International Strategy for Disaster Reduction

THE WORLD BANK

Drought Risk Reduction Framework and Practices:

Contributing to the Implementation of the Hyogo Framework for Action

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May 2007

United Nations

Drought Risk Reduction Framework and Practices: Contributing to the Implementation of the Hyogo Framework for Action

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Acknowledgements

The document draws on several sources and expert meetings:

In 2003 the ISDR secretariat convened an Ad Hoc Discussion Group on Drought at the request of the United Nations Inter-Agency Task Force on Disaster Reduction. Experts and practitioners of several institutes and UN agencies discussed new paradigms and actions required to reduce global drought risk. These discussion were captured in a document entitled "Living with Risk: An Integrated Approach to Reducing Societal Vulnerability to Drought", which is one of the guiding documents for the current discussion (see http://www.unisdr.org/droughts-doc).

In June 2006, some members of the Ad Hoc Group were re-convened in Beijing with the support of the Ministry of Civil Affairs of China and the China National Committee for Disaster Reduction. The group discussions have contributed to the main elements for a Drought Risk Reduction Framework.

In October 2006, a first document was presented in Nairobi at the 2nd African Drought Risk Reduction Forum organized by the UNDP/Drylands Development Centre and the ISDR secretariat. Governments, policy makers, UN organizations, experts and practitioners participated in this forum and provided valuable recommendations, information and good practices.

With this basis and considering ongoing discussions, the ISDR secretariat and the National Drought Mitigation Center (NDMC), University of Nebraska-Lincoln, United States have worked together in identifying additional practical information and tools to present a unified global framework geared towards defining concepts, understandings people's vulnerability and proposing key elements for a Drought Risk Reduction Framework illustrated with practices to guide the implementation of the Hyogo Framework. The last chapter of this document informs on networks and mechanisms to encourage the implementation of projects. Nevertheless, additional discussion is needed on the path and commitments needed to move forward.

The ISDR secretariat expresses its recognition to the National Drought Mitigation Center for the substantive contributions to the contents of the document. Valuable comments on earlier drafts were received from advisers (Annex 1) and the provision of the examples and practices in the text and in Annex 3 by a number of experts, is also very much appreciated.

This first edition of Drought Risk Reduction Framework and Practices: Contributing to the Implementation of the Hyogo Framework for Action will be subject to continuing consultation with experts and practitioners in Governments, international, UN and regional organizations and civil society. We would appreciate receiving readers' comments, inputs and further short case studies (see template in Annex 3) to be considered in the next edition. Please email any feedback to Pedro Basabe at basabe@un.org.

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ISDR secretariat, May 2007

Foreword

In an increasingly vulnerable world, nations, communities and individuals are confronted daily with suffering and loss of lives and livelihoods resulting from disasters triggered by natural and human-induced hazards. Worldwide, the number of disasters has grown over recent decades. This trend will be aggravated with the projections related to global climate change. Coordinated actions of the international community are urgent in order to address the root causes of disasters and to significantly increase national, local and community capacities to reduce their vulnerabilities.

Drought is one of the major natural hazard threats to people's livelihood and community socio-economic development. Each year, disasters originating from prolonged drought not only affect tens of millions of people, but also contribute to famine and starvation among millions of people, particularly in some African countries.

Drought is a slow-onset hazard, which provides time to consider and address its complex root causes, such as understanding people's vulnerabilities, and identifying unsafe conditions related to poverty, fragile local economy, livelihoods at risk, lack of strategies and plans, limited institutional capacities and resources. Understanding these issues allows government authorities and the public to undertake effective drought mitigation and preparedness measures.

In January 2005, Governments adopted the *Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters*, with the primary goal of achieving a substantial global reduction in disaster risks, and to contribute to the sustainable development of nations. The HFA provides comprehensive action-oriented policy guidance based on a holistic understanding of disasters, as induced by human vulnerability to natural hazards, and it reflects a solid commitment by Governments and organizations to implement an effective disaster reduction agenda. In order to support the implementation of the HFA at all levels, the UN-based International Strategy for Disaster Reduction (ISDR) is being strengthened as a multi-stakeholder "ISDR System", comprising Government representatives, international, regional and UN organizations, and civil society organizations, to coordinate programs and activities, identify good practices and gaps, and promote positive action.

With the aim of guiding the implementation of the HFA in respect to drought, the ISDR secretariat in cooperation with the National Drought Mitigation Center (University of Nebraska, USA) and other partners has developed the present document, based on current thinking and practice in many countries. It elaborates a framework for understanding drought and vulnerability to drought, and provides guidance on actions to reduce the risks associated with drought. The document discusses drought policy and governance, risk identification and early warning, awareness and knowledge management, and effective mitigation and preparedness measures. These framework elements are illustrated with practical examples, techniques, and extensive background information.

The publication of this first edition of *Drought Risk Reduction Framework and Practices: Contributing to the Implementation of the Hyogo Framework for Action* is intended to assist national governments and local communities, as well as international, regional and donor communities, to address the root causes of drought-related disasters, and to reduce drought impacts and the consequences for human welfare and food insecurity. The ISDR secretariat will welcome any feedback, which will be incorporated in subsequent versions of the document.

Sálvano Briceño
Director of the secretariat of the International Strategy for Disaster Reduction,
United Nations

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I

Context and Objectives

Drought is one of the major threats among natural hazards to people's livelihoods and socio-economic development. Drought tends to occur less frequently than other hazards (Figure 1). However, when it does occur, it generally affects a broad region for seasons or years at a time. This can result in a larger proportion of the population being affected by drought than by other disasters (Figure 2). For example, Figures 1 and 2 show that drought disasters account for less than 20 percent of all disaster occurrences in Africa, but they account for more than 80 percent of all people affected by natural disasters.

Some regions are more prone to drought disasters (Figure 3), and each country differs in its capacity to effectively prepare for and respond to the effects of drought. Therefore, the number of people affected by drought and the types of impacts experienced will vary by region (Figure 4). For example, disasters triggered by prolonged drought in Africa can severely harm countries' development, affect millions of people and contribute to malnutrition, famine, loss of life, emigration and complex situations; whereas droughts in developed countries primarily result in economic losses.

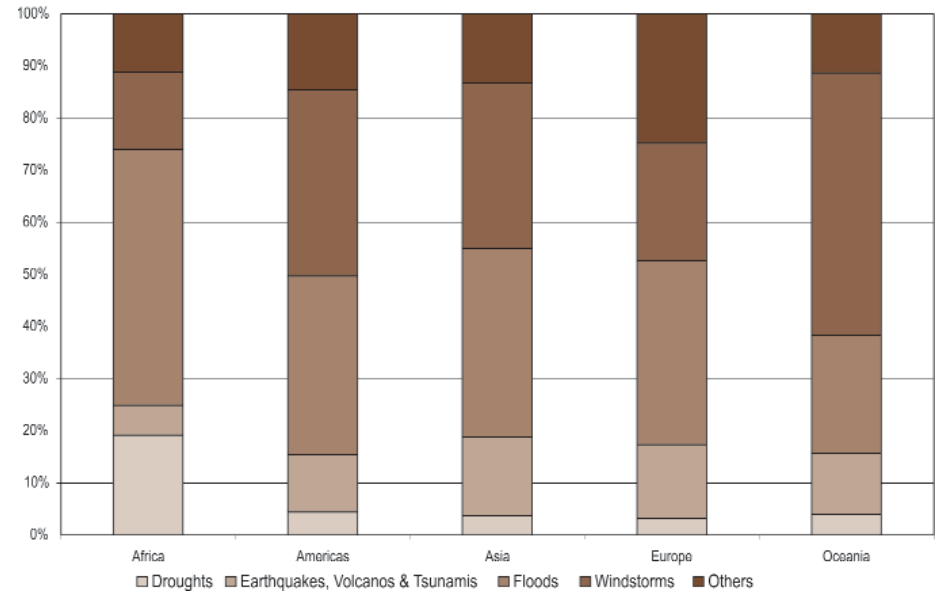
In 2006, extreme drought affected several countries in the Horn of Africa. Especially hard hit were people in the countries of Ethiopia, Somalia, Kenya, Eritrea, and Djibouti, where nearly 18 million people were estimated to be suffering from food shortages during the drought's peak in early 2006. UNICEF surveys revealed acute malnutrition rates of approximately 20 percent among children in many drought-affected communities.

To reduce the threat of drought around the world, an increasing number of national, regional, and international entities have begun to take action.

In 1977, the United Nations Conference to Combat Desertification (UNCCD) adopted a Plan of Action to Combat Desertification. The Convention to Combat Desertification was adopted in 1994 and came into force two years later. At least 179 countries have joined the convention.

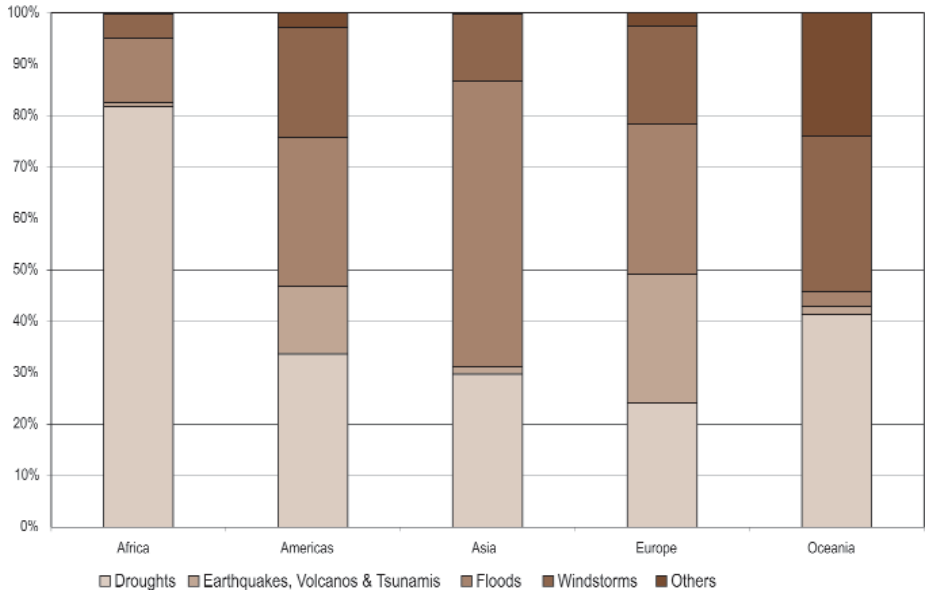
Drought risk reduction is also connected with another important international convention, the United Nations Framework Convention on Climate Change (UNFCCC). According to UNFCCC, there are at least two areas where activities related to drought can be undertaken: 1) adaptation to the impacts of climate change, and 2) research and systematic observation. Parties of the convention have committed to close cooperation in responding to drought, desertification, and flood disasters.

Figure 1
Proportion of disaster occurrence by continent: 1970-2006



Source: CRED CRUNCH newsletter, December 2006, Centre for Research on the Epidemiology of Disasters, Brussels, Belgium; http://www.em-dat.net/documents/CRED%20CRUNCH%207%20-%20December%202006.pdf.

Figure 2
Proportion of persons affected by each disaster type per continent: 1970-2006



Source: CRED CRUNCH newsletter, December 2006, Centre for Research on the Epidemiology of Disasters, Brussels, Belgium; http://www.em-dat.net/documents/CRED%20CRUNCH%207%20-%20December%202006.pdf.

In 2003, the secretariat of the United Nations International Strategy for Disaster Reduction (ISDR) facilitated the creation of an Ad Hoc Discussion Group on drought at the request of the United Nations Inter-Agency Task Force on Disaster Reduction. The endeavour brought together prominent scientists and practitioners from a variety of institutes and UN agencies to propose new paradigms and actions required to reduce global drought risk. The initiative resulted in an integrated approach to reducing societal vulnerability to drought, which has been used to promote drought-resilient nations and communities around the world (see http://www.unisdr.org/droughts-doc).

Subsequently, the World Conference on Disaster Reduction was held in Kobe, Hyogo, Japan, in January 2005, where governments adopted the landmark "Hyogo Framework for Action 2005-2015". The Hyogo Framework outlines five priorities to build resilience of nations and communities to natural hazards (see http://www.unisdr.org/hfa):

- governance: organizational, legal, and policy frameworks;
- risk identification, assessment, monitoring, and early warning;
- knowledge management and education;
- reducing underlying risk factors;
- preparedness for effective response and recovery.

The primary responsibility for implementing the Hyogo Framework for Action lies with the UN Member States, but the ISDR system, UN agencies, regional organizations, academic and civil society institutions, and international organizations are also actively involved.

Drought is a slow-onset natural hazard that allows for the implementation of disaster risk reduction measures as requested by the Hyogo Framework for Action. Understanding drought's evolution, complexity, and social implications, including people's vulnerability to drought, permits planners and the public to implement effective mitigation and preparedness measures to reduce drought impacts. To this end, wide-ranging and well-coordinated efforts at international, regional, and national levels are needed to build drought-resilient communities and societies.

In order to merge criteria from the ISDR's 2003 integrated approach and the Hyogo Framework for Action, members of the Ad Hoc Group on drought were re-convened in Beijing, China, in June 2006, with the support of the Ministry of Civil Affairs and the China National Committee for Disaster Reduction. At this meeting, members discussed about the elements for drought policies in line with the priorities of the Hyogo Framework for Action. Later on, an initial draft, which outlined the elements of a framework for drought risk reduction, was presented at the 2nd African Drought Risk and Development Forum. The forum, organized by the UNDP/Drylands Development Centre (DDC) and the ISDR secretariat in Nairobi in October 2006, brought together representatives of governments; international, regional, and UN organizations; experts; and practitioners who provided valuable comments to the paper.

The present document considers the recommendations of the cited international meetings, ongoing discussions, and the identification of information and good practices to present a unified global framework geared toward reducing the effects of drought as part of the implementation of the Hyogo Framework.

The present drought risk reduction framework proposes the following main elements for consideration, namely:

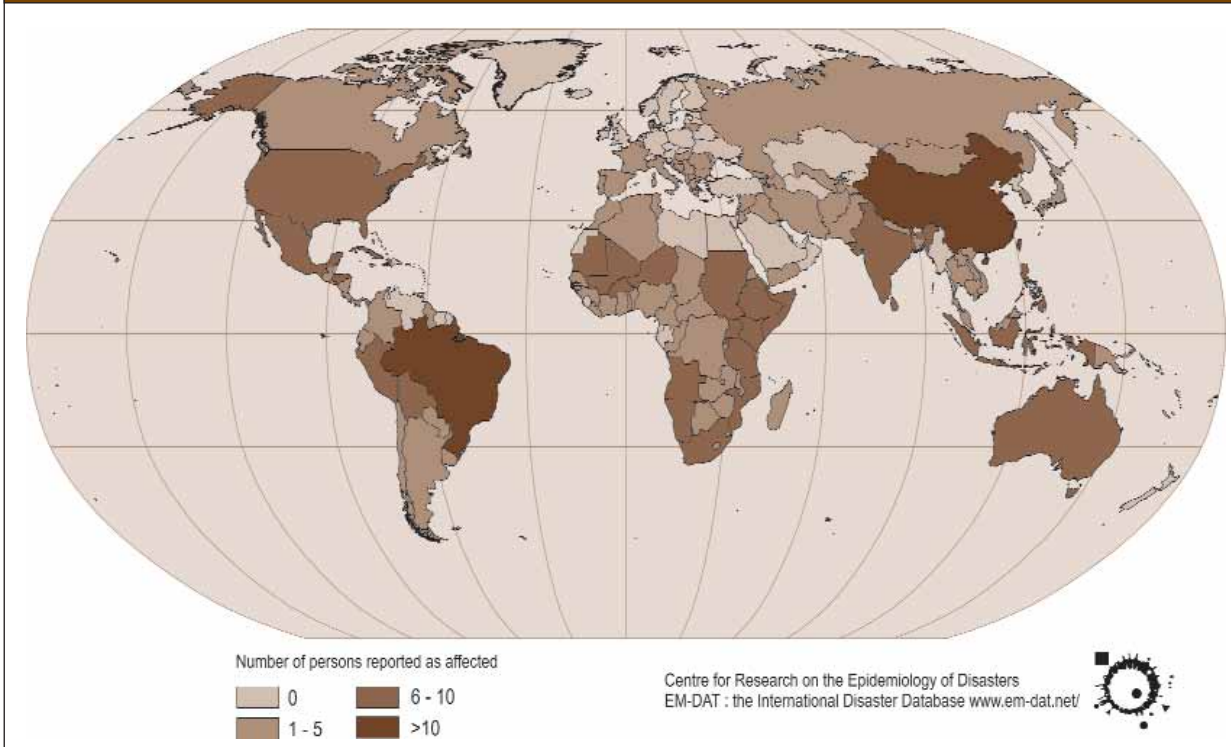
i) drought policies and governance,
ii) drought risk identification, impact assessment, and early warning,
iii) drought awareness and knowledge management, and
iv) effective drought mitigation and preparedness measures.

The first three elements correspond to the first three priorities of the Hyogo Framework, while the last element corresponds to the combined fourth and fifth priorities. The framework is complemented with information on existing networks and mechanisms to encourage the implementation of regional and national programs for drought risk reduction.

The document highlights the need to foster proactive drought risk reduction strategies and activities to address drought's root causes rather than relying solely on emergency response measures. It also stresses a move from policies to practices through the development of a knowledge network to identify indigenous practices, exchange expertise, and propose simple and affordable technologies and good practices that can be promoted and implemented in vulnerable communities through coordinated programs and projects.

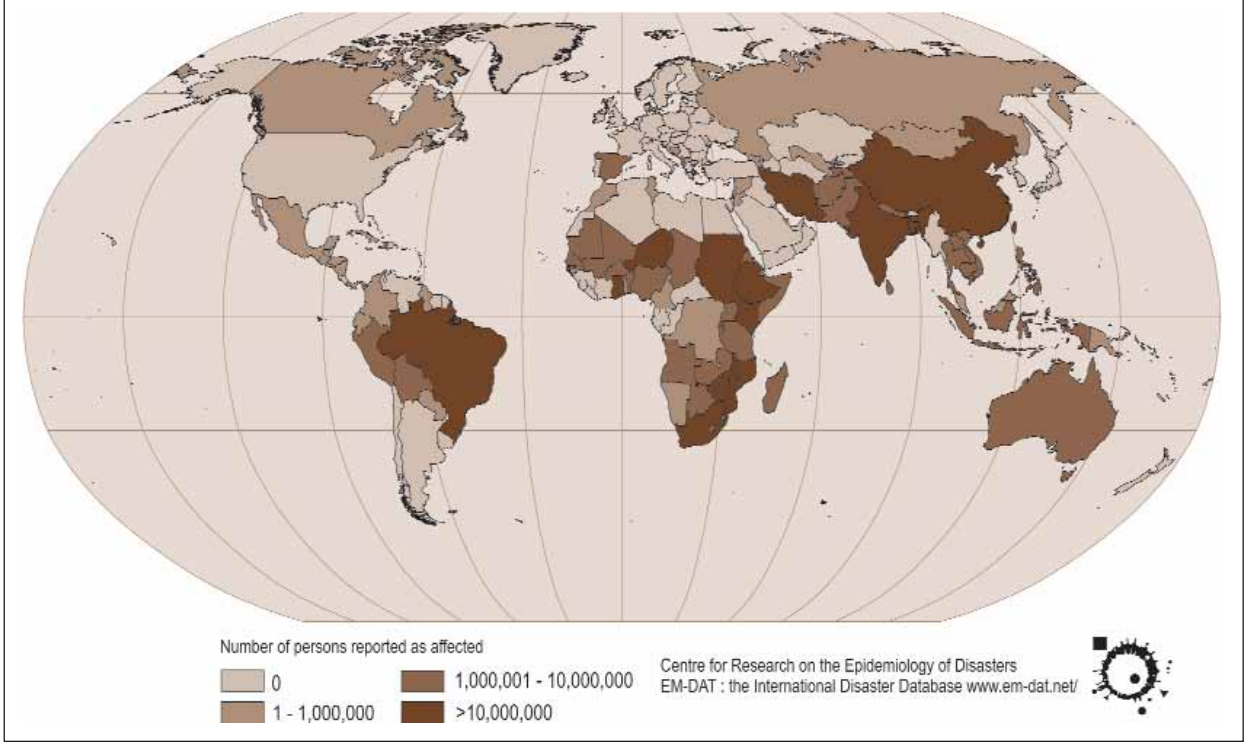
Considerable progress is being made in drought monitoring, mitigation, and preparedness policies and practices in many countries. Collaboration with countries experienced in drought risk reduction and interaction with regional and international initiatives can contribute to the development of a knowledge network to reduce the effects of drought.

Figure 3
Number of drought disasters reported by country: 1970-2006



Source: CRED CRUNCH newsletter, December 2006, Centre for Research on the Epidemiology of Disasters, Brussels, Belgium; http://www.em-dat.net/documents/CRED%20CRUNCH%207%20-%20December%202006.pdf

Figure 4
Number of persons reported affected by drought disasters: 1970-2006



Source: CRED CRUNCH newsletter, December 2006, Centre for Research on the Epidemiology of Disasters, Brussels, Belgium; http://www.em-dat.net/documents/CRED%20CRUNCH%207%20-%20December%202006.pdf

II

Drought Definition and Typology

Drought is a natural part of climate, although it may be erroneously considered as a rare and random event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. Drought is a temporary aberration; it differs from aridity, which is restricted to low rainfall regions and is a permanent feature of climate.

A broad definition of drought is a deficiency of precipitation over an extended period of time, usually a season or more, which results in a water shortage for some activity, group, or environmental sectors. However, in terms of typologies, droughts are commonly classified as meteorological, agricultural, hydrological, and socio-economic (Figure 5).

Meteorological drought is a natural event that results from climatic causes, which differ from region to region. Agricultural, hydrological, and socio-economic drought, however, place greater emphasis on the human or social aspects of drought. They highlight the interaction between the natural characteristics of meteorological drought and human activities that depend on precipitation to provide adequate water supplies to meet societal and environmental demands.

Meteorological drought is usually defined by a precipitation deficiency over a pre-determined period of time. The thresholds chosen, such as 50 percent of normal precipitation over a six-month time period, will vary by location according to user needs or applications.

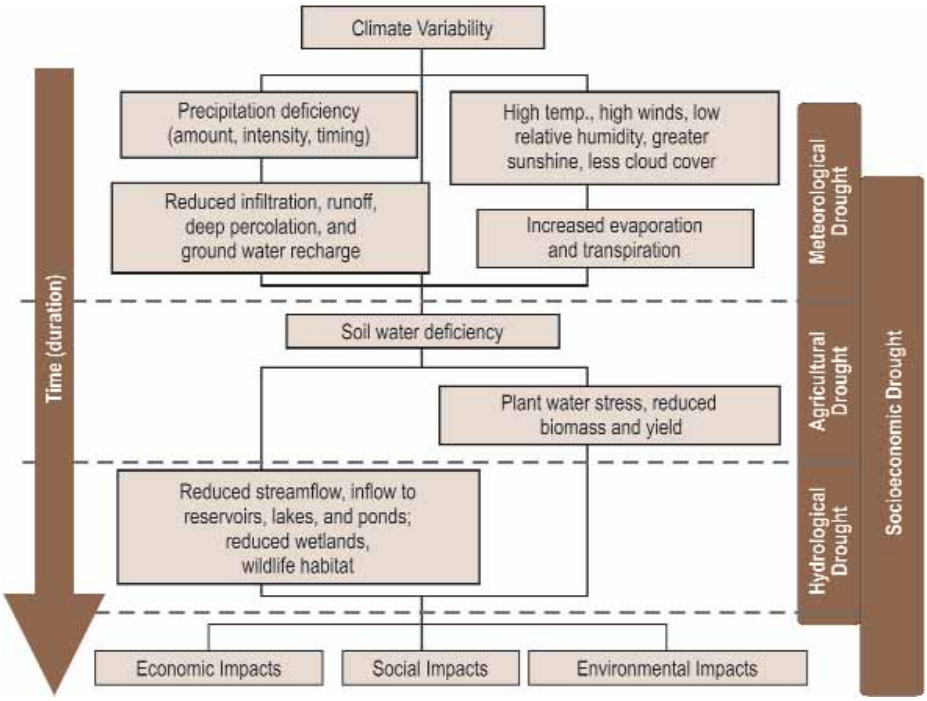
Agricultural drought is defined more commonly by the lack of availability of soil water to support crop and forage growth than by the departure of normal precipitation over some specified period of time.

The relationship between precipitation and infiltration of precipitation into the soil is often not direct. Infiltration rates vary depending on antecedent moisture conditions, slope, soil type, and the intensity of the precipitation event. Soil characteristics also differ. For example, some soils have a higher water-holding capacity, which makes them less vulnerable to drought.

Hydrological drought is normally defined by deficiencies in surface and subsurface water supplies relative to average conditions at various points in time through the seasons.

Like agricultural drought, there is no direct relationship between precipitation amounts and the status of surface and subsurface water supplies in lakes, reservoirs, aquifers, and streams because these hydrological system components are used for multiple and competing purposes, such as irrigation,

Figure 5
Relationships between meteorological, agricultural, hydrological, and socio-economic drought



Source: National Drought Mitigation Center, University of Nebraska-Lincoln, USA

recreation, tourism, flood control, transportation, hydroelectric power production, domestic water supply, protection of endangered species, and environmental and ecosystem management and preservation. There is also a considerable time lag between departures of precipitation and the point at which these deficiencies become evident in surface and subsurface components of the hydrologic system.

Socio-economic drought differs markedly from the other types of drought because it reflects the relationship between the supply and demand for some commodity or economic good (such as water, livestock forage, or hydroelectric power) that is dependent on precipitation. Supply varies annually as a function of precipitation or water availability. Demand also fluctuates and is often associated with a positive trend as a result of increasing population, development, and other factors.

The relationship between these types of drought is illustrated in Figure 5. Agricultural, hydrological, and socio-economic drought occur less frequently than meteorological drought because impacts in these sectors are related to the availability of surface and subsurface water supplies. It usually takes several weeks before precipitation deficiencies begin to produce soil moisture deficiencies leading to stress on crops, pastures, and rangeland. Continued dry conditions for several months at a time bring about a decline in streamflow and reduced reservoir and lake levels and, potentially, a lowering of the groundwater table.

When drought conditions persist for a period of time, agricultural, hydrological, and socio-economic drought occur, producing associated impacts. During drought, not only are inflows to recharge surface and subsurface supplies reduced, but demand for these resources increases dramatically as well.

As illustrated in Figure 5, the direct linkage between the main types of drought and precipitation deficiencies is reduced over time because water availability in surface and subsurface systems is affected by how these systems are managed. Changes in the management of these water supplies can either reduce or aggravate the effects of drought. For example, the adoption of appropriate tillage practices and planting more drought-resistant crop varieties can diminish the effect of drought significantly by conserving soil water and reducing transpiration. Therefore, the effects of drought are a product of both the physical nature of the hazard and our ability to manage risk.

