring a coordinated approach to effective fire management in areas with multiple organizations and stakeholder with responsibilities and interests in the fire program;*
- *Recognizing and utilizing the knowledge, leadership and expertise of local citizens and community groups*

Involving community members at the local, sub-national, national, regional and international level to assure that processes are open and accessible to people of different backgrounds and cultures (especially indigenous and traditional rural communities);

Principle 11 Knowledge Transfer

Access to, and the appropriate application of, knowledge is essential for all fire management activities.

Aspects of the Principle include but are not limited to:

- *Engaging in high-quality scientific research for the creation of new knowledge and confirming the utility of practical knowledge to support the creation or improvement of policies, regulations, guidelines and practices;*
- *Using science and technology transfer in local fire activities, including community-based approaches to strengthen fire management plans and programmes in a wide range of cultural, socio-economic and ecological environments;*
- *Developing a two-way flow of information so that local knowledge of the environment and the historical uses of fire can be considered and used by managers and researchers;*

- *Providing appropriate knowledge and the development of skills for personnel involved in fire activities so that they are competent for their roles and tasks;*
- *Incorporating effective communications and providing community education on fire management issues to enhance community preparedness and response;*

Collecting traditional and local knowledge and using that knowledge in the appropriate aspects of the fire management programme;

D.3 Fire Awareness and Education

Fire awareness and education can be a very effective way to involve the community and other groups in a fire management programme and to engage the community as a responsible partner. A well informed public will be more likely to use fire carefully and adhere to policy and legal boundaries. They can assist with the prevention, detection and reporting of fires, work with fire personnel to control unwanted fires, and provide a source of local and traditional knowledge.

D.3.2 Fire awareness and education programmes should be sensitive to the cultural and social norms of the community including the needs for local citizens to use fires for agricultural, forestry, biodiversity, traditional uses, or other basic needs;

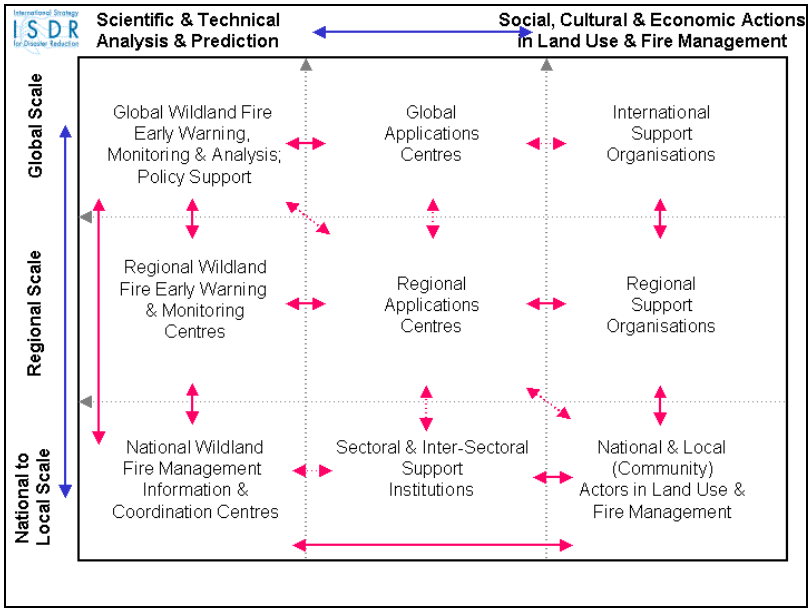
d) Vegetation Fires: Implications for sustainable development in relation to (a) to (c) above

This is a key task of the Global Wildland Fire Network: To facilitate the knowledge transfer to countries and to the local level, by promoting international cooperation in fire management (create synergies through cooperation and collective action; sharing of knowledge, capacity and resources between countries, multilaterally within regions, and globally):

http://www.fire.uni-freiburg.de/GlobalNetworks/globalNet.html
http://www.fire.uni-freiburg.de/fwf/fwf.htm

e) Vegetation Fires: Promoting understanding of impacts of, and vulnerability to, climate change

This also refers to the promotion of understanding of impacts of, and vulnerability to, climate change. The UNISDR Global Wildland Fire Network (GWFN) 7 Wildland Fire Advisory Group (WFAG), facilitated by the Global Fire Monitoring Center (GFMC), aims at providing the multi-directional exchange of information from local to global.



While the work of the UNISDR Wildland Fire Advisory Group (WFAG) is rather political and directed to international institutions and policy makers:

http://www.fire.uni-freiburg.de/GlobalNetworks/RationaleandIntroduction.html

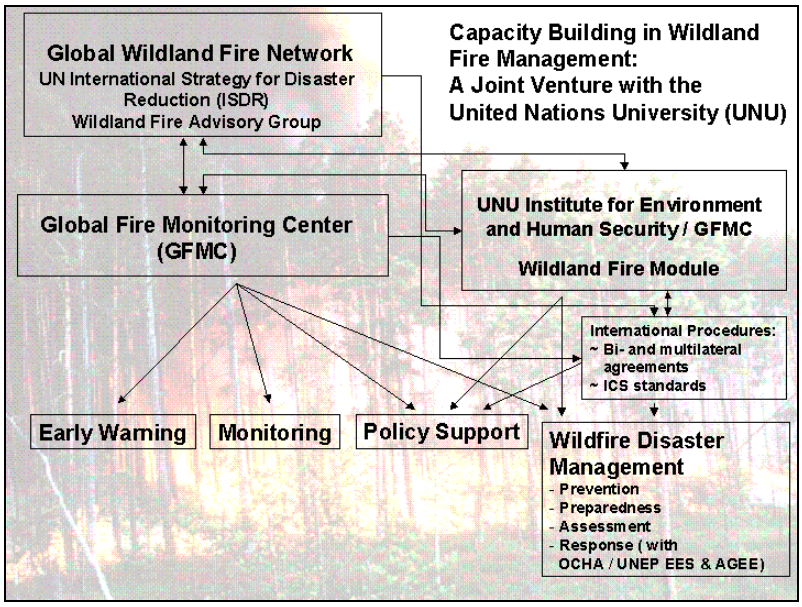
the approaches in Community-Based Fire Management (CBFiM)

http://www.fire.uni-freiburg.de/Manag/CBFiM.htm

is oriented towards bringing awareness and capacity to those who are directly concerned: local communities and people.

This overall capacity building is a joint GFMC-GWFN-WFAG venture with the United Nations University (UNU):

http://www.fire.uni-freiburg.de/programmes/un/unu/unu.htm



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