III

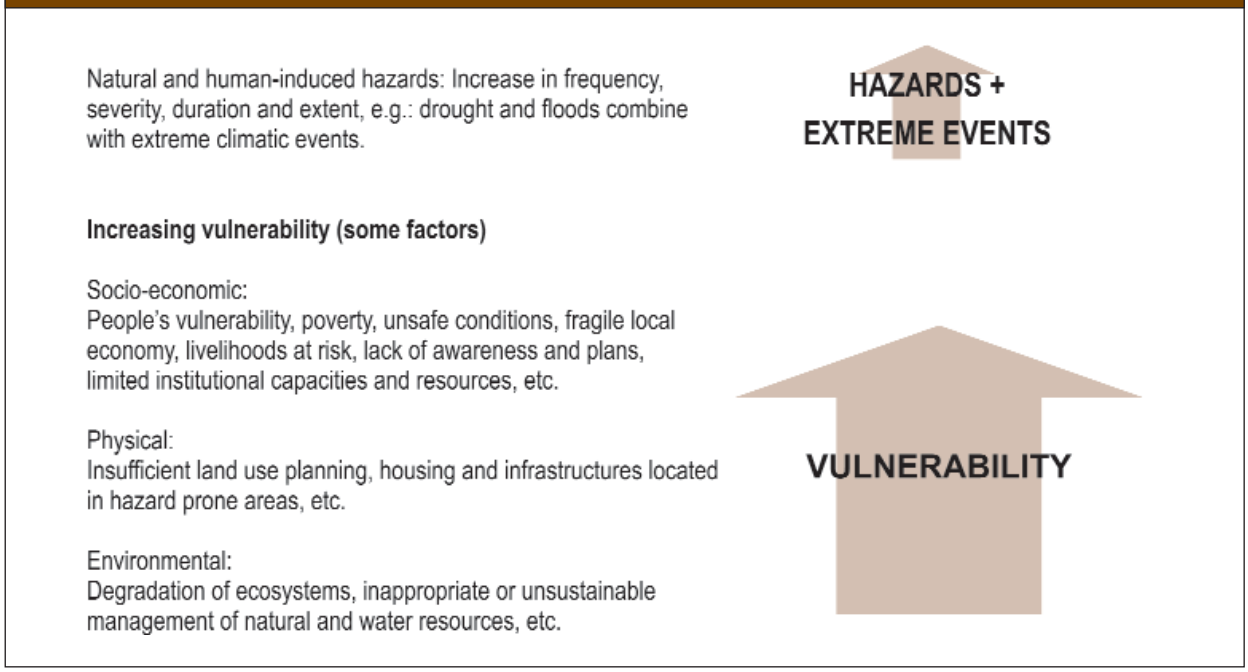
Understanding Drought Risk and Vulnerability

The risk associated with drought for any region or group is a product of the exposure to the natural hazard and the vulnerability of the society to the event (Figure 6). The ISDR definition for vulnerability is "The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards" http://www.unisdr.org/ terminology) Therefore, leaders and planners in drought-prone regions should conduct risk assessments to both better understand the drought hazard and identify the factors and processes concerning who and what is most at risk to drought and why.

Exposure to drought varies regionally and over time, and there is little, if anything, that can be done to alter its occurrence. However, it is critically important for scientists to understand and communicate the probability of drought events of various levels of intensity and duration. It is also essential to understand precipitation and temperature trends, including changes in variability, because these key meteorological variables may indicate potential changes in the frequency and severity of future drought episodes.

Recently, the Intergovernmental Panel on Climate Change (IPCC) released the report on "Climate Change 2007: Impacts, Adaptation and Vulnerability" which confirms that our atmosphere is warming, a trend that will have impact on the frequency and severity of some natural hazards, such as drought. The report informs that recent climate changes and variation are beginning to have effects on many natural and human systems. For example in the Sahelian region of Africa, warmer and drier conditions have led to a reduce length of growing season with detrimental effects on crops. In southern Africa, longer dry seasons and more uncertain rainfall are prompting adaptation measures. The report also informs that drought affected areas will likely increase in extent. Source: http://www.ipcc-wg2.org/index.html. Climate change is therefore, an important factor to be considered in drought risk analysis.

Figure 6
Global trends and risk components



Source: The International Strategy for Disaster Reduction

Drought by itself does not trigger an emergency. Whether it becomes an emergency or not depends on its effect on local people, communities and society, and this, in turn, depends on their vulnerability to the stress of the drought.

People's vulnerability to drought is complex. Drought results in substantial effects in both developing and developed countries, but the characteristics of these effects differ considerably. The ability to cope with drought also varies considerably from country to country and from one region, community, or group to another. Therefore, a vulnerability profile, including analysis of vulnerability factors, is an invaluable tool in assessing local risk. The vulnerability profile is a cornerstone of drought risk reduction planning.

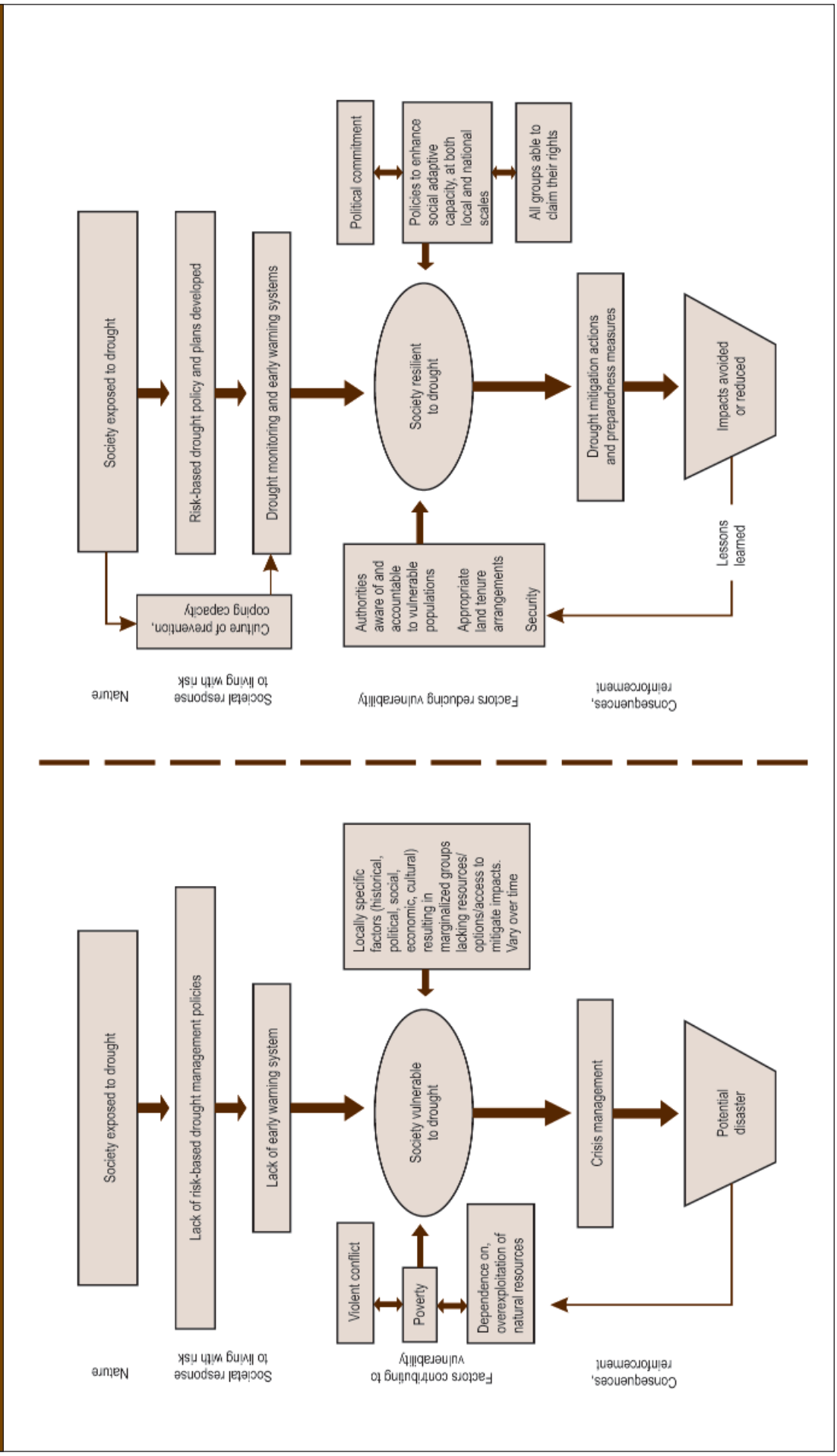
A complete vulnerability analysis requires an assessment of both the macro and micro contexts, and of local people's response to that context. For example, the effect of drought in southern Africa must consider the context of violent conflict in some areas, a major health crisis in the form of the HIV/AIDS pandemic, and deepening poverty in many parts of the region. Added to this are well-documented cases of damaging policies, such as the mismanagement of strategic grain reserves and slowness in international relief operations. This macro context has resulted in large number of people who are now more vulnerable to the drought than they were ten years ago. The micro context varies, of course, from one location to another.

Micro and macro contexts are also important in developed countries such as the United States, Canada, and Australia, where droughts have resulted in widespread and severe effects in many sectors. In these instances, greater institutional capacity and resources are available to monitor, prepare for, and respond to drought, but the effects are still devastating to individual families' livelihoods, as well as to the environment and social fabric of local communities.

To understand what is happening at the micro level requires an understanding of local livelihoods and of coping strategies and capacities. How diverse and drought-resistant are local people's livelihoods? How strong is their asset base to tide them over during a prolonged period of drought? What claims can the most vulnerable groups make on those groups that are not as vulnerable? Understanding these dynamics is essential in understanding vulnerability, the likely effect of drought, and appropriate responses.

One way to better understand vulnerability is through a livelihoods approach, especially if it

Figure 7
Characteristics of drought vulnerable and drought resilient societies



Source: modified from Drought: Living with Risk, UNISDR, 2003 at http://www.unisdr.org/droughts-doc

captures both macro and micro factors and long-term trends that affect vulnerability and the impact of short-term shocks. Much work has been done by operational agencies and by researchers to develop various livelihoods frameworks, to make sense of the complex ways in which individuals, households, and communities achieve and sustain their livelihoods, and the likely impact of an external shock like drought on both lives and livelihoods.

The essence of a livelihoods approach is that it puts people at the center of the analysis and is cross-sectoral, taking into account economic, political, and cultural factors. Understanding the asset base is also crucial, including physical assets such as land and livestock, human capital, and social capital. Generally speaking, the stronger and more diverse the household's asset base, the more drought-resilient it is likely to be and the greater its ability to switch between different livelihood strategies.

There are subtle differences between the various agencies' frameworks for analyzing and understanding livelihoods. Those that focus on the macro context and political factors are stronger in incorporating power relationships that are often underplayed.

Nevertheless, a livelihoods framework offers a valuable tool for assessing vulnerability by taking all these factors into account, and thus for understanding the potential and actual effects of drought on people.

Overall, drought risk assessment must consider both an improved understanding of the natural hazard and human exposure to this climatic extreme, as well as a better understanding of the micro and macro context of people's vulnerability to drought. With this understanding, enhanced drought mitigation, preparedness, and response measures can be identified and implemented to create a more drought resilient society.

Figure 7 illustrates the differences between a society vulnerable to drought and a society resilient to drought, taking into consideration societal behaviour, vulnerability factors, and consequences.

IV

Main Elements for a Drought Risk Reduction Framework and practices

The elements for a drought risk reduction framework can be summarized in four main areas of endeavour (Figure 8), all of which consider priorities of the UN International Strategy for Disaster Reduction, the Hyogo Framework for Action, regional strategies, and thematic risk reduction documents:

1. **Policy and governance** as an essential element for drought risk management and political commitment.

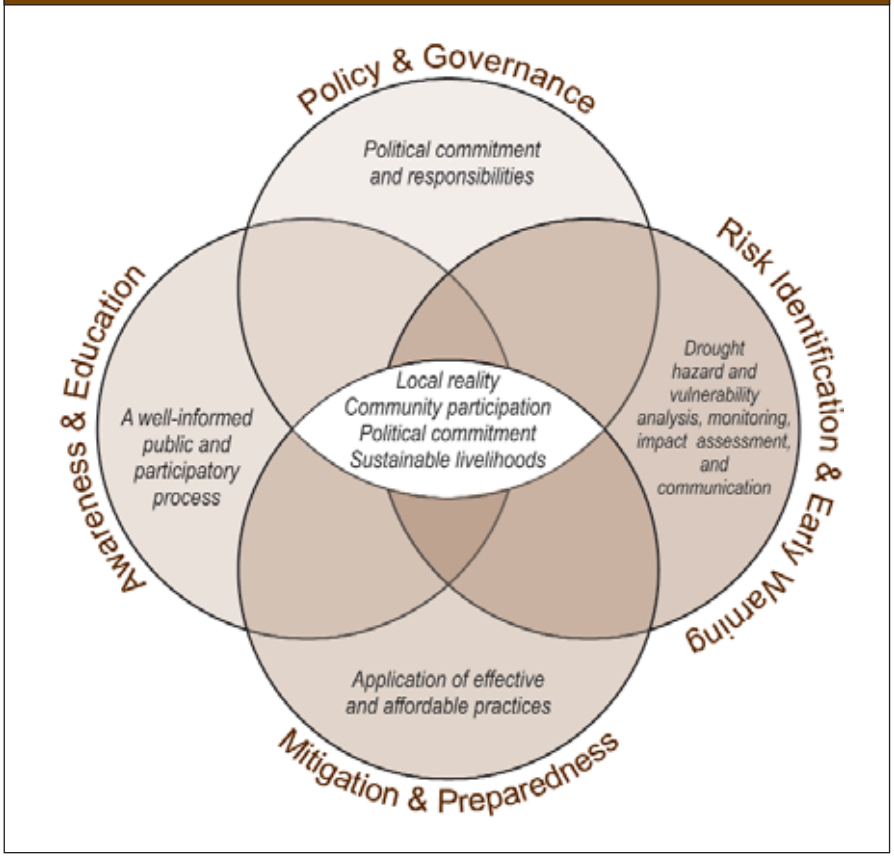
2. **Drought risk identification, impact assessment, and early warning,** which includes hazard monitoring and analysis, vulnerability and capability analysis, assessments of possible impacts, and the development of early warning and communication systems.

3. **Drought awareness and knowledge management** to create the basis for a culture of drought risk reduction and resilient communities.

4. **Effective drought mitigation and preparedness measures** to move from policies to practices in order to reduce the potential negative effects of drought.

All of these elements need strong political commitment, community participation, and consideration of local realities and indigenous knowledge. The international and regional communities also play an important role in coordinating activities, transferring knowledge, supporting project implementation, and facilitating effective and affordable practices.

Figure 8
Proposed main elements for Drought Risk Reduction Framework



Source: ISDR secretariat and National Drought Mitigation Centre, University of Nebraska-Lincoln, USA

4.1 Policies and Governance for Drought Risk Reduction

Related to Priority 1 of the Hyogo Framework for Action:
To ensure that drought risk reduction is a national and local priority with a strong institutional basis for implementation.

People and institutions at the apex of political power need to be fully aware of the danger that drought poses, aware of the hardship it creates for people whose livelihoods are vulnerable to drought, and committed to disseminating information and implementing policies to help reduce human suffering and environmental degradation. Often, people at all levels of government in both developed and developing countries are preoccupied with other faster-moving, seemingly more urgent problems, until drought strikes, at which point it is difficult to implement change.

Building drought resilience thus needs to be part of other long-term considerations and an integral part of policies related to agriculture, water, food security, and hazard planning. Ideally, national policies to create drought resilience work in accord with community-based policies and practices, encouraging practices that reduce vulnerability to drought. All this requires sustainable policies and governance, which may necessitate capacity development to foster meaningful participation in policy and planning processes.

Guiding Principles

The development of national and local strategies for reducing drought risk, together with the implementation of such a strategy, should be guided by the following principles:

1. Political commitment, strong institutions, and appropriate governance are essential for integrating drought risk issues into a sustainable development and disaster risk reduction process,
2. A bottom-up approach with community participation, both in decision making and implementation, is essential to move from policies to practices,
3. Capacity building and knowledge development are often required to help build political commitment, competent institutions, and an informed constituency,
4. Drought policies should establish a clear set of principles or operating guidelines to govern the management of drought and its impacts as well as the development of a preparedness plan that lays out a strategy to achieve these objectives,
5. Drought policies and plans should emphasize mitigation and preparedness rather than relying solely on drought relief,
6. Drought monitoring, risk assessment, and the identification of appropriate risk reduction measures are principle components of a drought policy and plan,
7. Policy mechanisms to ensure that drought risk reduction strategies are carried out should be developed and enforced,
8. Sound development of long-term investment in mitigation and preparedness measures is essential to reduce the effects of drought.

4.1.1 Building Political and Public Alliances

Political commitment, strong institutions, and appropriate governance are essential for building and maintaining the necessary support to formulate drought policies, and for integrating drought risk issues into a sustainable development and disaster risk reduction process. Drought policy making is a long-term commitment that should complement long-term sustainable development and other disaster planning efforts, such as meeting the United Nations Millennium Development Goals (MDGs).

The MDGs include eradicating extreme poverty and hunger, achieving universal primary education, promoting gender equality and empowering women, reducing child mortality, improving maternal health, combating diseases, ensuring environmental sustainability, and developing a global partnership for development (www.un.org/millenniumgoals).

Community participation, both in decision making and implementation, is also essential in order to move from policies to practices. Participation is required to develop policies and strategies that are relevant, feasible, and equitable at the local level. It may also help create a larger sense of "community" ownership among stakeholders that will foster commitment and responsibility when implementing drought policy. Developing an effective drought risk reduction strategy and implementing it in practical actions requires the contribution and coordination of organizations and institutions at all levels. Each has a particular function for which it is responsible and accountable.

A. **Communities**, particularly those that are most vulnerable, are key to people-centred drought risk reduction strategies and actions. Their indigenous knowledge and ability to cope with drought and to respond will ultimately determine the extent of risk and drought impact. They should be aware of drought hazards and the related effects to which they are exposed and be able to take specific actions to minimize the threat of loss or damage. Local communities also promote the use of traditional knowledge and know-how.

B. **Local governments** usually have direct responsibilities for citizen safety and considerable knowledge of the hazards to which their communities are exposed. They must be actively involved in the design and implementation of drought risk reduction programs and projects, and understand all advisory and warning information received in order to be able to advise, instruct, or engage the local population in a manner that increases their safety and reduces the possible loss of resources and livelihoods on which the community depends. Local government also serves as the interface between local and national governments.

C. **National governments** are responsible for policies and frameworks (including the Hyogo Framework for Action) that facilitate drought risk reduction practices, as well as the technical systems required for preparing and issuing timely warnings. National governments ensure coordination among different line ministries as well as with bilateral and multilateral partners through national platforms for disaster risk reduction (http://www.unisdr.org/guidelines-np-eng) and other existing mechanisms. They have responsibility at the national level to ensure the implementation of policies, develop mitigation and preparedness measures, and ensure that transition warnings and related responses address all of the population, particularly the most vulnerable. They also provide support to local governments and communities to develop coping capabilities and to translate drought risk policies into local drought risk reduction practices.

D. **Regional institutions and organizations** provide specialized knowledge and advice in support of national efforts to develop or sustain coping and operational capabilities of countries that share a common drought-prone geographical environment. Regional organizations are crucial to linking international capabilities to the particular needs of individual countries and in facilitating effective drought risk reduction practices among adjacent countries in regard to transboundary disaster risk reduction issues and response (e.g., drought-triggered refugees).

E. **International bodies and bilateral entities** provide support for national drought risk reduction programs and projects and foster the exchange of data and knowledge between countries. Support may include provision of advisory information, technical assistance, and policy and organizational support necessary to ensure the development of the operational capabilities of national authorities or agencies

responsible for disaster and drought risk reduction. International partners mobilize technical and financial resources to support the preparation, ratification, implementation, and review of global agreements such as the Hyogo Framework for Action, MDGs, and MEAs. Some international partners are considered neutral advocates on critical issues of national and global importance.

F. **Civil society** plays a critical role in raising awareness among individuals and organizations involved in disaster risk reduction and in the implementation of drought risk reduction policies and practices, particularly at the community level. This includes religious leaders and organizations that have a very powerful voice in communities and can help in raising awareness and public information dissemination. In addition, these individuals and groups play an important advocacy role to help ensure that drought risk stays on the agenda of government policy makers. Some actions promoted by NGOs are at the cutting edge of people-centred drought risk reduction practices. They sometimes have some level of flexibility in accessing funding and developing and implementing new pilot strategies that can inform national and global drought risk reduction policy and practice.

G. **The private sector** has a diverse role to play in disaster and drought risk reduction, including developing coping capabilities within their own organizations. In addition, the private sector has a large untapped potential to help provide skilled services in the form of technical resources, know-how, and donations (in-kind and cash) of goods or services, especially for the communication and dissemination of mitigation and preparedness measures, as well as to develop and communicate early warnings to reduce drought impacts. Positive contributions and interventions of the private sector that augment and comply with international best practices are encouraged.

H. **The media** plays an important role in improving the "disaster reduction consciousness" of the general population and disseminating early warnings. In many cases, the media is the primary means of communication between policy makers, practitioners, and the public. In this regard, the media carries a great responsibility to serve the needs of their audiences, and policy makers and practitioners are tasked with improving ways to formulate messages that are "newsworthy" and attract the media.

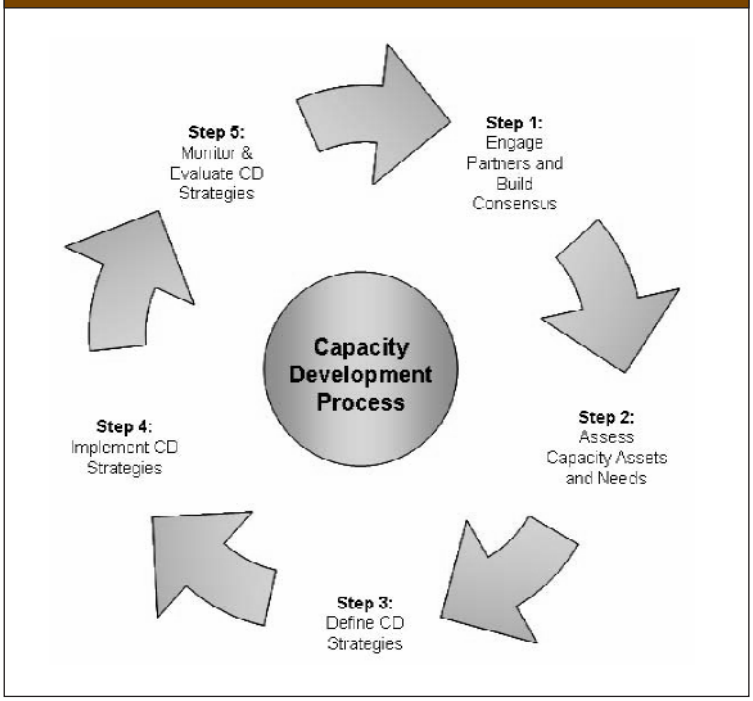
I. **The scientific community** has a central and critical role in providing specialized scientific and technical input to assist governments and communities in drought risk reduction. Their expertise is fundamental to analyzing natural hazard risks facing communities; identifying and analyzing vulnerability of people and livelihoods; supporting the design of scientific and systematic monitoring, communications, and warning services; supporting data exchange; translating scientific or technical information into comprehensible messages; and disseminating understandable warnings to those at risk. Scientists also analyze and promote the use of traditional knowledge as well as the transfer and adaptation of appropriate technology. They assess, promote, and further develop a body of knowledge based on lessons learned from concrete experiences in the field.

4.1.2 Capacity Development

In the Hyogo Framework for Action, capacity development is noted to be a cross-cutting element for disaster risk reduction. It is recognized as a central and critical issue for sustainable development and for disaster risk reduction, though how to promote and carry out capacity development in practice at all levels is a challenge.

According to the ISDR's International Task Force for Disaster Reduction, "Current conceptual approaches conceive capacity building at three different levels. At the individual and group level, capacity building refers to the process of changing attitudes and developing skills while maximizing the benefits of participation and knowledge exchange. At the institutional level, capacity building concentrates on organizational performance and functional capabilities. In recent years, increased emphasis has also been placed on a third level, the systemic dimension of capacity development, with emphasis on the overall policy framework in which individuals and organizations interact with the environment." (www.undmtp.org/Documents/DMTP%20CB%20Concept%20Paperv8.pdf)

Figure 9
UNDP Capacity Development Process



Source: J. Colville and K. Wignaraja, Capacity Assessment Practice Note, UNDP http://www.capacity.undp.org/).

To further advance innovation and exchange and the integration of capacity issues and measures into disaster risk reduction, in 2007, the ISDR, United Nations Development Programme's (UNDP) Bureau for Crisis Prevention and Recovery and the UN Office for Coordination of Humanitarian Affairs created the Capacity for Disaster Reduction Initiative (CADRI) (www.undmtp.org).

CADRI will strengthen the focus on the research and practice of capacity development for disaster risk reduction, closely linked to the implementation of the Hyogo Framework of Action and in support of the work of the ISDR system (http://www.unisdr.org/isdr-system). The capacity development process is described in Figure 9.

CADRI's areas of emphasis and support will include capacity assessment for planning and programming, and the documentation, dissemination and exchange of capacity enhancement strategies and processes (e.g., learning and training, methodologies for promoting local ownership and engagement, leadership development, institutional strengthening, and networking for DRR higher (tertiary) education. See also title 4.3.3 on Education and Training.

Greater emphasis on how to effectively utilize and enhance local and national capacities will foster an environment that is more conducive to developing effective drought risk reduction and other sustainable development strategies.

4.1.3 Components of a Drought Policy

A drought policy can take many forms, such as a legislative act, a planning document, a group of related programs, or an informal understanding among collaborators. Nonetheless, the goal in developing any drought policy is that it should establish a clear set of principles or operating guidelines to govern the management of drought and its impacts as well as the development of a preparedness plan that lays out a strategy to achieve these objectives.

A drought policy should consider the main elements of the proposed drought risk reduction framework (Chapter IV), networks and mechanisms (Chapter V), and resource availability.

As their foundation, drought policies and plans should emphasize mitigation and preparedness rather than relying solely on crisis management, which has been the primary focus in the past. Drought response efforts are essential, but many actions can be implemented before a drought occurs to reduce the potential effects on people, livelihoods, and the environment.

Drought identification, monitoring, vulnerability analysis (risk identification), and risk management are the cornerstones of drought mitigation and preparedness plans. A drought monitoring system can provide a historical record to assess changing conditions and provide early warnings of potential threats to people and activities at risk. Risk identification will help to determine regions, population groups, and economic and environmental sectors most vulnerable to the effects of drought, so that risk management actions can be identified and implemented to reduce those risks.

Ultimately, preparedness plans will improve coordination within and between levels of government; procedures for monitoring, assessing, and responding to water shortages; information flow to primary users; and efficiency of resource allocation. The goals of these plans are to reduce water shortage impacts, personal hardships, and conflicts between water and other natural resource users. These plans should promote self-reliance by systematically addressing issues of principal concern to the region or nation in question.

Mechanisms to ensure that drought risk reduction strategies are carried out should be developed and enforced. Creating a drought policy is one task; ensuring the actions identified in the policy are implemented is another task. Political and financial investment in mitigation and preparedness measures

Figure 10
The ten-step drought mitigation planning process, developed by the National Drought Mitigation Center

The 10-step drought mitigation planning process was originally created with U.S. states in mind, but it has been modified extensively to include the experiences and lessons learned from many other developed and developing nations. In response to greater interest in drought preparedness planning, it has evolved to emphasize drought risk assessment and mitigation tools. The 10-step process has been the basis for discussions at regional training workshops and seminars on drought preparedness and management.

1. Appoint a drought task force or committee
2. State the purpose and objectives of the drought mitigation plan
3. Seek stakeholder input and resolve conflicts
4. Inventory resources and identify groups at risk
5. Prepare and write the drought mitigation plan
6. Identify research needs and fill institutional gaps
7. Integrate science and policy
8. Publicize the drought mitigation plan and build awareness and consensus
9. Develop education programs
10. Evaluate and revise drought mitigation plans

Source: National Drought Mitigation Center, University of Nebraska-Lincoln, USA

are essential to reduce the effects of drought. Investing in the prevention of drought impacts is more humane and cost-effective than only dealing with them after they have occurred.

There are guides available to help national, provincial, and local planners in formulating drought policies and plans, such as the 10-Step Drought Planning Process (Figure 10). This guide has been used as the basis for drought plans by community, provincial, and national governments around the world.

4.1.4 National Drought Policy Case Studies

Because of an increased understanding of the effects of drought on people and livelihoods, a greater emphasis on disaster mitigation, and the development of model drought planning processes, an increasing number of nations have begun developing drought policies over the last two decades.

Case: Australia National Drought Policy

Australia developed a national drought policy in 1992 based on recommendations from the country's Drought Policy Review Task Force. Although the drought policy has been revised over the years, it primarily focuses on improving self-reliance and minimizing the need for government intervention by promoting the implementation of pro-active risk management strategies.

The policy stresses risk management and preparedness rather than disaster response, given the propensity of the Australian climate toward drought. Risk management assistance was initially provided through the main agricultural program, the Rural Adjustment Scheme.

Under this policy, officials decided when an area was experiencing "exceptional circumstances" in terms of weather and at what point financial support became available. The Rural Adjustment Scheme also stressed improved risk management by encouraging farmers to have financial reserves for times of crisis. In 1997, this scheme was replaced with new programs under the umbrella Agriculture-Advancing Australia, although the new programs are very similar to the ones they replaced.

The Australian government is still striving to make the policy more efficient, equitable, and cost-effective.

Source: National Drought Policy, Wilhite et al, Drought and Water Crises: Taylor and Francis, 2005.

Case: South Africa Drought Policy

South Africa has invested a great deal of time and effort into developing a cohesive national drought policy. These efforts were accelerated by the development of the National Consultative Forum on Drought in the early 1990s, which brought more stakeholders to the planning table and allowed more sectors to be included in drought planning efforts.

These efforts resulted in new drought policies that strove to encourage risk management, assist farmers financially, protect natural resources, promote the best use of resources for individual farmers, and help farmers maintain a nucleus breeding herd during a drought. With this policy, farmers must adopt specific resource conservation and long-term sustainability measures, such as adherence to established grazing capacities, to be eligible for financial aid. An agricultural risk insurance bill was also developed in 2002 that sought to supplement agricultural producers' incomes for those most susceptible to crop and livestock losses from natural disasters.

The country's primary challenge has become the maintenance of a policy balance between encouraging a risk management approach for large agricultural enterprises and providing a safety net for the resource-limited sectors of the population.

Source: National Drought Policy, Wilhite et al, Drought and Water Crises: Taylor and Francis, 2005.

Case: National Drought Policy of Namibia

When introducing a package of short-term drought relief measures in May 1995, the government simultaneously established a task force to draw up a national emergency and long-term drought management policy. This was done in recognition of the fact that Namibia is an arid country where dry years are the norm. Declaring drought too frequently is expensive for the government, can create dependency among aid recipients, and can promote resource degradation through inappropriate assistance.

The Task Force convened several consultations since 1996 until the endorsement of the national drought policy by the government in 2005.

Components of a Drought Risk Reduction Policy and Plan

A drought policy should establish a clear set of principles or operating guidelines to govern the mitigation and management of drought and its impacts as well as the development of a preparedness plan that lays out a strategy to achieve these objectives.

A national policy and plan shall specify the respective roles of government, local communities and land users, and the resources available and required to implement appropriate drought risk reduction activities. Although drought policies will vary to reflect local needs, drought risk reduction and preparedness policies should also address the following concepts:

1. Provide for effective participation at the local, national, and regional levels of non- governmental organizations and populations (both women and men) in policy planning, decision making, and implementation and review of national action programs;

2. Be rooted in thorough vulnerability, risk, capacity, and needs assessments, highlighting the root causes of the issues related to drought at national, sub-national, local, and trans-boundary scales;

3. Focus on strengthening the capacities of governments and communities to identify, assess, and monitor drought risks at national and sub-national levels for effective development planning, including strengthening of people-centred early warning systems and preparedness;

4. Incorporate both short- and long-term strategies to build the resilience of governments and communities to reduce the risks associated with drought, emphasize implementation of these strategies, and ensure they are integrated with national policies for sustainable development;

5. Link drought early warning indicators with appropriate drought mitigation and response actions to ensure effective drought management;

6. Allow for modifications to be made in response to changing circumstances and be sufficiently flexible at the local level to cope with different socio-economic, biological and geo-physical conditions;

7. Promote policies and strengthen institutional frameworks which develop cooperation and coordination, in a spirit of partnership, between the donor community, governments at all levels, local populations, and community groups, and facilitate access by local populations to appropriate information and technology;

8. Designate agencies and stakeholders responsible for carrying out drought mitigation and response actions, and require regular review of, and progress reports on, their implementation.

9. Strengthen drought preparedness and management, including drought contingency plans at the local, national, sub-regional and regional levels, which take into consideration seasonal to inter-annual climate predictions.

Source: UNDP, National Drought Mitigation Center, UNCCD, and ISDR secretariat, 2007

Namibia's drought policy is concerned with developing an efficient, equitable and sustainable approach to drought management. The policy aims to shift responsibility for managing drought risk from government to the farmer, with financial assistance and food security interventions only being considered in the event of an extreme or 'disaster' drought being declared.

The thrust of the policy is a move away from regular financial assistance to large numbers of private-tenure and communal-tenure farmers to measures that support the on-farm management of risk. The Government's involvement with drought will move beyond an exclusive focus on emergency drought programs to a broader, longer term perspective.

Sources: 2nd African Drought Risk and Development Forum Report, Nairobi, 18-18, October, 2006; Republic of Namibia, National Drought Policy and Strategy, 1997.

4.1.5 Provincial Drought Policies

In addition to national drought policies, increased importance has also been placed on provincial and local drought policy and planning, emphasizing self-reliance and drought resilience.

For example, several state governments and American Indian tribes in the United States have developed drought policies and plans. During the widespread U.S. drought of 1976-77, no state had a formal drought plan, and in 1982, only three states had drought plans. But as of October 2006, thirty-seven states had drought plans, two delegated planning to local authorities instead of having a single state-level plan, and two states were in the process of developing a plan. Only nine states did not have formal drought plans. Although the majority of state drought plans focus on drought response activities, a growing number of them are focusing more attention on drought mitigation. These state drought plans are available online at (drought.unl.edu/planstateplans.htm).

Similarly, at least eight American Indian tribes in the United States are in the process of developing drought plans detailing operational guidelines to help them better prepare for and respond to drought on their reservation lands. These are the Hopi Tribe, Hualapai Nation, Kaibab-Paiute Tribe, Navajo Nation, San Carlos Apache Tribe, and Zuni Pueblo in the states of New Mexico and Arizona and the Fort Peck Tribes and Northern Cheyenne Tribe in the state of Montana.

4.1.6 Local Drought Policies

Many communities around the world have also developed local-level drought plans. For example, the city of Melbourne, Australia, has a long history of dealing with drought. Since it was established in 1835, the city has continually faced the challenge of maintaining adequate water supplies for a growing community. However, since the early 1990s, community water planners have become more proactive in developing drought plans and investigating alternative strategies for sustainable living within their environment. For example, Melbourne's metropolitan water retailers, City West Water, South East Water, and Yarra Valley Water, each have a drought response plan that sets out the exact circumstances for introducing and lifting staged water restrictions.

Such examples highlight progress that has been made in developing and implementing drought policies and plans from the community to national levels around the world. However, the litmus test of making progress is whether drought risk reduction investments decrease the vulnerability of households, communities, and the livelihood systems that support them.

Case Study: Hualapai Tribe Drought Planning, United States

The federal Bureau of Reclamation provided funding for the Hualapai Tribe in Arizona, United States, to develop a comprehensive drought plan. The Hualapai Tribe's Department of Natural Resources took the primary lead in developing the plan, but the process ultimately became a collaborative endeavour between several tribal and federal agencies. Community meetings were also held to gather feedback from tribal members throughout the development of the plan.

In developing the plan, the tribe first identified the most vulnerable physical and social sectors of the reservation and tribal population. Based on this understanding, a range of appropriate drought mitigation and response actions were then identified, including the development of a drought early warning system.

The plan is to be reviewed and adapted as necessary on a bi-annual basis. The Hualapai Tribal Council approved and adopted the plan in January 2004 after soliciting comments and review by the cooperating partners. At the request of the Hualapai Tribe, the National Drought Mitigation Center evaluated the Hualapai Drought Plan and conducted a drought exercise to educate tribal members and agency personnel about their roles in implementing the plan, and also to identify potential barriers to the plan's full implementation.

Source: Analyzing Tribal Drought Management, Knutson et al., 2006, www.colorado.edu/hazards/research/qr/qr183/qr183.html

Case: Community Drought Planning, Melbourne, Australia

The availability of water has been instrumental in the development of Victoria. Melbourne was settled in 1835 and the city's first water supply reservoir, Yan Yean, came on line in 1857. Australian colonial officials denied the existence of drought during the late 19th century as part of their efforts to attract more European immigrants.

In the 20th century, drought was treated as something to be fought, cured, or beaten. Many schemes in Victoria tried to "drought-proof" towns, districts, or regions by capturing streamflows, building storages, and managing the distribution of water. Managing water demand during drought involved restrictions designed to curb use and conserve water.

After the severe 1972-73 drought, water restrictions were formalized. In 1975, the Melbourne and Metropolitan Board of Works (Melbourne Water's predecessor) and the State Rivers and Water Supply Commission produced an eight-stage set of restrictions. The 1982-83 drought affected most of eastern Australia, and Stage 6 restrictions were introduced in February 1983. Since then, Victorian water authorities have worked to plan for drought and simplify restrictions.

Today, the Australian government and Melbourne Water recognize that traditional water development approaches are no longer sustainable. Therefore, in the early 1990s, drought-management guidelines were completed for non-metropolitan areas, and in 1995, drought response plans were completed for the newly formed metropolitan retail water companies.
In March 2005, the government introduced permanent water saving rules across Victoria and penalties for breaches. The 2006 Central Region Sustainable Water Strategy also outlines actions to secure water supplies for urban and industrial use to the year 2055 by exploring alternative water sources, such as re-use, recycling, conservation, increasing efficiency, capturing storm water, desalination, and tapping aquifers.

Source: Living with Drought, Melbourne Water, (drought.melbournewater.com.au/Default.asp?bhcp = 1)

4.2 Drought Risk Identification, Impact Assessment, and Early Warning

Related to Priority 2 of the Hyogo Framework for Action:
To identify, assess, and monitor disaster risks and enhance early warning.

A starting point for reducing drought risk and promoting a culture of resilience lies in gaining knowledge about hazard occurrence, the potential effects of the hazard, and the related vulnerabilities of potentially affected people and activities. The latter includes the physical, political, social, economic, and environmental vulnerabilities to drought that most societies face and the ways in which hazards and vulnerabilities are changing in the short- and long-term. Understanding the physical nature of the drought hazard and the corresponding impacts and underlying vulnerabilities, and communicating these dangers in an effective manner, forms the basis for developing informed drought mitigation and preparedness measures to reduce the effect of impact of drought while contributing to drought-resilient societies.

Guiding Principles

Drought risk identification, impact assessment, and early warning activities should be guided by the following principles:

1. Drought risk is a combination of hazard and vulnerability, and managing risk requires understanding these two components and related factors in space and time.
2. Increasing individual, community, institutional, and national capacities can reduce drought vulnerability.
3. Impact assessment plays an important role in drought risk identification and targeting vulnerable groups and sectors during drought.
4. Drought monitoring and early warning systems play an important role in risk identification, impact assessment, and knowledge management.
5. Changing climate and the associated changing nature of drought poses a serious risk to sustainable development, the environment, and society.

4.2.1 Local, National, and Trans-boundary Risk Assessments

Drought risk is based on a combination of the frequency, severity, and spatial extent of drought (the physical nature of drought) and the degree to which a population or activity is vulnerable to the effects of drought. The degree of a region's vulnerability depends on the environmental and social characteristics of the region and is measured by inhabitants' ability to anticipate, cope with, resist, and recover from drought.

Vulnerability to drought can be reduced by increasing individual, community, institutional, and national capacities. This capacity refers to the identification, communication, and reduction of risk, as well as absorbing the effects of drought when they occur. A goal of capacity development should be to enable self-reliance in preparing for and responding to drought.

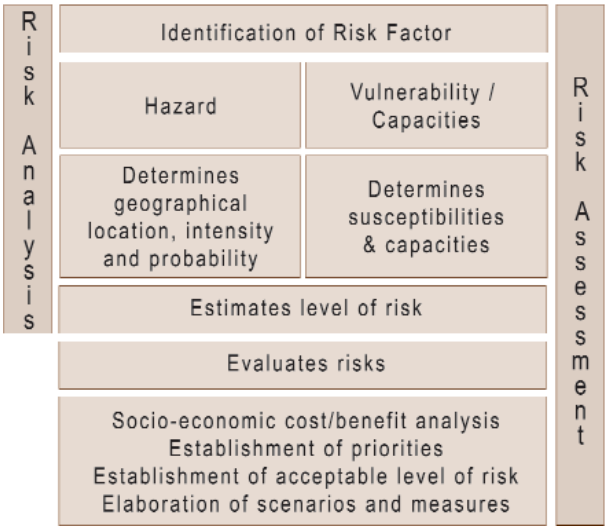
Researchers and practitioners are increasingly promoting the use of consistent terminology and strategies for assessing risk, and analyzing the strengths and weakness of these approaches. A risk assessment process promoted by the ISDR is shown in Figure 11.

The ISDR and several partners (e.g., UN-HABITAT, UNDP [BCPR], OAS, and ADPC) have created the Disaster Risk Assessment Portal (www.wg3dm.org/). This portal provides a forum for members of the disaster management community to exchange tools and case studies related to disaster risk assessment. This type of communication and assessment is essential for helping planners determine appropriate methodologies for assessing risk.

In terms of drought, the National Drought Mitigation Center, USA, has developed a guide, "How to Reduce Drought Risk", to help entities better understand their own drought risk and develop locally based risk reduction measures (www.drought.unl.edu/planhandbook/risk.pdf). This document provides a step-by-step process for self-assessing drought risk and has been used by planners in several countries.

The risk assessment portion of the guide advocates the analysis of the historical frequency, severity, and extent of drought; the identification and ranking of drought-related impacts; and a vulnerability analysis to investigate why the impacts occur. This type of risk assessment identifies the underlying causes of drought impacts, which is essential for identifying effective drought mitigation and response measures.

Figure 11
Components of a risk assessment process



Source: Living with Risk, Chapter 3 http://www.unisdr.org/lwr-2004

4.2.2 Risk Assessment Methodology

Hazard Assessment

The frequency of occurrence of meteorological drought at various levels of intensity and duration defines the drought hazard for drought-prone nations and regions. It is critical for countries to better understand this hazard and how it varies temporally and spatially, and to establish comprehensive and integrated drought early warning systems that incorporate climate, soil, and water supply factors such as precipitation, temperature, soil moisture, snowpack, reservoir and lake levels, ground water levels, and streamflow.

It is also essential to identify trends in temperature and precipitation amounts, changes in the seasonal distribution and intensity of precipitation events, and other changes in climate that might be helpful in understanding how the hazard may change in duration, frequency, and extent in the future.

Drought Impact Assessment

Similarly, understanding trends in drought-related impacts over time is important for projecting future impacts and understanding changing vulnerabilities. Each drought produces a unique set of impacts, depending not only on the drought's severity, duration, and spatial extent but also on ever-changing social conditions.

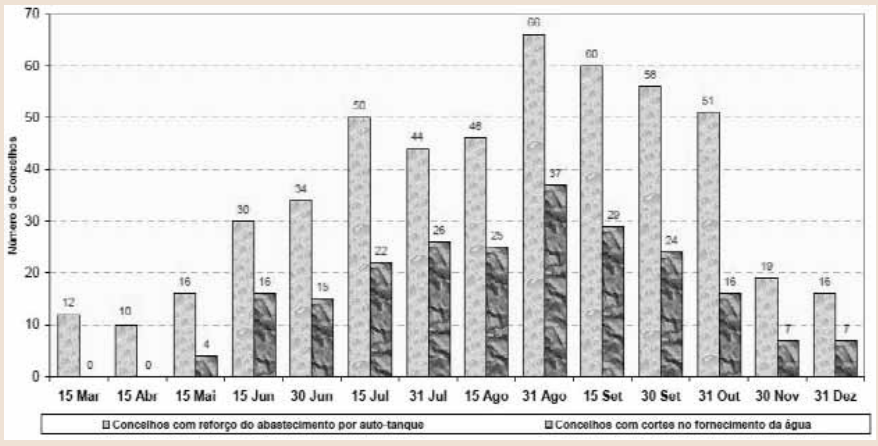
For practical purposes, the drought impacts can be classified as economic, environmental, or social, even though several of the impacts may actually span more than one sector. These impacts are symptoms of underlying vulnerabilities. Therefore, impact assessments are a good starting point to determine underlying vulnerabilities to target response measures

Case Study: Assessing Drought Impacts, Portugal

Portugal was affected by a severe drought in 2004-2005. The government conducted an assessment of impacts that occurred during the drought to better understand the effects of drought on the country, its people, and their livelihoods. The primary impacts identified were related to agriculture and cattle breeding, energy, urban water supply, and forest fires.

For example, the drought caused the drying out of water sources and the loss of their annual replenishing capability. The people and municipalities primarily affected were those with small caption systems in small river basins, or small underground reservoirs. The number of municipalities that were forced to increased water supplies or implement water supply cuts/reductions is listed in Figure 12. This type of impact assessment is essential for identifying vulnerable sectors and populations, and targeting limited resources to high-priority needs.

Figure 12
Number of municipalities with a reinforcement of the transported water suply or cuts/reduction to household supply



Source: Institute of Meteorology, Portugal

during drought. An impact assessment highlights sectors, populations, or activities that are vulnerable to drought.

Drought impact assessments begin by identifying direct consequences of drought, such as reduced crop yields, livestock losses, and reservoir depletion. These direct outcomes can then be traced to secondary consequences (often social effects), such as the forced sale of household assets or land, dislocation, or physical and emotional stress. Impacts should be examined for their occurrence in past or recent droughts, but consideration should also be given to the question "What drought impacts will be seen in the future?" This last question is crucial as populations shift and water demands change.

In the United States, the National Drought Mitigation Center has created a national drought impact database to assist in documenting and understanding the effects of drought. Users can query the Drought Impact Reporter database to search for impacts that are occurring or have occurred in their region (see http://drought reporter.unl.edu). Impacts are grouped by category, such as agriculture, water, energy, environment, fire, social, etc. This type of activity will help planners identify the range of impacts that are important in a region.

For example, in response to severe drought in 1996, the state of New Mexico completed a drought mitigation plan in 1998. To better understand drought impacts within the state, New Mexico organized four impact assessment subgroups representing the sectors most affected by drought in the state, including (1) agriculture, (2) drinking water, (3) wildlife and wildfire protection, and (4) tourism and economic impacts. These subgroups identified the major drought impacts occurring in each sector, although they did not assess how vulnerability is increasing or decreasing.

Another example, after the severe drought in Portugal in 2004-2005, the government conducted an assessment of impacts to better understand drought effects on people and their livelihoods. See case study in the box on page 24.

Although the method of impact data collection may vary by country because of technological, financial, political, and other factors, it is essential that impacts are assessed and archived in some manner. Institutional memory is often short and people's recollections biased. Accurate records of drought impacts will help provide more objective information on which to base planning decisions.
Once a drought impact assessment has been performed, the next step is to rank the highest priority impacts. Drought can result in many direct and indirect impacts. Some of these may be more important than others in terms of values and interests. Addressing the most significant impacts first will help target limited resources and hopefully have a larger effect in reducing drought impacts.

At the provincial level, for example, rankings should take into consideration concerns such as cost, areal extent, trends over time, public opinion, fairness, and the ability of the affected area to recover. To assist in this ranking and ensure equitable policy formulation, the general public, community advisory committees, and groups of relevant scientists and policy makers should be included in the process.

Vulnerability Analysis

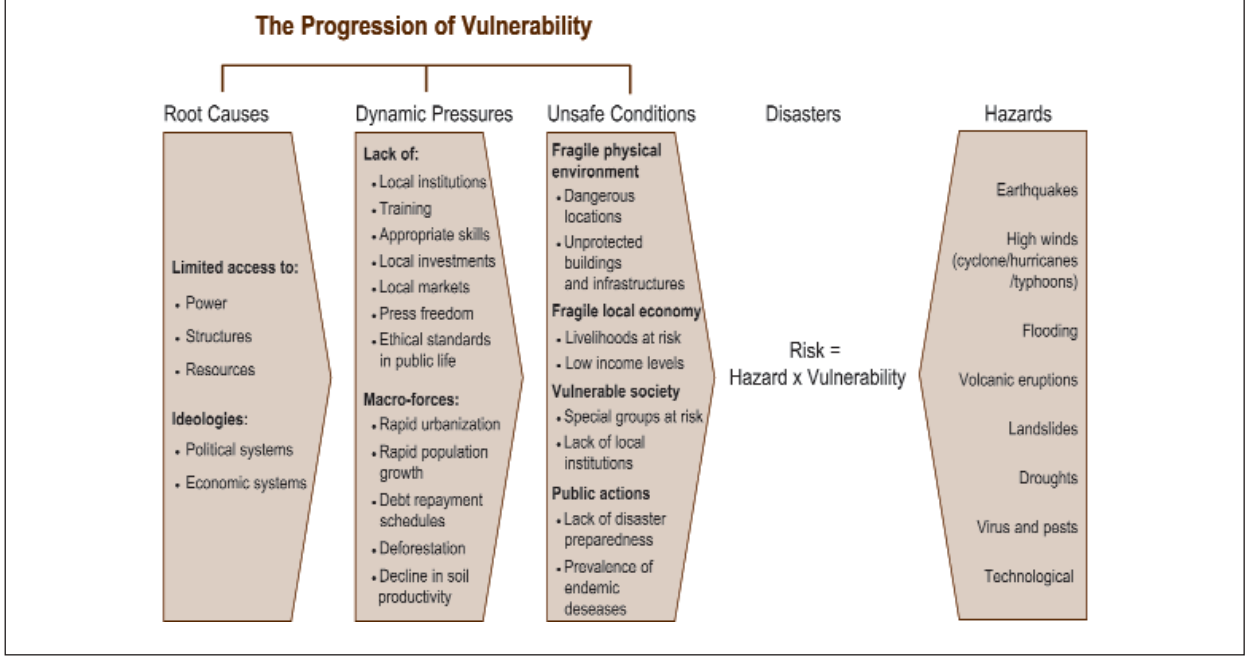
Vulnerability analysis provides a framework for identifying the social, economic, political, physical, and environmental causes of drought impacts. It directs attention to the underlying causes of vulnerability rather than to its result, the negative impacts, which follow triggering events such as drought.

For example, in drought conditions, the direct impact of a lack of precipitation may reduce crop yields. The underlying cause of this impact, however, may be that farmers did not plant appropriate crops because of cultural preference or government incentives, other seeds were unavailable or too expensive, or there was no drought warning. Hence, to conduct a vulnerability analysis, begin asking why significant impacts have occurred (or why they might occur). It is important to realize that a combination of factors (e.g., environmental, economic, and social factors) or underlying causes (e.g., livelihoods at risk, incentive preferences, and inappropriate crops) might produce a given event.

In general terms, Figure 13 illustrates the idea that underlying causes of vulnerability can lead to unsafe conditions that are more susceptible to natural hazards.

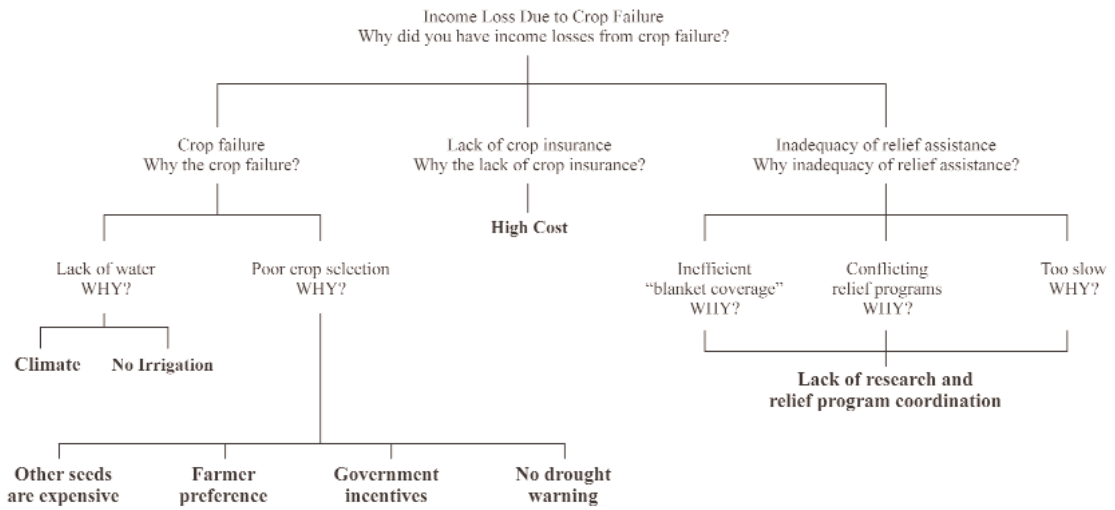
In assessing vulnerability, it might also be beneficial to diagram these causal relationships in some form of a tree diagram. An example of a tree diagram related to income losses due to crop failures is shown in Figure 14. The tree diagram illustrates the complexity of

Figure 13
Risk results from a combination of hazard occurrence and vulnerability to the hazard. There are many underlying causes of vulnerability



Source: Living with Risk at http://www.unisdr.org/lwr-2004

Figure 14
An example of a simplified agricultural impact tree diagram



Notice the boldface items represent the underlying causes of the listed impact. Although these items may be broken down further, this example illustrates the vulnerability assessment process (Source: National Drought Mitigation Center, USA).

understanding drought impacts, and demonstrates that impacts must be examined from several perspectives to expose their true underlying causes. Case studies and scenario building are other ways to better understand drought vulnerability.

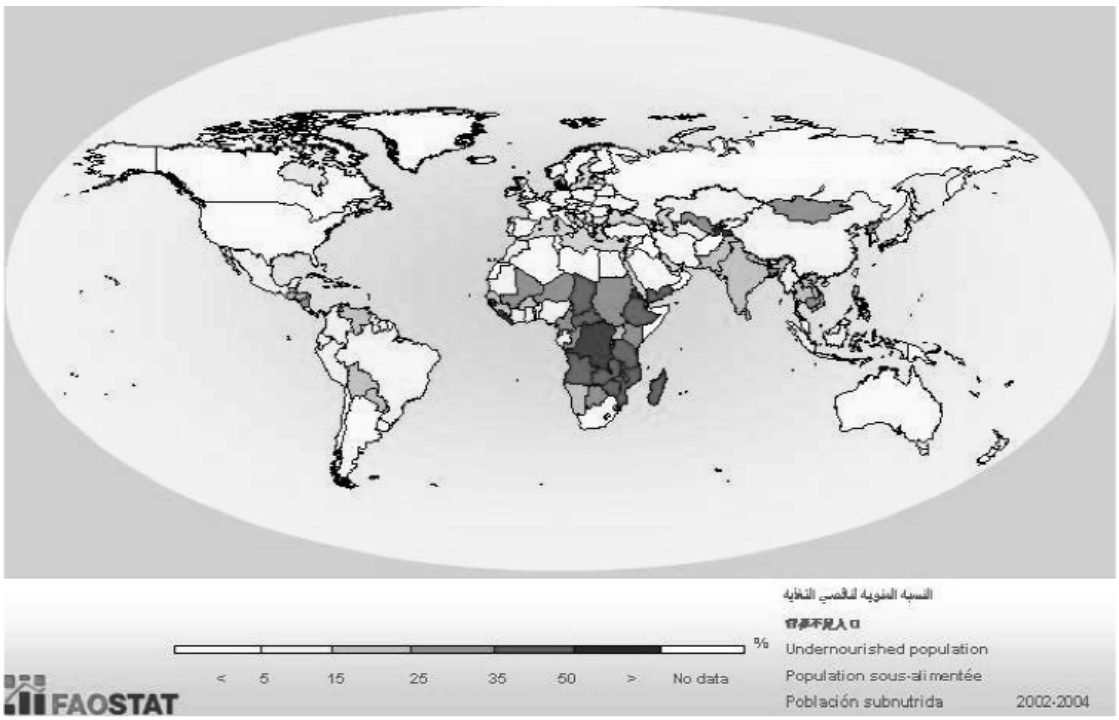
Other resources for gathering information on vulnerable populations, particularly in regard to famine, include programs such as the Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS), the World Food Programme's Vulnerability Analysis and Mapping (VAM) system, and the Food and Agriculture Organization of the United Nations food security system.

FIVIMS are networks of national information systems that assemble, analyze, and disseminate data on food insecurity and vulnerability. Their objectives are to raise awareness about food security issues, improve the quality of food security related data and analysis, facilitate integration of complementary information, promote better understanding of users' needs and better use of information, and improve access to information through networking and sharing.

VAM uses a wide array of technological sources and analytical methods: satellite imagery and spatial analysis, monitoring of food prices in local markets, exhaustive household surveys, and discussions with members of poor and food-insecure households to understand the nature of food insecurity and the risks to livelihoods.

Another example is the UN Food and Agriculture Organization, which also supplies food security statistics and maps, such as a map of the percentage of undernourished population by country around the world (Figure 15). Gathering and sharing this type of information is essential for analyzing drought vulnerabilities and helping decision makers target mitigation actions that will help address the real causes of drought impacts.

Figure 15
Percentage of undernourished population, by country, 2002-2004



Source: UN Food and Agriculture Organization at http://faostat.fao.org/site/563/default.aspx

4.2.3 Enhancing Risk Assessment Methodology and Applications

Risk assessment methodologies, maps, and standards should continue to be tested and modified to meet the needs of stakeholders. They should also become required as part of national and local planning strategies. Institutionalizing the processes will help ensure they are carried out as administrations and initiatives change over time.

In order to enhance risk assessment efforts, it is recommended that researchers and planning entities support the development of common methodologies for defining and assessing risks, thereby encouraging the identification and adoption of best international practices. This includes the adoption of drought hazard and vulnerability indicators and using metrics most relevant to decision makers and clients (e.g., identifying the agricultural drought hazard rather than simply the climate hazard).

In addition, researchers and practitioners should develop, update periodically, and disseminate risk maps and related information on drought exposure and vulnerability, with special emphasis on those populations most at risk. Institutions must also cooperate regionally and internationally, as appropriate, to assess and monitor regional and trans-boundary hazards and vulnerabilities and exchange relevant information.

4.2.4 Drought Monitoring and Early Warning

Drought is typically a slow-onset phenomenon, which means that it is often possible to provide early warning of an emerging drought. Such information allows for a shift from reactive to proactive hazard management and represents a change in focus from disaster recovery to disaster prevention.

Because there is no single definition for drought, its onset and termination are difficult to determine. We can, however, identify various indicators of drought specific to sectors or water uses, and tracking these indicators provides us with a crucial means of monitoring and providing early drought warnings.

The ISDR Platform for the Promotion of Early Warning completed a global survey of early warning systems in 2006. The survey found that early warning systems for drought are more complex than those for other hydro-meteorological hazards and are, consequently, relatively less developed globally. They are heavily reliant on monitoring of observed patterns of monthly and seasonal rainfall, streamflow, ground water levels, snowpack, and other parameters and the use of historical and statistical data. The study also stressed the importance of "people-centred" early warning systems, i.e. systems that focused on reaching the people affected and providing them with meaningful information that they can act upon. (see http://www.unisdr.org/ppew/)

Global Circulation Models (GCMs) and associated statistical ensemble methods are being routinely used to provide predictions of upcoming climate anomalies and offer promise for increasingly useful forecasts of the onset, severity, and duration of drought for large geographic regions on monthly and seasonal timescales. Requirements for early warning range from a few weeks to several months.

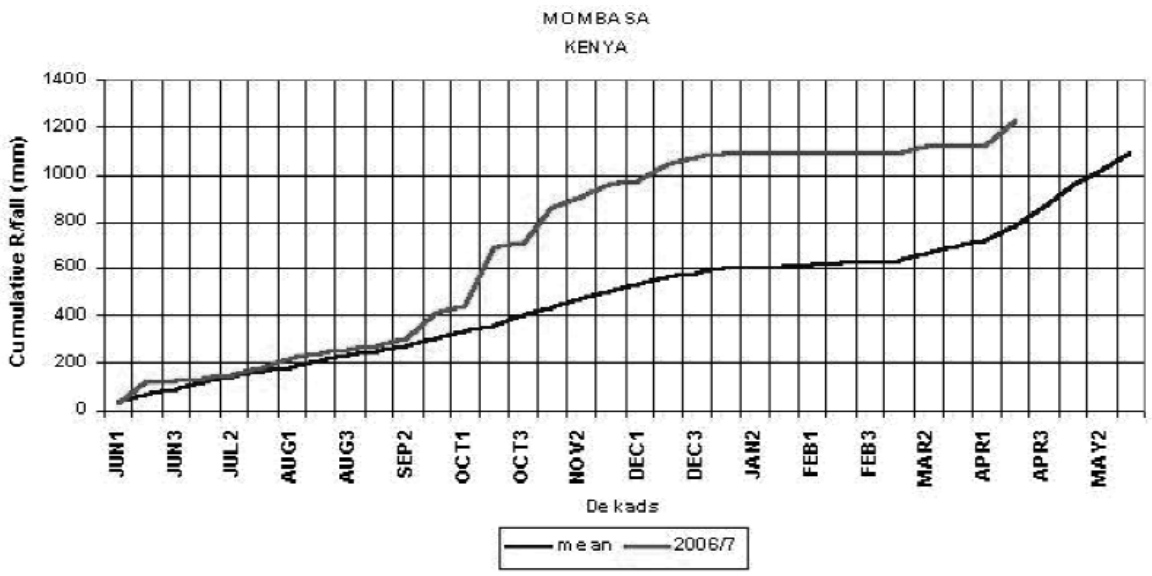
For example, eastern African countries have developed drought early warning systems capable of integrating information from various sources and providing warnings of the imminent onset of drought. In Africa, regional centers such as the IGAD Climate Prediction and Applications Centre (ICPAC) and the Drought Monitoring Centre (DMC) in Harare, supported by the World Meteorological Organization and Economic Commissions and the Sahara and Sahelian Observatory, provide current data, develop climate outlooks, and issue warnings to national meteorological and hydrological services.

Figures 16 to 18 illustrate a range of climate- and drought-related products produced by ICPAC (www.icpac.net). The products depict cumulative rainfall deviations from the mean for Marsabit, Kenya; a regional climate outlook map; and a map illustrating the food security outlook for the countries in the Greater Horn of Africa, respectively.

ICPAC organizes regional climate outlook forums comprising national, regional, and international experts to review conditions and develop climate outlooks. User representatives from different sectors often participate in the forums. Such forums are also organized in other regions of the world.

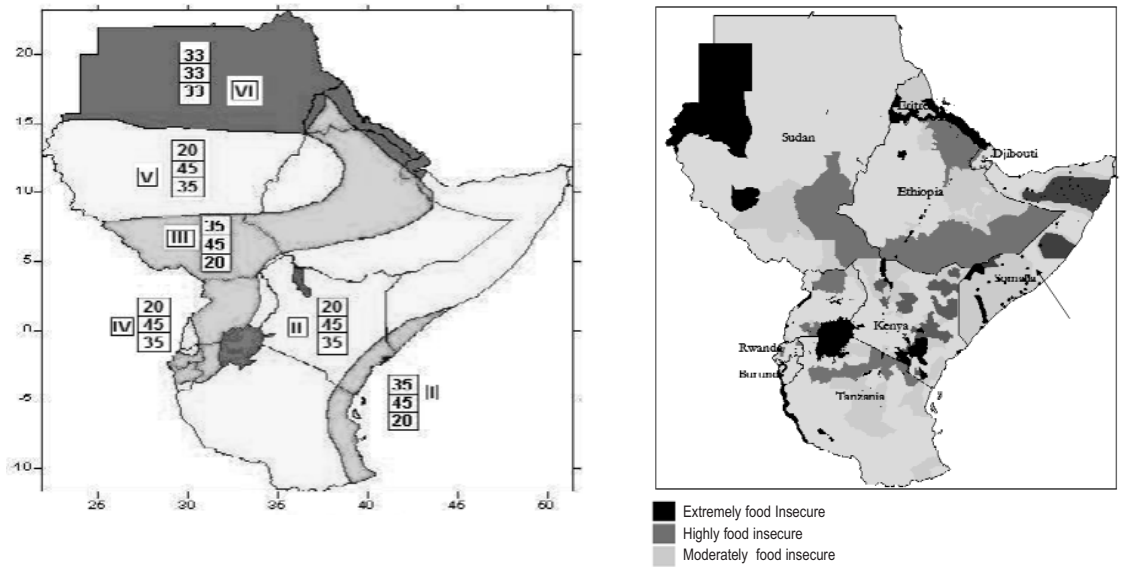
As discussed in the 2006 World Meteorological Organization document "Drought monitoring and early warning: concepts, progress, and future challenges" (www.wmo.ch/web/catalogue/freedwn/pdf/1006_E.pdf), drought monitoring

Figure 16
Cumulative rainfall over parts of Kenya, June 2006-March 2007



Source: ICPAC at www.icpac.net

Figures 17 and 18
Climate outlook, March-May 2007 (left), and food security outlook, September-December 2005 (right), for the Greater Horn of Africa



Source: ICPAC at www.icpac.net

systems have also been developed in countries such as China, South Africa, Portugal, Australia, and the United States, as well as a collaborative North American drought monitoring system between Canada, the United States, and Mexico. Each of these countries has developed unique monitoring systems to suit their needs and capacities.

Other examples, China relies heavily on the Standardized Precipitation Index to monitor drought occurrence, Portugal utilizes the Palmer Drought Severity Index, and Australia quantifies precipitation percentiles.

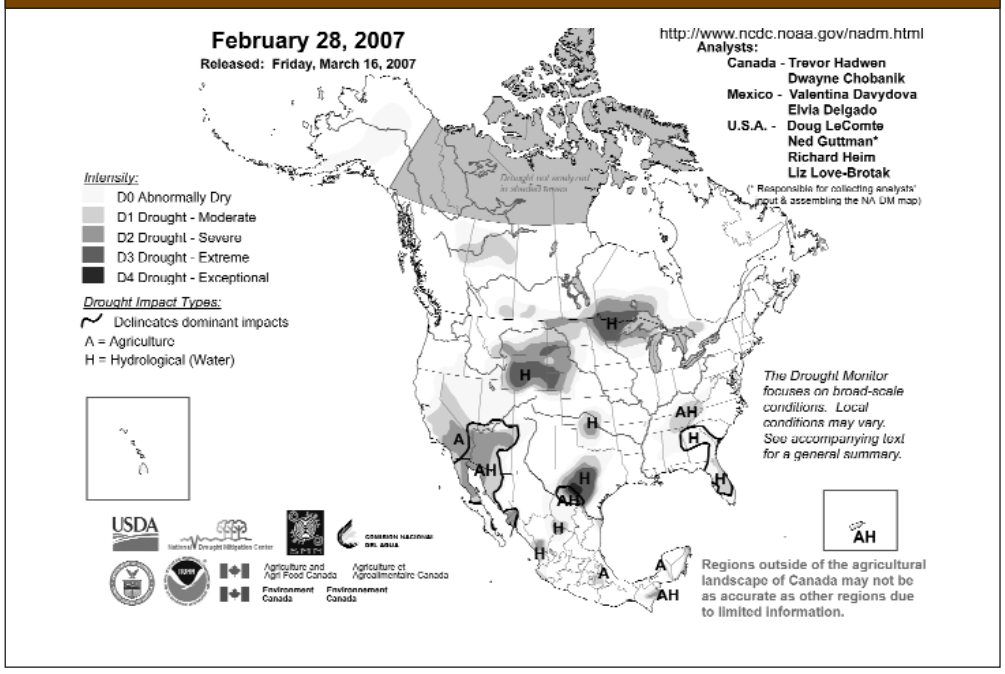
Taking a more integrative approach, the United States Drought Monitor (USDM) and the North American Drought Monitor (NADM) utilize multiple climate indices and indicators to assess drought conditions (e.g., Palmer Drought Severity Index, Standardized Precipitation Index, streamflow, satellite-derived vegetation health, soil moisture, Keetch-Byram Drought Index, reservoir levels, Surface Water Supply Index, river basin snow water equivalent, and pasture and range conditions). To ensure the accuracy of regional drought depictions on the USDM, a growing network of more than 225 experts across the United States has an opportunity to comment on the map before its release each week.

The NADM in Figure 19 shows drought conditions across North America in February 2007 (NADM). NOAA's Climate Prediction Center also provides a monthly drought outlook across the United States, illustrating regions where drought is expected to linger, become more serious, or degrade.

In some developing countries, an outcome of drought, and sometimes of other weather hazards, is the risk of famine or extreme food insecurity. For example, early warning systems for food security in many African developing countries make use of information from the major international food security monitoring systems. The FAO Global Information and Early Warning System on Food and Agriculture (GIEWS) is the most globally complete system, but other systems, including the USAID-sponsored Famine Early Warning System (FEWS NET), are also important. FEWS NET is mainly focused on Africa, where the majority of food security warning systems operate, but it also covers parts of central Asia, Central America, and the Caribbean.

Traditional monitoring and forecasting also remains an important source of climate information in many rural communities. Along with growing appreciation that traditional observations and outlook methods may have scientific validity, there is increased interest in harmonizing traditional and modern scientific

Figure 19
The North American Drought Monitor



Source: National Drought Mitigation Center, U.S. Department of Agriculture, National Oceanic and Atmospheric Administration, Agriculture and Agrifood Canada, Meteorological Service of Canada, and National Meteorological Service of Mexico

Case Study: India, Collaborative Drought Monitoring and Utilizing Existing Resources

In India, the Crop Weather Watch Group (within the Federal Ministry of Agriculture) evaluates information and data furnished by Indian and other agencies to determine the likely effects of meteorological and other environmental parameters on agriculture. The group meets every Monday during the rainy season (June to September) and the frequency of meetings increases during drought events.

The group is derived of representatives from several different sectors, and utilizes several different communication nodes to relay drought monitoring information from the field to decision makers.

Composition and role of CWWG of the Ministry of Agriculture, Government of India.

Partners	Tasks
Additional Secretary, Ministry of Agriculture	Chairperson of the Group; promotes overall coordination
Economic & Statistical Adviser, MoA	Report behavior of agro-climatic and market indicators
India Meteorological Department	Rainfall forecast and progress of monsoonal conditions
Central Water Commission	Water-availability monitoring in major reservoirs
Plant Protection Division	Watch pests and diseases outbreak
Crop Specialists	Crop conditions and production
Agricultural input supply divisions	Supply and demand of agricultural inputs
Agricultural extension specialists	Report on field-level farm operations
Ministry of Power	Manage electrical power for groundwater extraction
Indian Council of Agricultural Research	Technical input and contingency planning
National Center for Medium Range Weather Forecast	Provide medium-term forecasts

Details of CWWG monitoring and information management.

Parameters	National-level agencies	State-level agencies	District-level agencies	Field-level agencies	Communication mode
A. Meteorological					
Delay in the onset ofmonsoon	W	W	D	D	Wireless/Fax/Telephone/e-mail
Dry spell during sowing	W	W	D	D	Wireless/Fax/Telephone/e-mail
Dry spells during critical crop-growth periods	W	W	D	D	Wireless/Fax/Telephone/e-mail
B. Hydrological					
Water availability inReservoirs	W	W	D	D	Wireless/Fax/Telephone/ e-mail/Written reports
Water availability in tanks/lakes	F	F	F	W	Written reports
Stream flow	F	F	F	W	Written reports
Groundwater level	S	S	S	S	Written reports
Soil moisture deficit	F	F	F	F	Written reports
C. Agricultural					
Delay in sowing	W	W	W	W	Wireless/Fax/Telephone/e-mail
Sown area	W	W	W	W	Wireless/Fax/Telephone/e-mail
Crop vigor	F	F	F	W	Written reports
Change in croppingpattern	W	W	W	W	Wireless/Fax/Telephone/e-mail
Supply and demand of agricultural inputs		W	W	W	W Wireless/Fax/Telephone/ NICNET

D = Daily; W= Weekly; F= Fortnightly; M= Monthly; S = Seasonal (Pre- and Post-rains)

Source: J.S. Samra, 2004, Review and Analysis of Drought Monitoring, Declaration, and Management in India, Working Paper 84, International Water Management Institute (www.iwmi.cgiar.org/pubs/working/WOR84.pdf)

methods of climate prediction. Studies have been initiated in some countries, such as Zimbabwe and Kenya, to gain further understanding of traditional forecasting.

4.2.5 Enhancing Drought Monitoring and Early Warning Capacities

Drought monitoring and early warning systems will be enhanced if planners and scientists work together to promote the development of systems that are timely, relevant, understandable, affordable, and people-centered. In order to achieve this goal, it is essential to develop the appropriate social and technological capacity to research and implement programs to better understand, monitor, and communicate drought occurrences and their related effects.

This includes fostering the ability of national governments and other planning entities to support the development and sustainability of the required infrastructure and scientific, technological, and institutional capacities needed to research, observe, analyze, map and, where possible, forecast natural and related hazards, vulnerabilities, and drought impacts.

It is also essential to support the development and improvement of relevant databases and the promotion of full and open exchange and dissemination of data for assessment, monitoring, and early warning for drought at international, regional, national, and local levels. This includes the development of decision-support models for the dissemination of drought-related information to end users and appropriate methods for encouraging feedback on climate and drought assessment products, and on other forms of early warning information.

Effectively gathering and sharing this information will require the promotion of institutional development and the skills necessary for effective collaborative research and planning among relevant scientific groups (i.e., physical and social scientists), policy makers, and stakeholders.

Where possible, scientists should also encourage the prudent adoption of climate and forecast information to foster a shift from reactive to proactive management of drought risks. In this regard, changing climate and the associated changing nature of drought pose a serious risk to sustainable development, the environment, and society. Climate change will lead to changes in the dynamics of drought, with associated (but somewhat uncertain) changes in drought hazard and exposure.

Therefore, it is essential that entities begin to compile and analyze, in a consistent manner, information on the occurrence of drought hazards, to enable a better understanding of past and future changes. With this information, planners can begin to research, analyze, and report on long-term changes in drought risk, and in particular those aspects that might increase vulnerabilities and the capacity of authorities and communities to respond to drought. They can also evaluate the potential for incorporating drought risk assessments into national vulnerability and adaptation assessments for climate change.

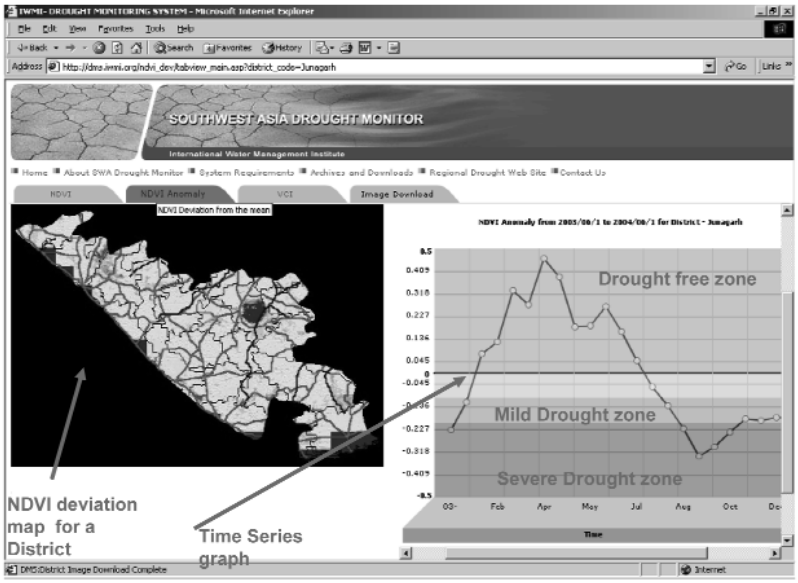
An example of online drought monitoring is given by the South Asia Drought Monitor (SADM), a project which until 2004, facilitated information in the web, based on remote sensing data, drought-related indices and GIS. The project aimed at supplying timely information on drought onset, progression and extent. This near-real-time drought monitoring and reporting system covered Afghanistan, Pakistan and western parts of India. The information and maps could be displayed at the district or village scales. See Figure 20 and http://dms.iwmi.org/ about_swa_dm.asp.

In some countries and regions without adequate infrastructure to measure the physical manifestations of drought, such as precipitation, streamflow, or ground water levels, an early warning system may be based on the effects of drought such as market fluctuations (increased food prices or cattle sales), health indicators (increase in malnutrition or disease); human or animal migrations, or other social indicators.

Promoting the inclusion of indigenous or local groups and knowledge in drought monitoring and early warning systems is essential for developing appropriate local drought indicators, verifying the occurrence of drought, and communicating the warnings to local populations. An example on indigenous drought prediction in Himalayas of India is given in the box on page 33.

Networks should also continue to be established to support the sharing of basic climate and early warning across borders and regions. For example, the AGRHYMET Centre (a specialized center of the Permanent Interstate Committee for Drought

Figure 20
SouthWest Asia Drought Monitor, example of on-line drought monitoring report at a district/village scale with Normalized Difference Vegetation Index (NDVI) and time series of drought anomalies, date 2004.



Source: International Water Management Institute (IWMI), based in Sri Lanka, http://dms.iwmi.org/about_swa_dm.asp

Indigenous Drought Prediction in Himalayas of India

Indigenous knowledge still plays an important role in climate and drought forecasting in many regions of the world. Some of the indigenous strategies for predicting rainfall and drought in the upper northwest Himalayas of India are:

- If the "Jonks" (leeches) are immobile on water surfaces, dry weather is predicted, but rainfall is predicted if they move rapidly in upward and downward directions.
- Heavy rainfall is predicted during the coming rainy season if the "Tatihari" bird (lapwing) lays her eggs on the higher portion of the field, but if the eggs are laid in the lower portion of the field then a drought is predicted. If a single egg is laid, there will only be rainfall one out of four months of the rainy season. If two eggs are laid, rainfall will occur for two months and similarly four eggs indicate there will be rainfall during all the four months of the rainy season.
- If the "Tillbohara" (dragon flies), which appear generally in the rainy season, are observed to swarm in a large group over the surface of a pond, dry weather is predicted, but early rainfall is predicted by the farmers if they swarm over open dry lands or fields.
- If the "Khejri" tree bears good fruit in a particular year, then farmers predict good rainfall during the next rainy season and, vice versa, less rain is predicted in the event of a poor fruit crop.
- When cloudy days are accompanied by clear nights and the eastern winds blow somewhat strongly, then no rainfall is predicted.

Source: L.R. Verma, 1998, Indigenous technology knowledge for watershed management in upper north-west Himalayas of India, GCP/RAS/161/NET, FAO (UN), Kathmandu, Nepal

Control in the Sahel) provides agro-meteorological monitoring services across western Africa in Burkino Faso, Cape Verde, Chad, The Gambia, Guinea Bissau, Mali, Mauritania, Niger, and Senegal. In this capacity, the center monitors a range of conditions such as rainfall amounts and surface water supplies, start of the growing season, crop water requirements, crop pests and diseases, and vegetation stress (www.agrhymet.ne).

The AGRHYMET Centre is also a member of a consortium, along with the African Centre for Meteorological Applications to Development (ACMAD) and the Niger River Basin Authority, which issues forecasts for the July-September cumulative rainfall, two to three months in advance, for the Economic Community of Western African States (ECOWAS) member countries (Figure 21). This type of collaboration and information sharing is essential to create robust and international drought early warning systems.

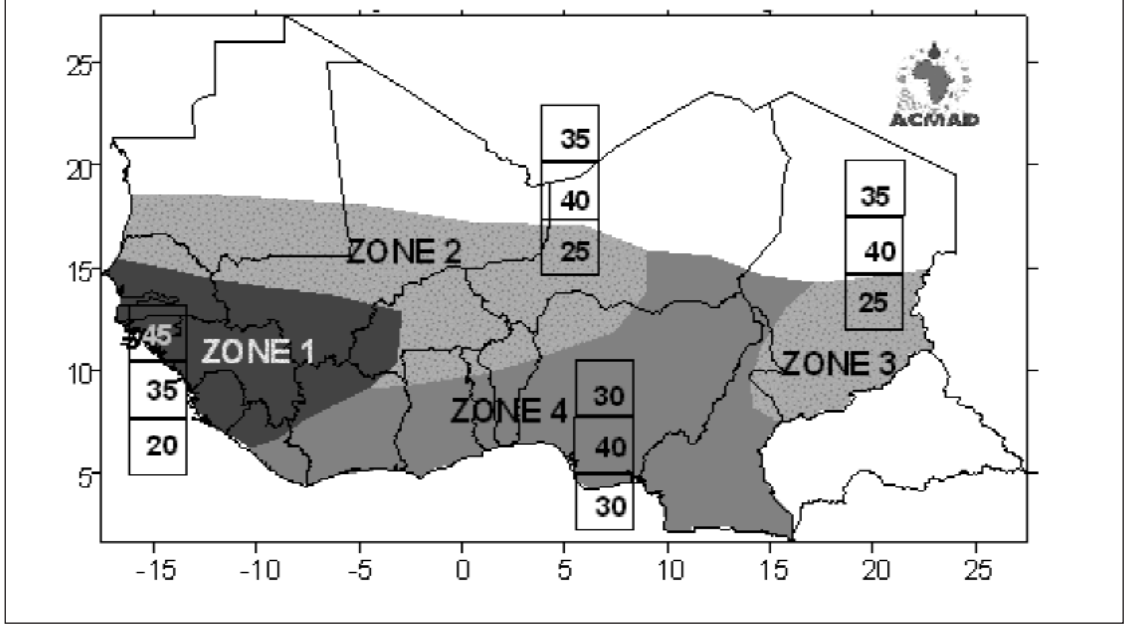
National and local capacities may need to be enhanced to ensure that early warning information is appropriate for user needs (including those at the community level), and that it is well integrated into policy and decision-making processes and emergency management systems at both the national and local levels. The responsibility for organizing appropriate preparedness and responses to warnings usually rests with national disaster management organizations, but it also requires interaction with national and regional forecast institutions.

In developing countries, emergency response agencies, committees, and organizations, as well as NGOs and UN agencies, can play significant roles in capacity development (see the UN Capacity for Disaster Reduction Initiative at www.undmtp.org, and the UNDP Capacity Development website at www.capacity.undp.org). These groups seek to work with relevant national agencies to coordinate the development of technical capacities for monitoring, detecting, and warning for a wide range of hazards and their impacts.

These capacities need to be used for drought risk reduction purposes to develop a drought knowledge network where governments, international and regional organizations, experts, and practitioners can exchange information, policies, and practices in a coordinated and systematic way. This network is also important for improving forecast and early warning information.

Augmenting forecast and early warning information with decision support capabilities to provide information on options for reducing vulnerability to

Figure 21
Seasonal forecast for the year 2006 July-August-September cumulative rainfall in Western Africa



Source: African Centre for Meteorological Applications to Development -ACMAD- at www.acmad.ne

Ethiopia Case study
FAO/WFP collaboration on weather-indexed livelihood protection scheme

Ethiopia has had generally favourable weather over the last few growing seasons, with record grain production in 2006/2007, but the country in general, and many areas in particular, remain vulnerable to crop failure from extended dry spells, or even drought. Early warning of impending crop failure is essential to take prompt actions to mitigate a disaster or compensate rural households for food and income losses, but response is often delayed by a lack of objective data and evidence.

To overcome this, and provide both scientific basis for decision making, and a response financing mechanism, the Food and Agriculture Organization and the World Food Programme are jointly developing and testing weather indexed livelihood protection schemes, similar to a partial indemnity insurance policy.

The weather index combines ground station and rainfall estimates with state-of-the-art modelling of water requirement satisfaction for 13 major crops of Ethiopia. The spatial resolution is fine enough to differentiate between proximate but different ecological and livelihood systems. In combination with household level data, the model allows one to derive estimates of the impact of drought, in terms of the value of productive assets (e.g. livestock, farm implements, seed) people would have to sell to cope with the disaster. Since the onset of the disaster on the affected areas can be verified by the model, the weather-index serves as the objective basis for the release of a partial indemnity insurance payment.

These funds can then be used by WFP and national institutions to provide immediate support to the affected households, and avoid the liquidation of critical household assets. If the crop failure is severe or total, additional assistance can then be mobilized through the national Productive Safety Net Programme, an appeal process, or other means.

Once the current prototype is validated, it will provide an objectively verifiable means to establish a very rapid first line of defence against the effects of drought.

Source: Henri Josserand, FAO and Ulrich Hess, WFP, 2007.

drought enhances local coping capacities and provides an important mechanism for reducing drought risk.

Tracking Progress

Planners should develop performance indicators and institute a monitoring process to measure progress in drought risk identification, impact assessment, awareness, and knowledge through engagement with the social science community and stakeholders, and further engage in effective mitigation and preparedness measures (see Section 4.4).
Often, drought monitoring and management is under the authority of physical scientists and policy makers. Social scientists and NGOs provide an important link to stakeholders that are ultimately affected by drought and benefit from risk reduction efforts. They are also the experts in social capacity development and policy analysis, who are needed to implement and review risk assessment methodologies.

Monitoring and evaluating the effects of risk assessment programs requires an extensive review of on-the-ground projects, the development of case studies, and discussions with a wide range of stakeholders affected by drought.

4.3 Drought Awareness and Knowledge Management

Related to Priority 3 of the Hyogo Framework for Action:
To use knowledge, innovation, and education to build a culture of safety and resilience at all levels of society.

Today, the world has a wealth of knowledge and information on disaster risk reduction at its disposal; the key is compiling, collecting, sharing, and using this in a proactive way through awareness-raising and educational initiatives so that people can make informed decisions and take action to best protect themselves and their property and livelihoods from natural hazards.

Guiding Principles

In general, drought awareness and knowledge management activities should be guided by the following principles:

1. The effects of drought can be substantially reduced if people are well informed and motivated toward a culture of disaster prevention and resilience,
2. Effective information management and exchange requires strengthening dialogue and networks among disaster researchers, practitioners, and stakeholders in order to foster consistent knowledge collection and meaningful message dissemination,
3. Public awareness programs should be designed and implemented with a clear understanding of local perspectives and needs, and promote engagement of the media to stimulate a culture of disaster resilience, including resilience to drought and strong community involvement,
4. Education and training are essential for all people in order to reduce local drought risk.

4.3.1 Developing a Culture of Drought Prevention and Resilience

There are many challenges to improving the management of droughts.

The first challenge is that drought must be recognized as a natural hazard, not just a natural event, within the natural hazard community of scientists and policy makers. Because of its slow-onset characteristics and lack of structural impacts, it is often disregarded.

This lack of recognition of the importance of drought as a natural hazard by some actors has been an impediment to obtaining adequate financial and research support and, in many instances, an obstacle to building awareness among policy makers at the local, national, regional, and international level. This lack of awareness, in turn, has resulted in an under-appreciation of drought and its far-reaching impacts. It has also perpetuated the process of dealing with drought in a crisis management mode when the knowledge and technology necessary to improve preparedness for and mitigation of impacts is readily available.

A second challenge is to build awareness of drought as a natural part of climate. Climate change is an additional variable to be considered in drought hazard identification, monitoring, mitigation and preparedness.

Drought can occur anywhere, although its features vary from region to region. Defining drought is therefore difficult; it depends on differences in regions, needs, and disciplinary perspectives. Based on the many definitions that have appeared in the literature, for example, drought may be defined in Libya as occurring when annual rainfall is less than 180 mm, but in Bali, drought might be considered to occur after a period of only 6 days without rain. Nonetheless, it is often considered to be a rare and random event, resulting in a lack of emphasis on preparedness and mitigation.

Improved understanding of the different types of drought (see Chapter II) and the need for multiple definitions and climatic/water supply indicators that are appropriate to various sectors, applications, and regions is a critical part of this awareness-building process.

A third challenge is to erase misunderstandings about drought and society's capacity to mitigate its effects.

Many people consider drought to be purely a physical phenomenon. This leads to the question, "If drought is a natural event, what control do we have over its occurrence and the impacts that result?" Drought originates from a deficiency of precipitation over an extended period of time. The frequency or probability of occurrence of these deficiencies varies spatially and represents a location's exposure to the occurrence of drought. Some regions have greater exposure than others, and we do not have the capacity to alter that exposure. However, as with other natural hazards, drought has physical, social, and economic components (see Chapter III).

It is the social factors, in combination with our exposure, that determine risk to society. Some of the social factors that determine our vulnerability are level of development, population growth and its changing distribution, demographic characteristics, demands on water and other natural resources, government policies (sustainable versus unsustainable resource management), technological changes, social behaviour, and trends in environmental awareness and concerns. It is obvious that well-conceived policies, preparedness plans, and mitigation programs can greatly reduce societal vulnerability and, therefore, the risks associated with drought.

A fourth challenge is to convince policy and other decision makers that investments in mitigation are more cost effective than post-impact assistance or relief programs.

Evidence from around the world, although limited, illustrates that there is an escalating trend of losses associated with drought in both developing and developed countries. Also, the complexity of impacts is increasing. It seems clear that investments in preparedness and mitigation will pay large dividends in reducing the impacts of drought.

A growing number of countries are realizing the potential advantages of drought planning. Governments are formulating policies and plans that address many of the deficiencies noted from previous response efforts that were largely reactive. Most of the progress made in drought preparedness and mitigation has been accomplished in the past two decades. Although the road ahead will be difficult and the learning curve steep, the potential rewards are numerous.

The crisis management approach of responding to drought has existed for many decades and is ingrained in the culture and reflected in the institutions of both developed and developing countries. Movement from crisis to risk management will certainly require a paradigm shift.

In part because of the crisis management approach, those affected by drought have become accustomed to government assistance programs. In many instances, misguided and misdirected government programs and policies have promoted the unsustainable use of natural resources. Many governments have come to realize that drought response in the form of emergency assistance programs that are not linked to changing practices only reinforces poor or unsustainable actions and decreases self-reliance.

These messages also need to be reinforced throughout society. As governments begin to adopt risk reduction approaches, they can help formulate educational programs directed at developing a

Essential Drought Messages

Developing a culture of drought prevention and resilience requires engraining the following messages into society:

1. Drought is a natural hazard that affects a wide range of sectors.
2. Drought is natural part of climate that should be managed.
3. There are proactive measures that can be taken to reduce drought risk.
4. Pre-drought mitigation and preparedness actions are more cost-effective than drought response measures.

culture of risk aversion throughout their constituencies. In some cases, this movement has been promoted from the grassroots level when governments have not been responsive to the paradigm shift. People's understanding and skills are essential components of any drought risk reduction strategy and practices. An investment in human resources by increasing individual capabilities across generations is likely to have more lasting value than other investments or measures to reduce risks.

Governments have a responsibility to promote public awareness of natural hazards and risk on a continuous basis and provide mechanisms for the sustainability of such programs at the local level. They must also support capacity development at the local level for understanding and using drought risk and related information in short- and long-term decision making. As these themes become engrained in society, people will become increasingly responsive to the development and implementation of drought policies and planning, drought risk assessment and early warning systems, educational programs, and drought risk reduction measures outlined in the framework.

4.3.2 Effective Information Management and Exchange

Enabling effective information management and exchange requires the collection, compilation, and dissemination of relevant knowledge and information on hazards, vulnerabilities, and capacities and linking that knowledge to community drought risk reduction awareness campaigns, programs, and projects. Interaction between the generators and users of information is essential for developing useful messages and helping to ensure the use of that information.

Specifically, this interaction and networking can help ensure that awareness programs are designed and implemented with a clear understanding of perspectives and requirements that reflect local conditions and target all sections of society, including decision makers, educators, professionals, members of the public, and individuals living in threatened communities.

In these efforts, it is essential to identify the information users and their particular needs so that programs, information products, and technologies will be useful and applicable. Different types of messages, locations, and delivery systems are necessary to reach the broad range of target audiences.

These messages must also provide easily understandable information on drought risks and mitigation options, especially to citizens in high-risk areas, to encourage and enable people to take actions to reduce risks and build resilient societies. Involvement of the media is often crucial in this process, and to stimulate a culture of disaster resilience and strong community involvement in sustained public awareness campaigns and public consultations at all levels of society.

Case Study: Southern Africa Drought Technology Network

SADNET is a network that brings together development practitioners involved in agriculture to promote indigenous knowledge systems and drought mitigation activities in Southern Africa.

The NGO Southern Alliance for Indigenous Resources (SAFIRE) adopted SADNET as one of its strategies to address livelihood and food security issues for communities in drought-prone areas of Zimbabwe, Zambia, Malawi, and Mozambique through an emphasis on information sharing.

The project is based on the premise that "knowledge is power" and that the vulnerable farmers are in a better position to make informed decisions with regard to their agricultural production and drought mitigation activities if they have a ready supply of relevant and up-to-date information. SADNET facilitates information-sharing among small-scale farmers, NGOs, and community-based organizations in the areas of rural food security, agricultural research, and extension, as well as relating the role of agribusiness in fostering drought-coping strategies.

Collaborating partners include the Canadian International Development Agency (CIDA), Canadian Hunger Foundation (CHF), Care Zambia, Civil Society Network on Agriculture (CISANET), and CARE Mozambique. SADNET was the winner of the 2004 Yeoman's Award for Local Content for Africa.

Source: Southern Africa Drought Technology Network at www.safireweb.org

Case Study: RANET: Improved Access to Information

RANET, named for its innovate linkage of radio and internet, is an international collaboration to make weather, climate, and related information more accessible to remote and resource-poor populations, where broadcast and telecommunications infrastructure is lacking or expensive to operate. RANET undertakes this mission in order to aid day-to-day resource decisions and prepare against natural hazards, including drought.

The program combines innovative technologies with appropriate applications and partnerships at the community level in order to ensure that the networks it creates serve all of the community's information needs. Community ownership and partnership is the core principle of RANET's sustainability strategy.

Specific RANET activities include awareness development, training, partnership development, pilot activities to demonstrate various community technologies, broadcast management, and development of a dissemination network through partnership and platform development. For the past several years, RANET has developed programs in a number of African countries. Based on the success of these efforts, the program began pilot efforts in the Pacific. Similar efforts are planned in South and Southeast Asia.

The RANET program is managed by the African Centre of Meteorological Applications for Development (ACMAD) and faculty at the University of Oklahoma, USA.

Source: RANET program at www.ranetproject.net

4.3.3 Education and Training

Education for disaster risk reduction is an interactive process of mutual learning among people and institutions. It encompasses far more than formal education at schools and universities and in training courses. It involves the use of traditional wisdom and local knowledge to safeguard against natural hazards as well as the active and informed participation of the mass media. The effects of drought can be substantially reduced if policy makers, scientists, media, and the public are well informed and motivated toward a culture of disaster prevention and resilience. This requires sustained efforts to educate all segments of society that are vulnerable to the disastrous effects of drought.

Education is a crucial means within society to communicate, motivate, and engage, as much as it is to teach. Awareness about drought risks and dangers needs to start in early education to create a culture of disaster reduction. The various dimensions of disaster risk within a community can be addressed and continuously reinforced and passed between generations through formal educational programs and professional training, which is part of knowledge management.

SADNET Achievements in Zimbabwe

SADNET is a network that brings together development practitioners involved in agricultural development, promoting indigenous knowledge systems and drought mitigation activities in Southern Africa. The Southern Africa Drought Technology Network adopted SADNET as one of its strategies to address livelihood and food security issues for communities in drought prone areas with an emphasis on information sharing. In Zimbabwe, SADNET has:

- Established information needs of various partners in Zimbabwe,
- Produced ten booklets on drought intervention technologies, two videos, and newsletters,
- Established eight community information resource centers, five of which are connected to internet, satellite radio, and email, and
- Trained more than eight rural communities in sustainable agriculture practices and documentation.

The project has resulted in diversified sources of information for local communities, increased and more relevant information from the media, and increased outreached by partners.

Source: Southern Africa Drought Technology Network (www.safireweb.org)

RANET - New Technologies for Drought Communication

A discussion between a meteorologist and a nomad in the desert of south-eastern Algeria led to the development of the RANET system. The meteorologist, Mohammed Boulaya, offered the nomad a gift of a weather radio but the offer was declined. The nomad commented that drought-related information such as rainfall would be useful in tending his flocks but that the radio would be useless and excess baggage once the batteries died.

Inspired by this conversation and the potential that drought monitoring and prediction technologies hold for improving the quality of life in rural Africa, the meteorologist worked with herders and farmers to design the RANET system.

The RANET system relies on sustainable technologies such as Freeplay wind-up radios, the Wantok solar-powered FM radio transmitter, and the WorldSpace Digital Satellite to maintain communications between users.

Source: RANET.net (www.ranetproject.net)

Natural Disaster Risk Reduction Education

There are a host of programs around the world that provide educational programs on natural hazard risk reduction. For example, the ISDR secretariat and its partners have made disaster risk education and safer school facilities the two key themes of the 2006-2007 World Disaster Reduction Campaign.

The campaign, entitled "Disaster Risk Reduction Begins at School" 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 ISDR secretariat and partners have also created a thematic cluster/platform on knowledge and education. The group identified and examined good practices to reduce disaster risk through education, knowledge, and innovation, including efforts to protect schools from extreme natural events. A comprehensive report was released in July 2006 entitled "Let our children teach us: A Review of the Role of Education and Knowledge in Disaster Risk Reduction" (http://www.unisdr.org/let-our-children-teach-us). The report informs about key elements, practices, and tools to develop a culture of disaster risk reduction in formal and informal education, and discusses knowledge development, gaps, and

Launch of the 2006-2007 Disaster Risk Reduction Begins at School Campaign

ISDR Director Sálvano Briceño with Tilly Smith, UK, Logham Salamatien, Iran, and Remi Takaze, Japan

The ISDR and its partners launched the 2006-2007 Disaster Risk Reduction Begins at School Campaign in Paris on June 15, 2006, during the International Symposium "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). ISDR Director Mr. Sálvano Briceño and UNESCO's Director General, Mr. Köichiro Matsuura, led the campaign launch that gathered more than 300 participants and media representatives. Children from France, Iran, Japan, and the United Kingdom exchanged their personal experiences of how they learned to protect themselves in the event of a natural hazard.

Source: ISDR (www.unisdr.org/wdrc-2006-2007)

opportunities geared toward implementing Priority 3 of the Hyogo Framework for Action.

Several NGOs have been working in education and capacity development. For example, Oxfam Great Britain's "Cool Planet" online education module focuses on all aspects of global citizenship, including understanding disasters such as drought and measures that can be taken to reduce societal vulnerability to drought (www.oxfam.org.uk/coolplanet/teachers/resources/disasters.htm). The education module was developed by the Oxfam Development Education team with close integration of advice from educators in England, Scotland, and Wales. Teachers and students (ages 5-16) in England, Scotland, and Wales are the primary audience of the education module, but it is accessible by any individual who has internet access.

By focusing on images and real world case studies, the "Water for All" portion of the Cool Planet education module integrates water supply statistics and causes and occurrences of water shortages (including drought) with solutions to water shortages that focus on community-led initiatives; it also allows students to develop their own local actions. The activity set ends with suggestions for how to effect positive change and celebrate water.

Students can complete the activities online or they can be adapted and presented in a regular classroom setting. Teachers are also able to find professional development resources to gain information and ideas about using case studies in a classroom setting and teaching about controversial and distant issues. Oxfam GB has also assembled an extensive list of additional resources, curricula, and notes for teachers. Grant programs are offered by Oxfam GB to facilitate education programs in schools.

Drought Risk Reduction Education

Other programs focus more directly on drought risk reduction. For example, the National Drought Mitigation Center (NDMC) in the United States has established an Internet clearinghouse for drought information (http://drought.unl.edu). The NDMC provides access to information on drought planning, monitoring, risk and impact assessment, and drought management options. NDMC staff also provide outreach and training around the world on a range of drought-related topics.

The National Oceanic and Atmospheric Administration has also initiated a program, in collaboration with other U.S. federal agencies and nongovernmental organizations, to establish a "U.S. Drought Portal" for information sharing and easy access to drought-related information. Part of this program will be directed at creating an educational outreach program on drought awareness and preparedness.

In addition to programs such as SADNET and RANET, other drought-related educational projects have experimented with new models for integrating risk reduction curricula in rural communities.

One example is a project funded by the United Kingdom Department for International Development (DFID). In this case, researchers from two Brazilian academic institutions (Universidade Federal Rural de Pernambuco and Universidade Federal de Pernambuco) and the University of Birmingham (UK) focused on fostering the sustainable use of rural water resources and the role of environmental education and gender roles in northeast Brazil. In this case, female teachers and male farmers were brought together to develop educational materials for students and community members on rural livelihood, including water conservation and related sustainability issues.

The Million Cisterns program in northeast Brazil is another example of a program that combines drought risk reduction actions and education. In this region, rainwater harvesting has become an important measure to mitigate drought. The P1MC, as this program is referred to, is distinct from various mitigation measures previously implemented, not only for focusing on the needs of the poor, but for stressing the importance of education as the basis for all its actions.

In such a context, the program broadens the understanding and the practice of handling the semiarid ecosystem in a sustainable manner. Considering these factors, it can be said that this is a program based on long-term mitigation measures, which gives priority to educational actions rather than to technical ones. The local population (women and men) participate in training workshops about water management and also learn how to build cisterns as they take part in the construction process.

The program, led by a collaboration of local NGOs and government ministries, was initially funded by the World Bank, but has since received funds from the Federation of Banks in Brazil, international NGOs, and other private donations.

These types of innovative educational programs must continue to be expanded and monitored so that both positive and less-positive lessons in drought risk reduction and knowledge management are documented and shared, thereby fostering a process of continual improvement.

Sustainable Use of Water Resources and the Role of Environmental Education and Gender Roles in Northeast Brazil

Researchers from the University of Birminghanm (UK) and the Universidade Federal Rural de Pernambuco (UFRPE) and Universidade Federal de Pernambuco (UFPE) in Brazil implemented a rural environmental education program from 2003 to 2005. The program had a significant impact as it presented a new educational model not found in any school settings in rural Brazil.

The project brought together teachers, most of whom were women with formal training, and farmers, most of whom were men with no formal education. Such integration was very important and gave credibility to the program because the teachers belong to a group of women who have high status at the community level, and the farmers were well respected.

The program presented a new educational model that combined theory and practice in a way that recognized traditional knowledge held by farmers, which placed high value on agriculture. An important impact in regard to drought mitigation was that the program highlighted the relevance of aspects related to rural livelihood and introduced ways for students and community members in general to monitor the availability of water.

Historically, the educational model followed by both rural and urban schools had been heavily modeled on urban life. This has had a very negative impact on rural students, particularly those who inhabit the drought-prone areas of Northeast Brazil, as it contributed to out-migration. The main goal of the environmental education program was to raise the students' awareness about how to mitigate the impacts of drought.

The program was very successful in introducing measures to mitigate drought effects because it focused on education and therefore had a long-term sustainable impact. The program showed the importance of involving different partners, such as local community members, teachers, NGOs, international organizations, and government officials, in the implementation of long-term sustainable drought mitigation measures.

Source: Jan van Wonderen and Mott MacDonald, University of Birmingham (UK), UFRPE, and UFPE

4.4 Effective Drought Mitigation and Preparedness Measures

Related to the Priority 4 & 5 of the Hyogo Framework for Action:
To reduce underlying drought-related risk factors and to strengthen disaster preparedness at all levels of society.

The goal of mitigation and preparedness is to reduce drought vulnerability and foster drought-resilient societies. Mitigation can be defined as any structural/physical measures (e.g., appropriate crops, sand dams, engineering projects) or non-structural measures (e.g., policies, awareness, knowledge development, public commitment, and operating practices) undertaken to limit the adverse impacts of natural hazards, environmental degradation, and technological hazards. Preparedness is defined as established policies and specified plans and activities taken before an apparent threat to prepare people and enhance institutional and coping capacities, to forecast or warn of approaching dangers, and to ensure coordinated and effective response in an emergency situation.

Before drought, mitigation actions can be implemented to build resilience into an enterprise or system so it will be less affected when drought eventually occurs. Some mitigation actions can require relatively small changes in our lives while others may require the re-evaluation and modification of more basic elements of our livelihoods and production systems. An important mitigation measure is the development of drought preparedness and contingency plans that detail specific measures to be taken by individuals or responsible agencies both before and during drought. Effective drought mitigation and preparedness planning are based on established policies and institutional capacity (Section 4.1), sound drought risk identification and EW (Section 4.2), and drought awareness and knowledge management (Section 4.3), while this chapter focuses more on the selection of specific actions that will be implemented in the plans.

Drought impacts and losses can be substantially reduced if authorities, individuals, and communities are well-prepared, ready to act, and equipped with the knowledge and capacities for effective drought management. It should be recognized that mitigation and preparedness have a greater impact on reducing the scale and effects of drought disasters than ah-hoc emergency response measures.

Guiding Principles

1. Mitigation and preparedness are central to disaster reduction, rather than relying solely on ad-hoc emergency response measures.
2. Dialogue, exchange of information, and coordination are needed between disaster reduction, development, and disaster response actors.
3. The selection of appropriate drought mitigation and preparedness measures requires many considerations, such as integrated environmental and natural resources management, social and economic development, land use planning opportunities, and climate change adaptations.
4. A combination of top-down and bottom-up approaches is required for development and implementation of effective mitigation and preparedness measures.
5. Institutional capacity, coordinated mechanisms, identification of local needs and indigenous knowledge are required to implement effective mitigation and preparedness strategies.
6. Monitoring and early warning are key elements of disaster preparedness and must be linked to appropriate risk reduction actions.
7. Drought mitigation and preparedness requires a long-term commitment of resources.

Definitions: Mitigation and Preparedness

Mitigation can be defined as any structural/physical measures (e.g., appropriate crops, sand dams, engineering projects) or non-structural measures (e.g., policies, awareness, knowledge development, public commitment, and operating practices) undertaken to limit the adverse impacts of natural hazards, environmental degradation, and technological hazards.

Preparedness can be defined as pre-disaster activities that are undertaken within the context of disaster risk management and are based on sound risk analysis. This includes the development/enhancement of an overall preparedness strategy, policy, institutional structure, warning and forecasting capabilities, and plans that define measures geared to helping at-risk communities safeguard their lives and assets by being alert to hazards and taking appropriate action in the face of an imminent threat or an actual disaster.

4.4.1 Considerations in Selecting Drought Mitigation and Preparedness Measures

Dialogue, exchange of information, coordination, and common understanding among different actors are necessary. Experience has shown that a critical feature of effective mitigation and preparedness is the extent to which different actors and entities operate in a coordinated and timely manner by avoiding gaps, duplication of effort, and parallel activities and structures. This is especially vital given the increasing number of organizations involved in disaster risk reduction, development, and humanitarian assistance.

Common understanding, roles, responsibilities, spheres of activities, and accountability need to be clearly established and adhered to.

Different political, cultural, and socio-economic environments necessitate institutional arrangements, including coordination mechanisms that are appropriate to a particular context. Exchange of information is crucial to coordinate activities and actions for drought mitigation and preparedness.

Effective drought management requires a combination of drought mitigation, preparedness, and response actions. Drought response measures often result in immediate effects on people's lives and livelihoods. For example, direct food and cash distribution saves lives and benefits livelihoods in the short term. However, these efforts can also create dependencies and other new vulnerabilities and may not reduce underlying drought vulnerabilities. Therefore, these same individuals may experience similar or more extreme conditions the next time a drought occurs. Although drought relief is an important safety net and is often politically appealing, it should not be the primary focus in drought risk reduction.

The selection of risk management options must be evaluated in the context of numerous constraints and issues. Some constraints could include time, financial and personnel resources, geography, feasibility, the level and nature of development and vulnerability, the attitudes and desires of the affected communities and landowners, legalities, public acceptance, and liability. They must also take into account social factors such as gender, age, and social and economic capacities. Women, children, the elderly, and the poor are especially vulnerable to the effects of drought. Special consideration must be given to these populations and those livelihoods least able to cope with drought.

Drought mitigation and response actions should complement those of other programs focusing on public health, economic development, environmental management, and climate change adaptation. For example, when appropriate, integrating drought risk reduction planning into the health sector can pay long-term dividends. In this regard, planners can promote activities that assist the health sector in monitoring the health impacts of drought and develop their capacity to help mitigate and prepare for drought disasters. This includes fostering food security to ensure the resilience of communities to drought and other hazards that can weaken agriculture-based livelihoods.

In regard to **economic development**, planners should promote diversified income options for populations in high-risk areas to reduce their vulnerability to drought, and ensure that their income and assets are not undermined by development processes that increase their vulnerability. These efforts should parallel those that promote the development of innovative financial instruments and risk-sharing mechanisms, particularly insurance against drought. For example, the innovative market-based solutions proposed by the Commodity Risk Management

A Community Builds a Groundwater Dam to Help Solve its Water Problems

One possible solution to water scarcity during the dry season: the groundwater dam. Groundwater dams store water underground, rather than on the surface. Water that is stored in the soil does not evaporate like ponds and streams. It is clean and healthy - parasites will not contaminate underground water. The key is to find ways to capture wet season rainfall underground. There are many ways to do this, both traditional and modern; but whatever method is used, the principle is the same: slow down the flow of water as it runs downhill.

The groundwater dam requires a fair amount of labour to complete, but the technology is not difficult, and the rewards are considerable. However, each region will have its own traditional solutions, based on its own unique needs for water, its soil structure, its climate, and its social structure.

A conversation with an African villager describing the implementation of a groundwater dam can be found on the website of the Developing Countries Farm Radio Network (www.farmradio.org/english/radio-scripts/71-9script_en.asp). The radio network provides various materials to radio broadcasters in 39 African countries.

Source: Dr. Chris Reij http://www.farmradio.org/english/radio-scripts/71-9script_en.asp

Group of the World Bank include index-based weather insurance and price risk insurance linked to credit (see www.iwmi.cgiar.org/drw/images/ADDF2_report.doc).

A combination of resilience-building actions and safety nets for exceptional circumstances provides a balanced approach to drought risk reduction.

In recent years, sustainability has also been increasingly stressed as essential for creating more resilient systems and reducing the effects of natural hazards. Therefore, planners should encourage the sustainable use and management of ecosystems, including better land-use planning and development activities to reduce drought risk. This includes mainstreaming drought risk considerations into planning procedures for major development projects such as the creation of settlements, urban growth projects, and building and water supply regulations and management.

Case Study: Kenya, Green Belt Movement

The Green Belt Movement (GBM) of Kenya exemplifies an organization that fosters local-based efforts to create a more sustainable environment that will be more resilient to the effects of drought. The program creates a culture of resilience by encouraging women and men in rural areas to plant and nurture native trees.

Established in the mid-1970s, GBM is credited with planting more than 30 million trees and is now expanding to other African countries. Its founder, Wangari Maathai, won the Nobel Peace Prize in 2004. The idea came to her as she observed the effects of commercial agriculture on people in villages: it reduced their food choices because they had less firewood for cooking; it de-emphasized traditional, unprocessed foods in the diet; there was more erosion and soils were less fertile; and there were fewer springs so women had to walk farther for water. There was also less wildlife, clean air, and shade.

The result was greater vulnerability to drought, malnourishment, famine, and death. Maathai taught women to collect seeds of indigenous trees from their immediate surroundings and to nurture them using whatever resources were at hand. GBM paid the women a token amount for each seedling that survived. With each tree planted, she asked them to repeat words affirming the need to roll back encroaching desertification. GBM organizers conducted a variety of environmental education and awareness activities for its "foresters without diplomas," and made a point to listen to people in their native languages as they shared traditional knowledge from their particular areas.

This example demonstrates how one program aimed at planting trees has grown to meet broader needs of local communities, such as increasing re-forestation, increasing food security, empowering women, and providing for environmental education and leadership capacity development.

Source: Greenbelt Movement, www.greenbeltmovement.org

Africa: Innovative Market-Based Solutions for Drought Risk Reduction

At the 2nd African Drought Risk and Development Forum in Nairobi in 2006, the Commodity Risk Management Group of the World Bank put forward innovative market-based solutions to improve responses to drought. Index-based weather insurance and price risk insurance linked to credit are two proposed drought risk management options that are financially viable.

According to the World Bank, Malawi farmers have started to purchase weather insurance contracts and, following the drought of 2005, the government has used futures market price risk management as a way of hedging the potential cost of importing emergency food relief.

There is a need to shift from the typical ex-post to an ex-ante response, so that agencies are not always operating with high costs. The market for these instruments is developing quickly, thus the need to be aware of them and experiment with unconventional options.

Source: Session 2: Innovative Market-Based Solutions, 2nd African Drought Risk and Development Forum, Nairobi, Kenya (www.iwmi.cgiar.org/drw/images/ADDF2_report.doc)

Case Study: India, Indo-German Watershed Development Program

Another example of the integration of sustainable development and drought risk reduction is the Indian government's development of the Indo-German Watershed Development Program between 1992 and 2001, coordinated by the Watershed Organization Trust (WOTR) and the National Bank for Agriculture and Rural Development.

This project incorporated land restoration activities, such as tree and grassland planting, a switch to more sustainable crops, and community-led pilot projects to promote soil and water conservation (e.g., education, water harvesting, and irrigation techniques) on drought-affected test sites across India. This project was successful in restoring native habitat; increasing crop yields; raising water tables; stabilizing rural migration; and fostering leadership, technical and organizational capacities, and community unity.

Planners should also promote the integration of drought risk reduction associated with existing climate variability into strategies for adapting to climate change, which includes the identification of drought-related risks, the development of appropriate risk reduction measures, and the use of climate risk information by decision makers.

Source: World Resources 2005 at http://www.grida.no/wrr/047.htm

Overall, drought risk reduction strategies must be realistic, as well as socially and environmentally compatible. This activity must also take place on a scale that is meaningful to those who must act, whether at the national, regional, or local level. In choosing the appropriate actions, stakeholders may want to ask some of the following questions:

- Will the action equitably address the needs of affected individuals and groups?
- What are the cost/bene?t ratios for the identified actions?
- Which actions do stakeholders consider feasible and appropriate?
- Which actions are sensitive to the local environment (i.e., sustainable practices)?
- Do the actions address the right combination of causes to adequately reduce the relevant impact or vulnerability?
- Do the actions address short- and long-term solutions?

Indo-German Watershed Development Program: Integrating sustainable development and drought risk reduction

Darewadi village and the surrounding area in the Ahmednagar district of Maharashtra state in India was faced with near-complete desertification, limited agricultural production, and the seasonal migration of villagers to find work. In response to situations such as this one in Darewadi, the Indian government developed the Indo-German Watershed Development Program between 1992 and 2001, coordinated by the Watershed Organization Trust (WOTR) and the National Bank for Agriculture and Rural Development (NABARD).

Restoration activities such as tree and grassland planting and a switch to more sustainable crops were coupled with community-led pilot projects to promote soil and water conservation (e.g., education, water harvesting, and irrigation techniques) over a 5-year time span. The projects were carried out on both privately owned and publicly held land. Communities were considered eligible for participation in the program if they were considered to be drought-affected, the land-ownership within the region was relatively equally distributed, and their geographical position within a watershed was conducive to the restoration activities.

The communities also had to agree to a ban on tree cutting and grazing in areas where the restoration activities were to take place and provide voluntary labour equal to 15-20% of the project's total costs. The restoration activities and pilot projects were carried out by community members after receiving technical and organizational training and economic assistance from WOTR. An unpaid Village Watershed Committee, appointed by the Village Assembly, oversaw the implementation of the projects, monitored the grazing and tree cutting bans, organized labour and wages, and imposed fines on any violators.

The Indo-German Watershed Program was widely successful throughout regions of India. It was particularly successful in Darewadi, where after 5 years of the restoration activities, 65% of the trees and grasses that were planted on 395 hectares of previously denuded terrain and grazing biomass increased 170%. Crops such as maize, wheat, and other vegetables were being sustainably grown and irrigated hectares of land increased from 197 to 342 ha. The project's funding ceased in 2001 but Darewadi continued to experience a rise in the water table, grazing biomass, and amount of land under irrigation.

The seasonal migration of villagers also ceased as a result of stabilized agricultural production and wages. Importantly, the community members also gained leadership, technical and organizational skills, and unity among community members.

Source: World Resources 2005 at http://www.grida.no/wrr/047.htm

4.4.2 Mitigation and Preparedness Methodologies

There are currently a limited number of tested strategies available for identifying appropriate drought risk reduction strategies. For example, as discussed in Section 4.2.1, the National Drought Mitigation Center (USA) has developed the guide "How to Reduce Drought Risk" to help entities better understand their own drought risk and develop locally based risk reduction measures (www.drought.unl.edu/planhandbook/risk.pdf). According to the methodology, after completing impact and vulnerability assessments to ascertain the true underlying causes of drought, risk reduction strategies should be identified and implemented to reduce those vulnerabilities (Table 1).

In the United States, some states have formed impact and risk assessment committees to help identify potential risk reduction activities. For example, the state of Colorado has formed eight assessment committees reflecting the state's primary sectors: Municipal Water, Wildfire Protection, Agricultural Industry, Tourism, Wildlife, Economic Impacts, Energy Loss, and Health. On the other hand, the state of Nebraska has only two committees: Agricultural, Natural Resources, and Wildlife; and Municipal Water Supply, Health, and Energy. The state of Arizona has taken this a step further and formed local drought impact groups (LDIGs) to coordinate drought public awareness, provide impact assessment information to local and state leaders, and implement and initiate local mitigation and response options.

Examples of mitigation and response actions proposed by states can be seen by examining the state drought plans at (http://drought.unl.edu/plan/stateplans.htm). In fact, several U.S. states have implemented numerous mitigation and response actions because of recurring droughts over the last two decades. According to surveys by the National Drought Mitigation Center, more than 50 specific actions identified by the state governments were classified into the following nine categories: 1) assessment programs; 2) legislation/public policy; 3) water supply augmentation/ development of new supplies; 4) public awareness and education programs; 5) technical assistance on water conservation and other water-related activities; 6) demand reduction and water conservation programs; 7) emergency response programs; 8) water-use conflict resolution; and 9) drought contingency plans. The list of potential actions is available at (drought.unl.edu/mitigate/tools.htm).

The mitigation and response activities identified were diverse because of regional differences in impacts, legal and institutional constraints, drought plans and institutional arrangements, and the wide range of state agencies responsible for drought planning and mitigation. Overall, these states have made significant progress in the field of drought planning. However, most U.S. drought plans still emphasize emergency response rather than mitigation. Tribal governments in the United States, many of which are located in extremely drought-prone western regions, are also pursuing development of drought mitigation plans. For example, as part of their drought planning process, the Hopi Nation (an American Indian group in the south-western United States) conducted a vulnerability analysis that revealed four sectors of concern: range and livestock, agriculture, village water supplies, and environmental health.

Table 1
A hypothetical illustration of a typical drought impact, the underlying vulnerabilities, and a range of potential drought mitigation and response actions

Impact of Drought	Underlying Causes of Vulnerability (Basal Causes of the Why Questions)	Possible Actions	Mitigation (M), Response (R), or Accepted Risk (AR)
Income loss from crop failure	Variable climate	Weather modification	M
		Weather monitoring	M
	No irrigation	Haul water during a drought	R
		Provide government assistance for projects	M
	Expensive seeds	Subsidize seed sales	M
	Farmer preferences to plant specific seeds	Conduct workshops	M
		Conduct research	M
		Enhance communication	M
	Government incentives to plant specific crops	Lobby for new incentives	M
	No drought warning	Provide weather monitoring	M
		Identify "triggers"	M
	High cost of crop insurance	Government subsidies	R
	Lack of research as to the efficiency of drought relief efforts	Identify target groups and conflicting relief program criteria and goals	M
	Lack of drought relief program coordination	Streamline relief application and funding	M

Source: How to Reduce Drought Risk, Knutson et al., http://drought.unl.edu/plan/handbook/risk.pdf, 1998

Case Study: Nebraska, USA, Identification of Drought Mitigation and Response Actions

Risk assessment committees for the state of Nebraska, USA, identified a range of potential drought impacts and vulnerabilities during their drought planning process, and subsequently identified mitigation and response actions to address each of those concerns.

In this rural, agriculture-dominated state, the majority of their actions were focused on sustainable agricultural practices, public health, and water resources protection. These actions are outlined in the Nebraska Drought Mitigation and Response Plan at (carc.agr.ne.gov/docs/NebraskaDrought.pdf).

Case: Hopi Nation, USA

The Hopi Nation developed a list of short- and long-term drought mitigation and response actions for each impact sector. For example, to mitigate range and livestock losses, the plan suggests that range management plans be completed for each range unit. To facilitate rotations and proper use of grazing lands, the Hopi range management plan also includes fencing and water development projects. Water availability in these units will be improved through a combination of rehabilitating surface water impoundments, additional wells at key locations, improved water distribution from the supply point to multiple stock watering troughs, and other conjunctive uses. The Hopi planners hope these mitigation actions will decrease the vulnerability of the range and livestock economic sector.

Example of Drought Mitigation and Response Actions

In 2004, the state of Nebraska, USA, completed a drought planning process that outlined a range of priority mitigation and response actions the state proposed to carry out to reduce the potential impacts associated with drought. Selected impacts and planned mitigation and response actions are listed below.

Potential Impact 1: Reduced range and pasture forage and livestock water results in poor animal health, soil erosion, and possible economic loss to ranchers
Planned Actions:

- Encourage the use of range and pasture management techniques such as reduced stocking rates, reserve pastures, rotational grazing, removing competitive plants, and stored feed to improve sustainability of rangelands
- Before and during drought, use public information programs and on-site visits to emphasize the importance of range-land management and planning to equalize stocking rates with available forage and the need for permanent water storage and distribution systems.
- Monitor forage supplies and conditions around the state and facilitate information exchange between interested par-ties.
- Investigate the needs of economically stressed ranchers who now rely on federal and state grazing leases to sustain their herds. Develop a coordinated plan of action to be taken by land management agencies to provide grazing and/or supplemental feed assistance to lessees. Investigate changing federal and state grazing regulations during drought.
- Assist ranchers in obtaining supplemental income by connecting them with employment opportunities, and, during drought, by holding job fairs and raising general awareness of job opportunities and ranchers' work skills.

Potential Impact 2: Social and physical stress on agriculture producers
Planned Actions:

- Develop working partnerships with local ministerial alliances and local health offices to develop social counselling and support programs.
- Implement and/or maintain farm/crisis telephone hotline(s).
- Use local TV and radio outlets to implement public information programs directed at reducing drought-induced mental stress and for announcements for hotline numbers and mediation services.
- Establish education programs to increase awareness of dust-related respiratory problems and how proper land man-agement can improve air quality.
- Communicate with state medical allergy and asthma experts to develop recommendations for treating and mitigating dust-related health problems.

Potential Impact 3: Because of drought, many public water supply systems experience potable water demand problems
Planned Actions:

- Emphasize, and evaluate, long- and short-term drought contingency plans for all systems.
- Emphasize indoor and outdoor water conservation measures.
- Maintain a list of "problem systems" with a history of or potential for drought-related problems.
- Develop programs and educate the public on the potential uses of wastewater.
- Develop partnerships with utility companies and others who can help distribute drought-related information.

Source: Nebraska Drought Mitigation and Response Plan, Nebraska Climate Assessment and Response Committee, 2000, at http://carc.agr.ne.gov/docs/NebraskaDrought.pdf

In addition to identifying mitigation actions that will reduce the tribe's drought risk, the Hopi drought plan is unique in that it identifies the responsible agencies, provides a timeline to complete the actions, and proposes a cost estimate for these actions. For example, a cost of $12 million is estimated to upgrade the water supply systems of 12 tribal villages by improving pumping capacity, storage tank size, and pipe capacity. The tribe plans to seek funding for these actions through a variety of agencies and sources while enhancing water conservation at the same time.

Source: National Drought Mitigation Center, University of Nebraska-Lincoln, USA at (drought.unl.edu/plan/HopiPlan.htm).

4.4.3 Implementing Drought Mitigation and Preparedness Measures

Although it is essential to identify potential drought mitigation and preparedness measures, drought risk reduction can only be achieved if the actions are implemented. Promoting a culture of drought mitigation and preparedness is necessary to overcome the barriers in implementing short- and long-term measures needed to more fully reduce drought risk. There are several strategies that will help formulate this culture and increase the likelihood of implementation:

Demonstrate long-term benefits of mitigation and preparedness

As discussed previously, cost is one factor in implementing effective drought mitigation and preparedness measures. The development and implementation of effective drought mitigation and preparedness strategies often requires long-term financial and institutional investments. Many countries are beginning to realize that the long-term benefits of more proactive drought mitigation and preparedness measures bring greater rates of return, although they may take longer to be realized.

In order to illustrate this concept, it is essential to evaluate the cost effectiveness of drought mitigation and preparedness measures in comparison to drought response measures. Demonstrating long-term costs and benefits will help in promoting the effective investment of resources into risk reduction strategies. Drought is a natural part of climate that should not be ignored during times of plenty.

Demonstrate the effectiveness of mitigation and preparedness

Not only should the costs and benefits involved in drought mitigation and preparedness be assessed, but also the effectiveness of the measures themselves. It is essential to identify and demonstrate effective approaches and opportunities for drought mitigation and preparedness, including case studies to show examples of good as well as weak policies. Policy makers, scientists, media, and the public often need to see "actions-at-work" in order to foster buy-in to similar efforts.

Incorporate drought mitigation into drought response efforts

Although droughts can be disastrous to local people and livelihoods, they also create a "window of opportunity" to develop capacities that reduce drought risk in the long term, including the sharing of expertise, knowledge, and lessons learned. To make the best of a poor situation, resources may even be pre-positioned to maximize the utilization of these opportunities when they occur. Long-term drought mitigation and preparedness activities can be incorporated into drought response and recovery processes while political will is strong and drought is in the minds and hearts of those affected.

Example of drought mitigation Planning, Indian Hopi Nation, USA

The Hopi Nation, an American Indian group in the south-western United States, followed the NDMC's 10-Step Drought Planning Process and the NDMC's risk assessment methodology in conducting a drought planning process.

As part of the process, the tribe conducted a thorough impact and vulnerability analysis to identify sectors of concern. Based on this analysis, they then identified mitigation and response actions to address the vulnerabilities, including identifying responsible agencies to carry out these activities, an implementation timeline, and cost estimates.

Source: Developing a Drought Plan: The Hopi Nation, National Drought Mitigation Center, University of Nebraska-Lincoln, USA at http://drought.unl.edu/plan/HopiPlan.htm.

Example of Integrating Drought Response and Mitigation, El Salvador

Subsistence farmers, especially in eastern El Salvador, suffered from sporadic rainfall between 1998 and 2001. Many crops in 62 municipalities were devastated by drought, with losses of up to 80% of the crops and 38% of farmers' incomes.

The Drought Response and Mitigation Project was developed by the Spanish Red Cross, Salvadorian Red Cross Society, Inter-American Institute for Cooperation in Agriculture, and El Salvador Post-Harvest Coordinating Unit to reduce drought impacts by providing immediate food aid, assisting with the technical aspects of diversification and marketing of crops, increasing family income, enriching daily diets, reforesting lands with fruit trees, and conserving soil to ameliorate environmental conditions. Those most in need began a program of agricultural recovery in which they received a farm kit containing tools to plant their crops. Emphasis was placed on sustainable agricultural techniques, organic fertilizers, and irrigation systems for small plots. Training and technical assistance was provided to increase production and assist with storing and marketing crops.

Approximately 300 families, or 1,500 people, were helped through this project and became better able to farm more effectively and efficiently. About 75% of those involved in the project were women who took on a greater role of leadership and decision making in the communities. Children learned that there is an alternative to migrating away from their communities for employment. Crops could be grown in the summer with the help of irrigation systems. Organizations witnessed the rewards of addressing drought vulnerability through long-term strategies. Those helped by the project have continued to practice the new methods they learned.

For example, the Spanish Red Cross, Salvadorian Red Cross Society, Inter-American Institute for Cooperation in Agriculture, and El Salvador Post-Harvest Coordinating Unit responded to drought conditions from 1998 to 2001 in El Salvador by establishing the Drought Response and Mitigation Project. This program focused both on providing immediate drought relief and implementing alternative farming techniques to increase local long-term sustainability.

Foster collaboration and community ownership

The implementation of drought mitigation and preparedness measures will also be enhanced by developing specific mechanisms to engage the active participation and ownership of relevant stakeholders in drought risk reduction, in particular building on the spirit of volunteerism and personal responsibility.

This entails fostering collaborative efforts and information sharing between sectors and partners from governmental, nongovernmental, and local entities, including the establishment of public-private partnerships to better engage the private sector in drought risk reduction activities.

The private sector should be encouraged to foster a culture of disaster reduction, putting greater emphasis on and allocating resources to pre-drought activities such as risk assessments and early warning systems. Drought is a complex phenomenon that affects a wide range of groups and sectors. Addressing drought in a holistic manner requires that stakeholders coordinate their efforts to maximize effectiveness and minimize redundancy and competing goals.

Inventory and Develop Capacities to Mitigate Drought

Many governmental and local entities may not have the capacity or resources to identify and support community-based mitigation measures. Efforts may be required to develop the capacity of these entities to more fully explore and implement mitigation and response strategies. This includes the ability to inventory national capacities to identify, assess, and implement mitigation and preparedness measures.

The ability to assess and incorporate local indigenous knowledge, capacities, and needs into drought mitigation and preparedness strategies is also essential in order to develop and implement equitable and community-based solutions. Planning at all levels should be collaborative and inclusive. As gaps in capacity are identified, resources and expertise should be targeted to meet these needs. Appropriate long-term investment of financial and technical resources into capacity development and drought mitigation and preparedness activities will be required to sustain these efforts.

Formalize drought mitigation and response responsibilities

Drought mitigation and response actions are more likely to be carried out if they are required by drought plans and if agencies or individuals are given the responsibility for their implementation. For example, as discussed in Section 4.2, it is essential that drought management policies emphasize monitoring and early warning as an essential part of drought preparedness.

Early warning information should be linked to actions that can be taken to reduce the effects of drought. For example, a drought plan may specify actions to be undertaken during normal times, during the early stages of drought, during drought, and in the drought-recovery period. The plan will also identify the entities responsible for carrying out each action. The implementation of the designated actions may be recommended or legalized depending on the situation, but it tends to foster a sense of responsibility in either case.

An example of linking Early Warning Indicators and Drought Mitigation and Response Actions is given by several U.S. states (e.g., Arizona, Georgia, Hawaii, and New Mexico) and American Indian tribes that have recently developed drought mitigation plans, including linking drought indicators with specific drought mitigation and response actions to be carried out by responsible agencies. The state drought plans outlining these linkages can be seen at (drought.unl.edu/plan/stateplans.htm). Specific drought plan for the Navajo Nation can be viewed at (drought.unl.edu/plan/Navajo_drought_pln2003.pdf).

Allocate resources for drought risk reduction

Drought is a significant natural hazard that is a catalyst for a wide variety of severe consequences for humans and the environment. Reducing the risk of this threat requires a long-term commitment of human, technical, and financial resources.

Governments, the private sector, and other stakeholders need to consider drought as a significant natural hazard and allocate the appropriate resources to reduce drought risk. Many studies have shown that investing in natural hazard preparedness and mitigation strategies is more cost-effective than relying solely on response activities.

Hence, any investment in drought risk reduction, mitigation, and preparedness measures to reduce the effects of drought is a profitable investment. Governments and other stakeholders should allocate adequate funds in their budgets for meaningful drought risk reduction efforts.

4.4.4 Tracking Progress

Benchmarks or milestones should be developed for determining "success" in mitigation and preparedness to determine if measures are working. Benchmarks should include methods of evaluation for different scales and sectors with both qualitative and quantitative measures. Potential examples include:

- Use of agricultural monitoring data to analyze the reduction in drought impacts on crop production due to early warning information
- An increase in the establishment of institutions with a specific mandate for drought mitigation and preparedness
- An increase in the development and use of early warning systems and contingency plans
- Demonstrations and piloting of new technologies for resource conservation in selected drought-prone areas

The ISDR and the NDMC have begun a program to collect drought risk reduction case studies in order to highlight innovative new strategies around the world. Researchers and practitioners must continue to document their work and make it available in order for us to more fully understand which actions are most effective in real-world situations.

We are very pleased to receive your information and documented practices. Send correspondence to Pedro Basabe, basabe@un.org

V

Networks and Mechanisms to Encourage the Implementation of Drought Risk Reduction Projects and Practices

The adoption of the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters has given impetus to disaster reduction activities worldwide, including drought risk reduction. Governments, UN agencies, and regional organizations have already embarked on redefining national plans and strategies and in setting up promotional campaigns and institutional plans for further action.

As agreed in the Hyogo Framework, the ISDR system will work with national, regional, and international partners to provide coordination and assistance in the promotion and implementation of the Hyogo Framework (see: http://www.unisdr.org/isdr-system). Chapter IV of this document presents the main elements of a drought risk reduction framework, taking the Hyogo Framework into consideration.

This chapter provides recommendations for the development of networks and mechanisms to encourage the implementation of drought risk reduction project and practices. The aim is to foster an ISDR-related collaborative "drought community", implementing drought risk reduction practices, and acquiring the resources to carry out these activities. Similar "thematic platforms" exist within the ISDR system for other disaster risk reduction topics such as early warning, disaster recovery, climate change, and education.

5.1 A Global Drought Risk Reduction Paradigm

Lessons from developed and developing countries demonstrate that drought results in significant impacts, regardless of level of development, although the character of these impacts will differ profoundly.

Because of increasing concern over escalating drought impacts and society's inability to effectively respond to these events, developing and developed countries are now placing greater emphasis on the creation or strengthening of policies and plans that emphasize the principles of risk management. In addition, global initiatives, such as the U.N. Convention to Combat Desertification (UNCCD) and the U.N. Framework Convention on Climate Change (UNFCCC), are emphasizing the importance of improving drought early warning systems and seasonal climate forecasts and developing drought preparedness plans.

Numerous other efforts are also underway at the regional, national, and local levels to address the challenges of building greater resilience to episodes of severe drought. These efforts include drought monitoring, prediction, early warning and disaster preparedness programs sponsored by a wide array of organizations, such as those shown in Figure 22. This includes renewed efforts for drought risk reduction facilitated by adoption of the Hyogo Framework.

However, a problem has been that many drought-related activities have been accomplished in a piecemeal manner, with limited sharing of knowledge. As new technologies, tools, and methodologies become available and are subsequently adopted by drought-prone countries and regions, the importance of sharing this information and experience is paramount to future advances in drought preparedness.

There is a need to establish a strategy to help change the common perceptions and management approach to drought. As described in the preceding sections, the strategy should be based on a new approach - one that is more focused on the human dimensions of drought and proactive risk reduction measures, including vulnerability reduction through risk assessment activities at the local and national levels. This section also stresses a need to focus on: 1) implementing practical, real-world drought risk reduction activities, and 2) establishing regional networks to share knowledge and expertise.

Two-Prong Approach for Drought Risk Reduction

- Implementing practical, real-world drought risk reduction activities
- Establishing regional networks to share knowledge and expertise

5.2 Fostering Practical Drought Risk Reduction Activities

It is essential to identify mechanisms and opportunities for fostering the implementation of practical, real-world drought risk reduction activities.

The ISDR organized a Drought Discussion Group in 2003, and reconvened the group in 2006 to exchange criteria on how to move forward drought risk reduction agenda, and is proposing that the group play a more permanent advisory role in the future (see Annex 1). The ISDR and members of this Group, along with the vast array of other stakeholders around the world, are expected to help facilitate the identification and implementation of drought risk reduction activities.

In 2006, the World Bank launched its Global Facility for Disaster Reduction and Recovery, a major new initiative to assist governments, especially in poor countries, to implement measures to reduce disaster risks and to integrate risk reduction strategies in development processes. The Facility includes a partnership with the ISDR secretariat to develop a supporting array of regional and international capacities and information resources (www.unisdr.org/partner-wb-isdr). This type of partnership and program will be valuable for supporting and coordinating drought risk reduction activities around the world.

In addition, in 2006, The ISDR and the National Drought Mitigation Center, USA, signed a Memorandum of Understanding to work together to reduce vulnerability and promote resilience to drought. The joint effort will promote coordination, networking, exchanging expertise, developing policies and identifying simple and affordable technologies, tools and good practices for drought risk reduction.

The ISDR and its partners (ISDR system) will continue to reach out to, and work with, a wide range

Figure 22
Some of the key institutions working on drought issues around the world.

1. United Nations Development Programme Drylands Development Centre (DDC)
2. United Nations Convention to Combat Desertification (UNCCD)
3. Food and Agriculture Organization of the United Nations (FAO)
4. World Food Programme of the United Nations (WFP)
5. United Nations Environment Programme (UNEP)
6. United Nations International Strategy for Disaster Reduction (ISDR)
7. United Nations Development Programme Bureau for Crisis Prevention & Recovery (BCPR)
8. United Nations Office for the Coordination of Humanitarian Affairs (OCHA)
9. United Nations International Fund for Agricultural Development (IFAD)
10. United Nations Educational, Scientific and Cultural Organization (UNESCO)
11. United Nations Children's Fund (UNICEF)
12. United Nations Framework Convention on Climate Change (UNFCCC)
13. UN Environmental and Sustainable Development Division (ESCAP)
14. International Center for Agricultural Research in the Dry Areas (ICARDA)
15. Consultative Group on International Agricultural Research (CGIAR)
16. World Meteorological Organization (WMO)
17. International Federation of Red Cross and Red Crescent Societies (IFRC)
18. The World Bank Group
19. European Drought Centre (EDC)
20. International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM)
21. Asian Development Bank (ADB)
22. South Pacific Applied Geoscience Commission (SOPAC)
23. Asian Disaster Preparedness Center (ADPC)
24. African Development Bank (AfDB)
25. South African Development Community Drought Monitoring Centre (DMC)
26. IGAD Climate Prediction and Applications Centre (ICPAC)
27. Central European Disaster Prevention Forum (CEUDIP)
28. Centre Régional AGRHYMET
29. Australian Bureau of Meterology's SILO/Drought
30. Agriculture and Agri-Food Canada Drought Watch
31. Beijing Climate Center, Drought Monitoring
32. Bureau de Recherches Géologiques et Minières (BRGM)
33. Turkana Drought Contigency Planning Unit (TDCPU)
34. Mexico National Drought Research Center
35. National Drought Mitigation Center (NDMC)
36. International Research Institute for Climate and Society
37. Natural Hazards Research and Applications Information Center, University of Colorado, Boulde
38. Embrapa
39. FUNCEME
40. International Boundary and Water Commission
41. Australia Bureau of Rural Sciences
42. Land & Water Australia
43. U.S. Department of Agriculture's Foreign Agricultural Service
44. South African Weather Service
45. Zambia Department of Meteorology
46. Canadian Climate Impacts and Adaptation Research Network
47. Center for Research on the Epidemiology of Disasters (CRED)
48. United Nations Development Group (UNDG)
49. United Nations University (UNU)
50. United Nations Human Settlements Programme (HABITAT)
51. ProVention Consortium (Disaster Management Facility, World Bank)
52. Inter-American Water Resources Network
53. Inter-American Development Bank (IADB)
54. Association of Southeast Asian Nations (ASEAN) Experts Group on Disaster Management (AEGDM)
55. African Centre of Meteorological Application for Development (ACMAD)
56. International Water Management Institute (IWMI)
57. The Long Paddock
58. All India Disaster Mitigation Institute
59. India Council of Agricultural Research (ICAR)
60. Office of Disaster Preparedness and Emergency Management Jamaica (ODPEM)
61. SAHEL Institute (INSAH)
62. Instituto Nicaraguense de Estudios Territoriales (INETER)
63. United States Department of Agriculture (USDA)
64. United States National Oceanic and Atmospheric Administration's Drought Information Center
65. United States National Climatic Data Center
66. US NOAA Cooperative Institute for Research in Environmental Sciences Climate Diagnostics Center (CDC)
67. United States Geological Survey (USGS) WaterWatch
68. Southern Alliance for Indigenous Resources (SAFIRE)
69. International Development Research Centre (IDRC)
70. International Institute for Applied Systems Analysis (IIASA)
71. International Institute for Sustainable Development (IISD)
72. Center for Disaster Management (CENDIM)
73. Inter-Agency Standing Committee (IASC)
74. Drought Management Center for South-Eastern Europe (DMCSEE)
75. International Center for Drought Risk Reduction (ICDRR)
76. The Office of the High Commissioner for Human Rights (OHCHR)
77. The Office of the United Nations High Commissioner for Refugees (UNHCR)
78. United Nations Development Fund for Women (UNIFEM)
79. United Nations Economic and Social Council (ECOSOC)
80. United Nations Volunteers (UNV)
81. World Health Organization (WMO)

Note that only agency headquarters may be shown in some cases. Also, this map is not meant to be inclusive of all agencies conducting drought-related activities. There are certainly many more national and local agencies undertaking significant drought-related work. (Source: National Drought Mitigation Center, University of Nebraska-Lincoln, USA).

of relevant stakeholders in order to foster the implementation of risk reduction activities. Discussions are underway with a number of governments on possible regional collaborative centers, which may include centers on drought-related risks.

In addition, current collaboration with the UN Office for the Coordination of Humanitarian Affairs (OCHA), its Emergency Preparedness Section, and regional offices is creating another important venue for risk reduction activities. OCHA is mandated to coordinate humanitarian response during disasters, policy development, and humanitarian advocacy. Addressing drought risk reduces the need for government interventions during drought and allows communities and regions to recover more quickly after drought.

Many drought risk reduction initiatives focus on Africa, owing to its high levels of poverty, insecurity, and life-threatening vulnerability to drought,. The Nairobi-based UNDP Drylands Development Center (DCC) and the ISDR African Office have agreed to work with the regional drought monitoring centers in the identification and implementation of drought risk reduction activities in Sub-Saharan Africa.

Several meetings have been held in Africa in recent years to foster drought risk reduction activities, including the inception of annual African Drought Risk and Development Forums, beginning in Kenya in 2005. These meetings concentrate on mechanisms to change the paradigm for drought management in Africa from crisis to risk management.

Concentrating funding and expertise to implement local and national risk reduction programs and pilot projects is critical for reducing drought risk and providing examples for others to follow. The coordination of these projects and sharing of knowledge will be increased by the creation or enhancement of regional drought preparedness networks.

5.3 Concept of a Global Drought Risk Reduction and Preparedness Network

One way to foster the exchange of information and experiences is through development of a global network of regional networks for drought preparedness. This "Global Drought Preparedness Network", relying heavily on the Internet and regional workshops for linking institutions within and between regions, will facilitate this communication exchange when implemented around the world.

The Global Drought Preparedness Network can provide the opportunity for nations and regions to share experiences and lessons learned (successes and failures) through a virtual network of regional networks.

For example, information on drought policies, emergency response measures, mitigation actions, planning methodologies, stakeholder involvement, early warning systems, automated meteorological networks, the use of climate indices for assessment and triggers for mitigation and response, impact assessment methodologies, demand reduction/water supply augmentation programs and technologies, and procedures for addressing environmental conflicts could be shared within and between regions through the network.

In essence, this global drought partnership will enhance current national and regional institutional capacities for drought risk reduction and preparedness by building regional networks and partnerships.

The network's goals relate to the overall objectives of the Hyogo Framework for Action in relation to drought, which are:

- Ensuring that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation,

The Global Drought Risk Reduction and Preparedness Network will facilitate the exchange of drought-related information and experiences around the world.

- Identifying, assessing, and monitoring disaster risks and enhancing early warning
- Using knowledge, innovation, and education to build a culture of safety and resilience at all levels of society,
- Reducing the underlying risks of drought, and
- Strengthening disaster preparedness for effective response at all levels of society.

The ISDR Drought Discussion Group's report in April 2003, Drought: Living with Risk: An Integrated Approach to Reducing Societal Vulnerability to Drought (www.unisdr.org), identified the key issues associated with drought risk reduction and recommended the development of a global network. The report and proposal were subsequently presented to and endorsed by the ISDR Inter-Agency Task Force.

The ISDR secretariat and the National Drought Mitigation Center (NDMC), USA, have since been working in partnership with key U.N. agencies, national agencies, NGOs, and appropriate regional and national institutions to build the Global Drought Preparedness Network with the goal of building greater institutional capacity to cope with future episodes of drought. The ISDR, NDMC, and other partners have also been working in collaboration to promote the development of regional drought networks.

5.4 Progress on the Development of Regional Networks

The concept of regional networks on drought preparedness has been discussed throughout regions in the Mediterranean, Latin America, North America, Sub-Saharan Africa, Asia, Australia, and Eastern and Central Europe.

However, the development of regional networks has been a challenging process because of overlapping political jurisdictions, differences in the types of participants and policy issues in each region, varying degrees of interest among potential regional participants, and different implementation timelines. These factors have resulted in the creation of dispersed regional networks, such as those illustrated in Figure 23.

Additional work is needed to facilitate the development of additional networks and coordinate the exchange of information and expertise between them.

Mediterranean/Near East/Central Asia Region: The UN Food and Agriculture Organization (FAO), International Center for Agricultural Research in the Dry Areas (ICARDA), and the International Center for Advanced Mediterranean Agronomic Studies (CIHEAM) launched the NEMEDCA drought preparedness network for the Near East, Mediterranean, and Central Asian countries in 2002. This collaboration, and funding by the European Commission, has also resulted in a regional drought planning guide for the Mediterranean region (southern Europe and North Africa), referred to as MEDROPLAN www.iamz.ciheam.org/medroplan).

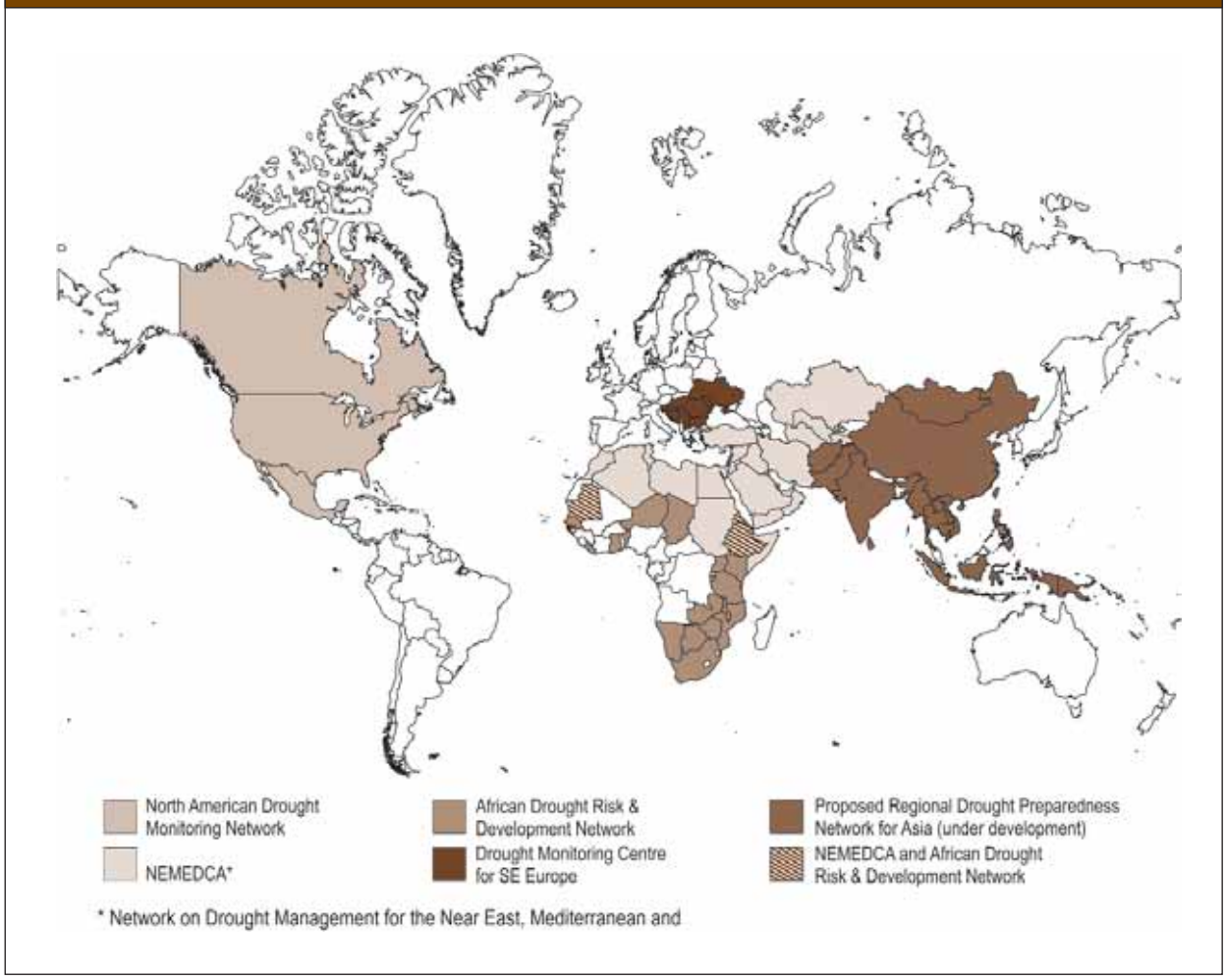
The UN/FAO has also funded technical cooperation projects in Iran, Syria, and Jordan to develop national drought strategies with the goal of developing a regional drought management center.

South-Eastern Europe: Slovenia has been selected to host the Drought Management Center for South-Eastern Europe (DMCSEE), organized by the World Meteorological Organization, the Secretariat of the United Nations Convention to Combat Desertification (UNCCD), and eleven countries from south-eastern Europe. The DMCSEE is to serve as an operational centre for South-Eastern Europe for drought preparedness, monitoring and management (www.wmo.ch/web/Press/Infonote29_E.doc)

Asia and Pacific: The concept of the GDPN and regional networks on drought preparedness was presented at the DESA/ESCAP/NOAA Interregional Symposium on Water-Related Disaster Reduction and Response in Bangkok, Thailand, in August 2001. Since that time, the NDMC ESCAP, UNDP, WMO, ISDR, the Asian Disaster Preparedness Center (ADPC), and the NDMC have discussed the development of networks for Asia and the Pacific Islands, received letters of support from most participating countries, and are actively seeking funding for organization of the network.

In April 2007, the International Center for Drought Risk Reduction (ICDRR), co-sponsored by the ISDR, was established by China in Beijing, to monitor and assess drought risk across Asia, develop knowledge and capacities for drought mitigation and promote cooperation between China and other Asian countries on drought relief.

Figure 23
Map of some drought preparedness networks around the world



Note: this map is not meant to represent all drought-related networks around the world. It shows representative networks that could potentially become part of a global drought preparedness network. (Source: National Drought Mitigation Center, University of Nebraska-Lincoln, USA).

Sub-Saharan Africa: The UNDP's Drylands Development Center (DCC) and Bureau for Crisis Prevention and Recovery and the ISDR African Office have agreed to work with the regional drought monitoring centers in the development of a network for Sub-Saharan Africa. Several meetings have been held in recent years, including the inception of annual African Drought Risk and Development Forums in Kenya, beginning in 2005. They are expected to provide further stimulus to the creation of the African Drought Risk and Development Network (www.droughtnet.org).

Other sub-regional African drought-related networks have also been tested, such as the Southern African Drought Technology Network, which enhance collaborative possibilities (see www.safireweb.org/html/sadnet.htm).

South America: The concept of a regional network for South America was originally discussed with the Institute of Agronomy at Campinas and National Institute for Space Research (INPE). The goal was for these organizations to take leadership in organizing this effort. Although there has been general agreement on the importance of establishing a network of this type, progress has been limited. Considerable work is yet to be done in identifying the principal regional and national member institutions, organizing a network, and seeking funding sources.

North America: The Prairie Farm Rehabilitation Administration/Agriculture Canada has agreed to work with the National Drought Mitigation Center, USA, to organize a North American regional network. Potential areas of collaboration are currently being identified. The Institute of Ecology

in Xalapa, Mexico, and the Mexican National Water Commission (CNA) will also be approached to determine their interest in participating in this network. These partners already cooperate in creating the North American Drought Monitor, so expansion of this network is sensible (see www.ncdc.noaa.gov/oa/climate/monitoring/drought/nadm/index.html).

Australia: The concept of a regional/global drought preparedness network has been discussed with the Australian Bureau of Resource Sciences (BRS) and the Bureau of Meteorology. BRS is interested in providing technical support for this network, especially in the Asian and Pacific Island regions. BRS is the primary organization in Australia providing support for their national drought policy. The next step is to better define a role for Australia in support of this regional drought networking effort.

5.5 Implementation of International Drought Risk Reduction Programs and Networks

The ISDR system, comprising Governments, international, regional and UN organizations, will continue to seek ways to promote and implement drought risk reduction programmes and knowledge networks to facilitate the implementation of the Hyogo Framework. Although activities will be supported worldwide, the initial emphasis may be placed in Africa, where drought and related factors result in the greatest loss of life.

It is likely that the ISDR Drought Advisory Group will be developed by ISDR system partners to provide improved international coordination and guidance, perhaps as a core element of an ISDR thematic platform on drought risk reduction. This group or platform could assist in identifying drought risk reduction priorities, coordinating global support initiatives, developing guidance information, and nurturing the development of regional networks. It should bring together the range of natural and social scientists and practitioners needed to implement the vision of drought management proposed in this document.

However, the implementation of drought risk reduction by the ISDR system operational partners, such as Governments, UN agencies (e.g. FAO, IFAD, UNCCD, UNDP, WFP, and WMO), regional organizations and other bodies, would continue to be undertaken by these organizations according to their mandates, in cooperation with national authorities and relevant organizations and networks.

The role of the ISDR secretariat will be to promote and support these efforts by ISDR system partners, through advocacy, information generation, promotion with donor organizations and programs, coordination of ISDR thematic platform, and stimulation of networks. The ISDR secretariat units in the regions can actively support related efforts at the regional level.

The ISDR secretariat is also exploring options for a global website of drought risk reduction, linked with regional websites, in collaboration with the NDMC. Other activities under consideration include regional workshops to identify partners and coordinating institutions, and to clarify the primary objectives and activities of the regional network. A global workshop should be held in due course to secure common understandings and inter-regional mechanisms for information exchange and coordination.

Working individually, many nations and regions may struggle to develop their drought coping capacities. However, by collectively working through global and regional networks and partnerships, they can significantly improve their chances of achieving a substantial reduction in the magnitude of social, economic, environmental, and political impacts associated with drought in the 21st century.

Annexes

Annex 1: List of Current Advisors on Drought Risk Reduction

Annex 2: Directory of Drought-Related Organizations

Annex 3: Examples of Drought Risk Reduction Practices

Annex 6: summary of the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters

The following annexes are available online on www.unisdr.org/drought-risk-reduction

Annex 4: List of Drought-Related References

Annex 5: Internet-Based Resources

Annex 1
List of Current Advisors

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NOTE 1: The following international and UN agencies and organizations have been kept informed about the proposed drought risk reduction framework and practices for their consideration and participation in the group of advisors:
UNDP/BCPR, IFRC, ProVention Consortium, UNCCD, UNFCCC, UNESCO and UNU

NOTE 2: Additional international, regional and UN organizations, bilateral agencies, NGOs, experts and practitioners will also be informed to enhance the document and develop a knowledge network on drought risk reduction.

Annex 2
Directory of Drought-Related Organizations

1. United Nations System
2. International Networks and Centres
3. Regional Networks and Organizations
4. Country-Based Organizations
5. Research Organizations

1. United Nations System

United Nations Children's Fund (UNICEF)
UNICEF is mandated by the United Nations General Assembly to advocate for the protection of children's rights, to help meet their basic needs and to expand their opportunities to reach their full potential. UNICEF works in 191 countries through country programs and National Committees. http://www.unicef.org/

United Nations Convention to Combat Desertification (UNCCD)
The ''United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa'' was adopted in Paris on 17 June 1994 and opened for signature there on 14-15 October 1994. It entered into force on 26 December 1996, 90 days after the fiftieth ratification was received. Over 179 countries were Parties as at March 2002. http://www.unccd.int

United Nations Office for the Coordination of Humanitarian Affairs (OCHA)
OCHA is led by the Under-Secretary-General for Humanitarian Affairs/Emergency Relief Coordinator and located in New York and Geneva. OCHA aims to alleviate human suffering by facilitating international coordination for the effective and efficient delivery of assistance to victims of disasters and complex emergencies. OCHA-Geneva has recently created the Emergency Preparedness Section to promote and strengthen disaster preparedness at all levels, among other activities. OCHA also assists in the operation of the HEWS, under the framework of the Inter-Agency Standing Committee (IASC), that serves as a common platform for humanitarian early warnings for natural hazards and socio-political developments worldwide. http://ochaonline.un.org

United Nations Country Team (UNCT)
The Secretary-General's reform process initiated in 1997 stressed the need to achieve a greater unity of purpose and coherence in country-level operations of the UN system, highlighting the need to strengthen the UN Country Team (UNCT) System and promoting a more united UN presence at the country level. The UNCT system encompasses all organizations of the United Nations system dealing with operational activities for development and relief, regardless of their formal presence in the country. The UNCT system aims to bring together the different UN agencies to improve the efficiency and effectiveness of operational activities at the country level.

United Nations Development Fund for Women (UNIFEM)
UNIFEM is the women's fund at the United Nations. It provides financial and technical assistance to innovative programs and strategies to foster women's empowerment and gender equality. http://www.unifem.org/

United Nations Development Group (UNDG)
Chaired by the UNDP Administrator, based in New York, the UNDG provides a framework for greater coherence and cooperation in UN development operations. As most of the UNDG members carry out activities related to disaster reduction, this group represents an opportunity to integrate disaster reduction into sustainable development. http://www.undg.org

United Nations Development Programme (UNDP) http://www.undp.org
UNDP is the UN's global development network, an organization advocating for change and connecting countries to knowledge, experience, and resources to help people build a better life. The Bureau is on the ground in 166 countries, working with them on their own solutions to global and national development challenges. As they develop local capacity, they draw on the people of UNDP and our wide range of partners. UNDP has two specialized divisions which deal with disaster risks reduction: Bureau for Crisis Prevention and Recovery (BCPR) http://www.undp.org/bcpr and the Drylands Development Centre (DDC) http://www.undp.org/drylands

The United Nations Economic and Social Council (ECOSOC)
ECOSOC serves as the central forum for discussing international economic and social issues, and for formulating policy recommendations addressed to Member States and the United Nations system. It is responsible for promoting higher standards of living, full employment, and economic and social progress; identifying solutions to international economic, social, and health problems; facilitating international cultural and educational cooperation; and encouraging universal respect for human rights and fundamental freedoms. It has the power to make or initiate studies and reports on these issues. With its broad mandate the Council's purview extends to over 70 percent of the human and financial resources of the entire UN system. The ECOSOC was established under the UN Charter as the principal organ to coordinate economic, social, and related work of the 14 UN specialized agencies, 10 functional commissions and five regional commissions. The Council also receives reports from 11 UN Funds and Programmes. http://www.un.org/docs/ecosoc/

United Nations Educational, Scientific and Cultural Organization (UNESCO)
UNESCO's main objective is to contribute to peace and security in the world by promoting collaboration among nations through education, science, culture, and communication in order to further universal respect for justice, the rule of law, human rights, and fundamental freedoms. http://www.unesco.org

United Nations Environment Programme (UNEP)
UNEP is the voice for the environment in the United Nations system. It is an advocate, educator, catalyst, and facilitator promoting the wise use of the planet's natural assets for sustainable development. http://www.unep.org

UN Environmental and Sustainable Development Division (ESCAP)
Established in 1947, ESCAP seeks to overcome some of the region's greatest challenges. It carries out work in three main thematic areas: poverty reduction, managing globalization, and tackling emerging social issues. http://www.unescap.org/; http://www.unescap.org/esd/environment

Food and Agriculture Organization of the United Nations (FAO)
FAO leads international efforts to defeat hunger. Serving both developed and developing countries, FAO acts as a neutral forum where all nations meet as equals to negotiate agreements and debate policy. FAO is also a source of knowledge and information. FAO helps developing countries and countries in transition modernize and improve agriculture, forestry, and fisheries practices and ensure good nutrition for all. Since its founding in 1945, its has focused special attention on developing rural areas, home to 70 percent of the world's poor and hungry people. http://www.fao.org

United Nations Framework Convention on Climate Change (UNFCCC)
Adopted in 1992, the UNFCCC sets out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases at a level that would prevent human-induced actions from leading to "dangerous interference" with the climate system. The UNFCCC entered into force on 21 March 1994. It now has 186 Parties. Seven meetings of the Conference of Parties (COP) have taken place, as well as numerous workshops and meetings of the COP's subsidiary bodies. http://unfccc.int

The Office of the High Commissioner for Human Rights (OHCHR)
OHCHR, a department of the United Nations Secretariat, is mandated to promote and protect the enjoyment and full realization, by all people, of all rights established in the Charter of the United Nations and in international human rights laws and treaties. The mandate includes preventing human rights violations, securing respect for all human rights, promoting international cooperation to protect human rights, coordinating related activities throughout the United Nations, and strengthening and streamlining the United Nations system in the field of human rights. In addition to its mandated responsibilities, the Office leads efforts to integrate a human rights approach within all work carried out by United Nations agencies. OHCHR's priorities are set out in its Strategic Management Plan 2006-2007 and follow the Vienna Declaration and Programme of Action of the 1993 World Conference on Human Rights, and the Charter of the United Nations. http://www.ohchr.org/

The Office of the United Nations High Commissioner for Refugees (UNHCR)
UNHCR was established on December 14, 1950, by the United Nations General Assembly. The agency is mandated to lead and co-ordinate international action to protect refugees and resolve refugee problems worldwide. Its primary purpose is to safeguard the rights and well-being of refugees. It strives to ensure that everyone can exercise the right to seek asylum and find safe refuge in another State, with the option to return home voluntarily, integrate locally or to resettle in a third country. In more than five decades, the agency has helped an estimated 50 million people restart their lives. Today, a staff of around 6,689 people in 116 countries continues to help 20.8 million persons. http://www.unhcr.ch/

The United Nations Human Settlements Programme (HABITAT)
The United Nations Human Settlements Programme, UN-HABITAT, is the United Nations agency for human settlements. It is mandated by the UN General Assembly to promote socially and environmentally sustainable towns and cities with the goal of providing adequate shelter for all. http://www.unhabitat.org/

International Fund for Agricultural Development (IFAD)
IFAD's goal is to empower poor rural women and men in developing countries to achieve higher incomes and improved food security. IFAD will ensure that poor rural people have better access to resources, and the skills and organization they need to take advantage of natural resources, improved agricultural technologies, a broad range of financial services, transparent and competitive markets for agricultural inputs and produce, opportunities for rural off-farm employment and enterprise development, and local and national policy and programming processes. http://www.ifad.org

The United Nations International Strategy on Disaster Reduction (ISDR)
ISDR is the focal point in the UN System to promote links and synergies between, and the coordination of, disaster reduction activities in the socio-economic, humanitarian, and development fields, as well as to support policy integration. It serves as an international information clearinghouse on disaster reduction, developing awareness campaigns and producing articles, journals, and other publications and promotional materials related to disaster reduction. It promotes the implementation of the Hyogo Framework of Action through global, regional, national and local disaster risk reduction partnerships. http://www.unisdr.org/

United Nations University (UNU)
The mission of the UNU is to contribute, through research and capacity building, to efforts to resolve the pressing global problems that are the concern of the United Nations and its Member States. The UNU aims to fulfil its mission by performing four key roles that are based on the mandate given to the University by its Charter: to be an international community of scholars; to form a bridge between the United Nations and the international academic community; to serve as a think-tank for the United Nations system; and to contribute to capacity building, particularly in developing countries. http://www.unu.edu/

United Nations Volunteers (UNV)
United Nations Volunteers is the United Nations focal point for promoting and harnessing volunteerism for effective development. UNV is a strategic source of knowledge and advice about the role and contribution of volunteerism and the benefits of civic engagement in development programs. UNV is dedicated to using Volunteerism for Development (V4D) to make distinctive contributions to the effectiveness of development. http://www.unv.org/

The World Bank Group http://www.worldbank.org
The World Bank is one of the world's largest sources of development assistance. The group consists of five closely associated institutions, owned by 185 member countries that carry ultimate decision-making power: the International Bank for Reconstruction and Development (IBRD), the International Development Association (IDA), International Finance Corporation, Multilateral Investment Guarantee Agency and International Centre for Settlement of Investment Disputes. Each institution plays a distinct role towards the Bank's overarching vision of global poverty reduction and the improvement of living standards. The Bank has recently launched the Global Facility for Disaster Reduction and Recovery (GFDRR) with the ISDR to support drought risk reduction globally. http://web.worldbank.org, http://www.unisdr.org/partner-wb-isdr

World Food Programme of the United Nations (WFP) http://www.wfp.org/english
WFP is the United Nations' frontline agency in the fight against global hunger. Operations aim to save lives in refugee crises and other emergencies, improve nutrition and quality of life of world's most vulnerable people at critical times in their lives, and enable development by (a) helping people build assets that benefit them directly; (b) promoting the self-reliance of poor people and communities. The WFP specializes in food aid and humanitarian assistance. One of WFP's key initiative related to Disaster Risk Reduction is the Vulnerability Analysis and Mapping (VAM) http://vam.wfp.org/

World Health Organization (WHO)
The World Health Organization is the United Nations specialized agency for health. WHO's objective is the attainment by all peoples of the highest possible level of health, which is defined as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. http://www.who.org

World Meteorological Organization (WMO)
The World Meteorological Organization is a Specialized Agency of the United Nations. It is the UN system's authoritative voice on the state and behaviour of the Earth's atmosphere, its interaction with the oceans, the climate it produces, and the resulting distribution of water resources. http://www.wmo.ch

2. International Networks and Centers

Center for Research on the Epidemiology of Disasters, Brussels
CRED promotes research, training, and information dissemination on disasters, with a special focus on public health, epidemiology, and structural and socio-economic aspects. It aims to enhance the effectiveness of developing countries' disaster management capabilities as well as fostering policy-oriented research. http://www.cred.be

Consultative Group on International Agricultural Research (CGIAR)
The Consultative Group on International Agricultural Research (CGIAR) is a strategic alliance of countries, international and regional organizations, and private foundations supporting 15 international agricultural Centers that work with national agricultural research systems and civil society organizations including the private sector. The alliance mobilizes agricultural science to reduce poverty, foster human well being, promote agricultural growth and protect the environment. The CGIAR generates global public goods that are available to all. http://www.cgiar.org (includes links to many partner and allied institutions)

Global Water News Watch
Global Water News Watch covers water news from 188 countries. The website is produced by Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHRA), a National Science Foundation Science and Technology Center at the University of Arizona. http://www.sahra.arizona.edu/newswatch

International Center for Agricultural Research in the Dry Areas (ICARDA)
Established in 1977, the International Center for Agricultural Research in the Dry Areas (ICARDA) is one of the 15 Centers strategically located all over the world and supported by the Consultative Group on International Agricultural Research (CGIAR). With its main research station and offices based in Aleppo, Syria, ICARDA works through a network of partnerships with national, regional and international institutions,

universities, non-governmental organizations and ministries in the developing world; and with advanced research institutes in industrialized countries. http://www.icarda.org

International Federation of Red Cross and Red Crescent Societies (IFRC)
Readiness to reduce the impact of disasters is central to the work of the International Federation and its member Red Cross and Red Crescent Societies around the world. This is carried out alongside work to help National Societies respond to the consequences of disasters at local, national and international levels. http://www.ifrc.org

ProVention Consortium (Disaster Management Facility, World Bank)
Its mission is "to help developing countries build sustainable and successful economies and to reduce the human suffering that too often results from natural and technological catastrophes". The ProVention Consortium is a global coalition of governments, international organizations, academic institutions, the private sector, and civil society organizations aimed at reducing disaster impacts in developing countries. The Consortium functions as a network to share knowledge and to connect and leverage resources to reduce disaster risk. http://www.proventionconsortium.org

NOTE: A number of bilateral agencies and international NGOs work together with partners of developing countries to contribute to their sustainable development and poverty reduction programs, including the implementation of practical projects to reduce drought risk. The final version of this framework document will include a description of these institutions.

3. Regional Networks and Organizations

African Development Bank Group (AfDB)
The ADB is a multilateral development bank whose shareholders include 53 African countries (regional member countries—RMCs) and 24 non-African countries from the Americas, Asia, and Europe (non-regional member countries—non-RMCs). It was established in 1964, with its headquarters in Abidjan, Côte d'Ivoire, and officially began operations in 1967. http://www.afdb.org

African Centre of Meteorological Application for Development (ACMAD), Niger
ACMAD is the Weather and Climate Centre with African continental competence. ACMAD has been operational in Niamey since 1992. ACMAD is composed of 53 Member States, the 53 countries of the "Africa" continent. http://www.acmad.ne

The Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationne Institute (AGRHYMET Regional Centre), Niamey, Niger
Created in 1974, AGRHYMET is a specialized hydro-meteorological institute of the Permanent Interstate Committee for Drought Control in the Sahel (CILSS). http://www.agrhymet.ne

Asian Development Bank (ADB)
ADB's vision is a region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their citizens. ADB's main instruments for providing help to its developing member countries are: policy dialogue, loans, technical assistance, grants, guarantees, and equity investments. http://www.adb.org

Asian Disaster Preparedness Center (ADPC), Bangkok, Thailand
ADPC is a regional resource Center established in 1986 dedicated to disaster reduction for safer communities and sustainable development in Asia and the Pacific. It is recognized as an important focal point for promoting disaster awareness and developing capabilities to foster institutionalized disaster management and mitigation policies. http://www.adpc.ait.ac.th

Association of Southeast Asian Nations (ASEAN) Experts Group on Disaster Management (AEGDM)
ASEAN cooperation on natural and man-made disasters is coordinated by AEGDM which was established in 1976 and meets regularly to discuss and share experiences of the region's disaster management and mitigation activities. http://www.adpc.ait.ac.th/pdr-sea/newsletter/issue3/pdr-update.html

Central European Disaster Prevention Forum (CEUDIP)
This Forum was established in 1999 by decision of the Central European Committees for the International Decade for Natural Disaster Reduction of the United Nations (IDNDR). This was done in order to continue the efforts initiated during the Decade by the countries of Central Europe (Czech Republic, Germany, Hungary, Poland and Slovakia) in activities requiring collaboration of neighbouring countries in all types of disasters, in particular in floods on rivers which are shared by these countries. The main focus was on early warning, but other important issues are being mutually considered, including the media's role, disaster prevention, and mitigation and legislation on states of emergency. Contact info: Czech University of Agriculture, Prague-Suchdol, Department of Water Resources, Phone: +420-235-510-680, Contact person: Prof. Nemec, Executive Secretary to CEUDIP, E-mail: jnemec@lf.czu.cz

Drought Management Center for South-Eastern Europe (DMCSEE)
The World Meteorological Organization, the Secretariat of the United Nations Convention to Combat Desertification (UNCCD), and eleven countries from south-eastern Europe have agreed to create this Center to be based in Slovenia. The DMCSEE is to serve as an operational centre for south-eastern Europe for drought preparedness, monitoring, and management. http://www.wmo.ch/web/Press/Infonote29_E.doc

European Drought Centre (EDC)
The European Drought Centre (EDC) is a virtual centre of European drought research and drought management organizations to promote collaboration and capacity building between scientists and the user community. The long term objective of the Center is to enhance European co-operation in order to mitigate the impacts of droughts on society, economy, and the environment. http://www.geo.uio.no/edc

IGAD Climate Prediction and Applications Centre (ICPAC) Nairobi, Kenya
ICPAC's mission is to improve the technical capacity of producers and users of climatic information; develop an improved, proactive, timely, broad-based system of information and product dissemination and feedback; and expand the knowledge base within the sub-region in order to facilitate informed decision making. http://www.icpac.net

Inter-American Development Bank (IADB), Washington DC, United States of America
The IADB is the oldest and largest regional multilateral development institution. It was established in December 1959 to help accelerate economic and social development in Latin America and the Caribbean. http://www.iadb.org

Inter-American Water Resources Network
Recognizing the need to strengthen water resources management, the mission of the Inter-American Water Resources Network is to build and strengthen water resources partnerships between nations, organizations, and individuals that transcend disciplines, political boundaries, and language barriers; promote education and the open exchange of information and technical expertise; and enhance communication, cooperation, collaboration, and financial commitment to the implementation of integrated water and land resources management within the context of environmental and economic sustainability in the Americas. http://www.iwrn.net

International Boundary and Water Commission
Established in 1889, the International Boundary and Water Commission (IBWC) has responsibility for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise out of these treaties. The IBWC is an international body composed of the United States Section and the Mexican Section, each headed by an Engineer-Commissioner appointed by his/her respective president. The United States Section of the International Boundary and Water Commission (USIBWC) is headquartered in El Paso, Texas.
http://www.ibwc.state.gov

International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM)
CIHEAM's ambition is threefold: to propagate a common scientific culture for the food and agriculture sector, to work in cooperative networks with national agricultural education and research institutions, to provide a Mediterranean forum where governments can discuss prospects for food and agriculture. CIHEAM seeks to be an instrument for Mediterranean cooperation, a pivotal center and support base for initiatives linking Europe and the Mediterranean. Through its analyses, it endeavours to hold up a mirror to the modern Mediterranean region and proclaim its specific identity. http://www.ciheam.org/uk/index.html

International Water Management Institute (IWMI), Sri Lanka
IWMI is a non-profit scientific organization funded by the Consultative Group on International Agricultural Research (CGIAR). IWMI's research agenda is organized around four priority themes covering key issues relating to land, water, livelihoods, health, and environment. The Institute concentrates on water and related land management challenges faced by poor rural communities. It also maintains the IWMI Drought Network and Information Center and the South Asia Drought Monitor (SADM). http://www.iwmi.cgiar.org
http://www.iwmi.cgiar.org/drw/info/default.asp?PG = HOME http://dms.iwmi.org/about_swa_dm.asp

North American Drought Monitor
The North America Drought Monitor (NA-DM) is a cooperative effort between drought experts in Canada, Mexico and the United States to monitor drought across the continent on an ongoing basis. Drought monitoring has become an integral part of drought planning, preparedness, and mitigation efforts at the national, regional, and local levels. http://www.ncdc.noaa.gov/oa/climate/monitoring/drought/nadm/index.html

Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS), Ouagadougou, Burkina Faso (Permanent Interstate Committee for Drought Control in the Sahel)
Its mission is to be involved in the research of food security and to combat the effects of drought and desertification for better ecological stability. http://www.cilssnet.org

South African Development Community Drought Monitoring Centre (DMC), Harare, Zimbabwe
The main objective of the SADC DMC is to carry out climate monitoring and prediction for early warning and mitigation of adverse impacts of extreme climatic events on agricultural production, food security, water resources, energy, and health among other socio-economic sectors. Since the center's inception, it has played an important role in providing the sub-region with weather and climate advisories and more importantly, timely early warnings on droughts, floods and other extreme climate related events. http://www.dmc.co.zw

South Pacific Applied Geo-science Commission (SOPAC)
SOPAC is an inter-governmental, regional organization dedicated to providing services to promote sustainable development in the countries it serves. Its work focuses on providing assistance to its member countries in three key program areas: Ocean and Islands Programme, Community Lifelines Programme and Community Risk Programme. http://www.sopac.org/tiki/tiki-index.php

4. Country-Based Organizations

All India Disaster Mitigation Institute, India
All India Disaster Mitigation Institute (AIDMI), India, is a community-based action research, action planning, and action advocacy non-governmental organization. It works toward bridging the gap between policy, practice, and research related to disaster mitigation, in an effort to link the community to the (inter)national level humanitarian scenario. Promoting adoption and practice of disaster mitigation through: partnership with the poorest within disaster vulnerable communities; integrating water, food, habitat, and livelihood security; capacity building of multiple humanitarian stakeholders; synergy between traditional and modern risk reduction strategies; capturing and disseminating lessons and innovative ideas; promoting use of humanitarian standards in disaster response; and providing timely and targeted relief in a sustainable manner.
http://www.southasiadisasters.net

Australia Bureau of Rural Sciences, Canberra
Agriculture is one of the most technically and scientifically adventurous sectors in the economy. Science is a key contributor to the prosperity and sustainability of Australia's rural industries and communities. BRS provides the scientific advice that delivers better decisions by government and better outcomes for rural industries and communities. ttp://www.daffa.gov.au/brs

Beijing Climate Center, Drought Monitoring, China
Drought monitoring from China's capital city. BCC's goal is to propose climate research and development projects and coordinate with other Regional Climate Centers (RCCs); to formulate plans for studies of climate variability, predictability, and impact in the region; to develop consistent practices to handle conflicting information in the region; to develop validation procedures relating to seasonal-to-interannual forecasting products and enhance co-ordination with other RCCs; to develop regional models, methods of downscaling, and interpretation of global forecast products; to undertake application research; to assist development and application of specific products for various users; and to study the economic value of climate information. http://bcc.cma.gov.cn/Website/index.php?ChannelID=3

Bureau de Recherches Géologiques et Minières (BRGM), France
Established in 1959, its activities on risks cover seismic risk, landslides, drought, volcanic risk, and pollution. http://www.brgm.fr

Canadian Climate Impacts and Adaptation Research Network
C-CIARN is a national network that facilitates the generation of new climate change knowledge by bringing researchers together with decision makers from industry, governments, and non-government organizations to address key issues. http://www.c-ciarn.ca/index_e.asp

Drought Watch, Canada
This is a monitoring site by the Canadian agriculture department with the goal of providing timely information on the impacts of climatic variability on water supply and agriculture and promoting practices that reduce drought vulnerability and improve management during a drought. http://www.agr.gc.ca/pfra/drought/default.htm

Embrapa, Brazil
The Brazilian Agricultural Research Corporation's mission is to provide feasible solutions for the sustainable development of Brazilian agribusiness through knowledge and technology generation and transfer. Embrapa researches and spreads knowledge in remote sensing and digital cartography for agriculture and the environment in Brazil. http://www.embrapa.br/

FUNCEME, Brazil
This site helps monitor climate and environment in northern Brazil. ttp://www.funceme.br

India Council of Agricultural Research (ICAR)
The Union Minister of Agriculture is the President of the ICAR. Its principal officer is the Director-General. He is also the Secretary to the Government of India in the Department of Agricultural Research and Education (DARE). The General Body, the supreme authority of the ICAR, is headed by the Minister of Agriculture, Government of India. Its members include the Minister of Agriculture, Animal Husbandry and Fisheries, and senior officers of the various state governments, representatives of the parliament, the agro-industries, scientific organizations, and farmers. http://www.icar.org.in/

International Center for Drought Risk Reduction (ICDRR), Beijing, China
The International Center for Drought Risk Reduction was established in Beijing on April 2007 under the auspices of the ISDR. The main functions of the ICDRR are to monitor and assess drought risk across Asia, develop knowledge and capacities for drought mitigation, promote information sharing and public awareness to reduce drought impacts, and enhance cooperation between China and other Asian countries on drought relief.

Jamaica Office of Disaster Preparedness and Emergency Management (ODPEM), Kingston
ODPEM is committed to taking pro-active and timely measures to prevent or reduce the impact of hazards in Jamaica, its people, natural resources and economy through its trained and professional staff, the use of appropriate technology and collaborative efforts with national, regional and international agencies. http://www.odpem.org.jm

Land and Water Australia, Australia
This national organization is devoted to investing in and managing research and development to underpin sustainable resource use and management. Land and Water Australia aims to generate the uniquely Australian knowledge needed to improve Australian farming systems and consequent profitability, improve the way our natural resources are managed for sustainability, inform large public investments in natural capital, and help governments balance competing demands on natural resources and rural landscapes. http://www.lwa.gov.au

The Long Paddock, Queensland, Australia
The Long Paddock website is provided by the Queensland Government. It supplies decision-support information services to help clients better manage climatic risks and opportunities, particularly those associated with the El Niño - Southern Oscillation (ENSO) phenomenon. http://www.longpaddock.qld.gov.au

Mexico National Drought Research Center, the Centro de Investigaciones Sobre la Sequia
Mexico's Centro de Investigaciones Sobre la Sequía (National Drought Research Center) is housed at the institute of Ecology in Chihuahua, Mexico [in Spanish] http://www.sequia.edu.mx

Instituto Nicaraguense de Estudios Territoriales (INETER), Managua, Nicaragua, (Nicaraguan Institute for Territorial Studies)
INETER is the technical and scientific body of the state. It provides its services to the entire population in such areas as basic information, projects and studies of the environment that contribute to socio-economic development and the lowering of vulnerability to natural disasters, and continuously tracking dangerous natural phenomena. http://www.ineter.gob.ni

National Drought Mitigation Center (NDMC), United States
Based at the University of Nebraska-Lincoln in the United States, the NDMC works to reduce societal vulnerability to drought through better monitoring and preparedness. The NDMC has also previously been the home of the International Drought Information Center (IDIC). The NDMC produces the Drought Monitor (drought.unl.edu/dm) in cooperation with federal, state, and academic partners. http://drought.unl.edu/

SAHEL Institute (INSAH), Bamako, Mali
INSAH, a specialized institution of CILSS, provides food security in a balanced ecological environment; coordinates, harmonizes, and promotes scientific and technical research and training; and disseminates scientific and technical information on issues related to drought control, desertification management, and population. http://www.insah.org/index.html

SILO/Drought, Australia
The Australian Bureau of Meteorology's drought monitoring products and statements. http://www.bom.gov.au/silo/products/Droughts.html

South African Weather Service
The vision of the South African Weather Service is to be a world-class meteorological organization that contributes to the sustainable development of South Africa and beyond. Their mission is to collect, process, and provide meteorological and climatological products and services for the public good and commercial use of all South Africans and beyond. http://www.weathersa.co.za

Southern Alliance for Indigenous Resources (SAFIRE), Zimbabwe
The Southern Alliance for Indigenous Resources (SAFIRE) is a Zimbabwean non-Governmental organization (NGO) which has been operational since 1994. It sponsors the Southern Africa Drought Technology Network (SADNET) between Zimbabwe, Zambia, Malawi, and Mozambique. http://www.safireweb.org

Turkana Drought Contingency Planning Unit (TDCPU), Kenya
The Early Warning System of Turkana was set up in 1987. It operates at the sub-national level, for the district of Turkana in the northern part of Kenya. It is run by local government, by the TDCPU. It provides information on how early warning data can be translated and communicated to decision makers.

United States Department of Agriculture (USDA)
The USDA provides weather and climate publications and supports programs such as the Foreign Agricultural Service, World Agricultural Outlook Board, and the Joint Agricultural Weather Facility.
http://www.usda.gov/oce/weather/pubs/index.htm http://www.fas.usda.gov/ http://www.usda.gov.oce/commodity/index.htm
http://www.usda.gov/oce/weather/index.htm

United States Geological Survey (USGS) WaterWatch
The USGS is a scientific agency within the United States federal government. They play a crucial role in monitoring and evaluating the nation's surface and ground water resources. http://water.usgs.gov/waterwatch

The U.S. National Climatic Data Center (NCDC)
The NCDC is the world's largest archive of weather data. They develop both national and global datasets that have been used by both government and the private sector to maximize the resources provided by our climate and minimize the risks of climate variability and weather extremes. http://www.ncdc.noaa.gov/oa/about/ncdcwelcome.html

The U.S. National Oceanic and Atmospheric Administration - Cooperative Institute for Research in Environmental Sciences Climate Diagnostics Center (CDC)
CDC identifies the nature and causes of climate variations on time scales ranging from a month to centuries, thus enabling prediction of climate variations on these time scales. The CDC provides several resources. http://www.cdc.noaa.gov

The U.S. National Oceanic and Atmospheric Administration's (NOAA) Drought Information Center
The Drought Information Center is a compilation of various NOAA websites and information on drought and climate conditions. It provides breaking news, including current drought assessments of various kinds, monthly roundups, and considerable background information; and links to websites with information about drought. http://www.drought.noaa.gov

Zambia Department of Meteorology
The Zambia Department of Meteorology offers a series of weather forecasts and analyses from Zambia and farther afield, and relevant to Zambia or the region. http://www.zamnet.zm/siteindex/Links/weather.html

5. Research Organizations

Center for Disaster Management (CENDIM), Turkey
CENDIM was established in January 2001 as an interdisciplinary research center for disaster management. The center is in strategic partnership with many national and international organizations to develop disaster, engineering, and risk management plans and to facilitate information sharing with governmental, non-governmental, and community based organizations. CENDIM also aims to deploy the synergy of multi-disciplinary collaboration by national and international organizations. http://www.cendim.boun.edu.tr/index.html

International Development Research Centre (IDRC), Canada
The International Development Research Centre (IDRC) is a public corporation created by the Parliament of Canada in 1970 to help developing countries use science and technology to find practical, long-term solutions to the social, economic, and environmental problems they face. Support

is directed toward developing an indigenous research capacity to sustain policies and technologies that developing countries need to build healthier, more equitable, and more prosperous societies. http://www.idrc.ca

International Institute for Applied Systems Analysis (IIASA), Laxemburg, Austria
IIASA is a non-governmental research organization located in Austria. The institute conducts inter-disciplinary scientific studies on environmental, economic, technological, and social issues in the context of human dimensions of global change. IIASA researchers study environmental, economic, technological, and social developments. In doing so, they generate methods and tools useful to both decision makers and the scientific community. The work is based on original state-of-the-art methodology and analytical approaches and links a variety of natural and social science disciplines. http://www.iiasa.ac.at

International Institute for Sustainable Development (IISD), Winnipeg, Canada
Its mission is to champion innovation, enabling societies to live in a sustainable way. It advances policy recommendations on international trade and investment, economic policy, climate change, measurement and indicators, and natural resource management to make development sustainable. By using the Internet it covers and reports on international negotiations and brokers' knowledge gained through collaborative projects with global partners, resulting in more rigorous research, capacity building in developing countries, and a better dialogue between North and South. IISDnet identifies issues, sets goals, and compiles information on sustainable growth. http://www.iisd.org

International Research Institute for Climate and Society, New York, USA
The mission of the IRI is to enhance society's capability to understand, anticipate, and manage the impacts of seasonal climate fluctuations, in order to improve human welfare and the environment, especially in developing countries. http://iri.columbia.edu

Natural Hazards Research and Applications Information Center, University of Colorado, Boulder, USA
The center is a national and international clearinghouse that provides information on natural hazards and human adjustments to these risks. The center's prime goal is to increase communication among hazard and disaster researchers and individuals, agencies, and organizations actively working to reduce disaster damage and suffering. The Natural Hazards Center carries out its mission in four principal areas: information dissemination, an annual workshop, research, and library services. http://www.colorado.edu/hazards

Annex 3
Examples of Drought Risk Reduction Practices

(with template for collecting further cases)

Note for readers:

This annex provides 20 examples of drought risk reduction practices, each in a standardised format. The ISDR secretariat would welcome further examples of sound practices on drought risk reduction, and readers are invited to provide additional examples using the template proposed in the next page. These will be used in further editions of this document and will be disseminated as part of the ISDR secretariat's advocacy and information activities.

Drought Risk Reduction Practice in Zambia-Malawi

Type: Cash distribution

Title: Unconditional cash transfers Zambia-Malawi

Implementer: Oxfam GB

Key partners: Chartered Bank, local leaders and security

Project period or timeframe: 2005-2006

Estimated cost: unknown

Summary (including key components):

Oxfam GB utilized local security companies and police to distribute cash to rural and urban residents of portions of Malawi and Zambia. The cash distribution was in response to crop failure associated with a mid-season drought. The program targeted approximately 13,500 individuals in Zambia and 6,000 individuals in Malawi. Cash was distributed to the targeted recipients through police escorts for program personnel in Malawi. In Zambia, Standard Chartered Bank utilized a contracting security company to distribute the cash.

Results:

A post-program evaluation indicated that the recipients used approximately 90% of the cash received to purchase food; the remainder was used to purchase paraffin for lamps, pay for health care, and invest in agricultural inputs. Women were the primary decision makers for how to spend the cash and were the primary recipients of the cash.

Lessons Learned:

The cash distribution program in both Zambia and Malawi served to offset the immediate food insecurity crisis. However, the program evaluation indicated that long-term food security was not achieved and that extending the cash distribution may have been necessary to prevent individuals from selling off harvested maize at relatively low prices. The effectiveness of the program is uncertain because of a lack of monitoring throughout the implementation of the program.

For more information:

Source: International Federation of Red Cross and Red Crescent Societies, "Proceeding of the Cash and Vouchers Seminar. May 18-19, 2006, Geneva, Switzerland. http://www.ifrc.org

Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought Risk Reduction Practice in Mali

Type: Combined cash distribution and credit system

Title: A mixed cash transfer system in Mali: credit system with traders and cash distribution

Implementer: Oxfam GB

Key partners: local traders

Project period or timeframe: 2005-2006

Estimated cost: unknown

Summary (including key components):

Oxfam GB initiated a combined cash and credit for work program in the Gao Region of Mali during 2005-2006 following widespread crop failure due to insect invasion and drought conditions. Two thousand workers in the region constructed dykes, ponds, and community stores and maintained greenbelts. They were given credit at a local trader's shop in the community for a value equivalent to half of their work time. The remaining half of the value of their work was paid to them in cash every two weeks. The trader who held the credit also distributed the cash to the individuals; each participating trader was chosen by community members. Individuals were allowed to choose items for purchase on a day-by-day basis. The goal of the intervention was to meet the immediate needs of residents and also promote an increase in savings and investments that could promote the long-term security of the communities. Examples of investments promoted by program personnel and local leaders included: small business creation, different seed varieties, livestock or other agricultural inputs (including stockpiling of consumables).

Results:

Participants enjoyed the opportunity to select items they wished to purchase and most stated that they had purchased food items. Inflation in the price of goods was not realized throughout the program area. Approximately 10% of the recipients chose to invest a portion of the cash received in livestock, health care, school fees, and other small trading activity.

Lessons Learned:

The results of Oxfam's post-implementation monitoring of the combined program indicate that the program has been a success in meeting the immediate needs of the community and promoting individuals' long-term resiliency. The security of the cash distribution was enhanced by utilizing the selected trader to handle both the credit and cash. Additionally, relationships between the program's recipients and the traders remained positive because the traders did not raise prices and saw the importance of maintaining successful business relations with community members. The individual investments coupled with the community and environmental enhancement projects developed through the program could assist individuals in assuring longer-term financial and food security.

For more information:

Source: International Federation of Red Cross and Red Crescent Societies, "Proceeding of the Cash and Vouchers Seminar. May 18-19, 2006, Geneva, Switzerland. http://www.ifrc.org

Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought Risk Reduction Practice in Niger

Type: Cash distribution

Title: Niger cash distribution: Breaking the cycle of food insecurity

Implementer: International Federation of Red Cross and Red Crescent Societies

Key partners: Niger Red Cross Society, Government of Niger

Project period or timeframe: Assessment of need began August-September 2005, followed by a period of distribution and post-distribution monitoring

Estimated cost: USD 1,371,120 distributed; no estimation of supporting program

Summary (including key components):

The International Federation of Red Cross and Red Crescent Societies identified 5,713 households (~34,000 individuals) in 87 villages and 3 pastoralist settlements within the Tanout area of Zinder Province, Niger, as at risk because of depleted food and cash reserves. The insecurity was a result of drought and locust invasion during the 2004-2005 growing season compounded by already existing malnutrition and poverty. Individuals' food and cash reserves were depleted by July 2005, leaving four months of the "lean period" (April-October) between harvests for individuals to cope with widespread food shortages. The low prices paid to agro-pastoralists/pastoralists, increased individual debt, and high cost of products led to a high incidence of migration of the economic head of households and individuals selling basic goods and foraging for wild plants. The goal of the cash distribution project was to provide monetary assistance to individuals to meet their basic needs and begin to re-establish economic security. The 90 villages/settlements received CFA 120,000 (USD 240) per household, which is the amount necessary to meet the daily subsistence needs for a household of 7 people for 40 days. The targeted villages/settlements exceeded the Government of Niger's early warning body's "60% food production deficit threshold" and were identified through existing census data. Funds were distributed to the women of each household in close cooperation with the village heads. Thirty trained volunteers assisted with the distribution and census-taking as well as pre-distribution awareness-raising and post-distribution monitoring.

Results:

The post-distribution monitoring and analysis indicated that the cash distribution project had been successful in re-establishing economic security and providing better long-term food security. The element of "choice" provided by the cash grants allowed families to purchase a diversity of food and goods to meet their immediate needs and to allocate their harvests for sale at certain times or personal use. Individuals were also able to purchase items such as carts for greater access to markets and health care facilities. Additionally, individuals chose to use some portion of the funds to repay personal debts, invest in livestock, and pool money for community development projects such as new wells.

Lessons Learned:

The cash distribution project in Niger had a principally positive effect on the people and economy. However, the census taken during distribution indicated that existing census data had underestimated the number of households by almost 25% because of outdated records that did not account for population movement. A reliable assessment of the at-risk population is necessary for the appropriate allocation of funds and program resources to ensure that the needs of the entire vulnerable population are met. The post-distribution monitoring and evaluation also indicated that refining the targeted population based on greatest need and geographic dispersion may be necessary as cash distribution programs of this magnitude may not be possible in all circumstances.

For more information:

Source: International Federation of Red Cross and Red Crescent Societies, "Proceeding of the Cash and Vouchers Seminar. May 18-19, 2006, Geneva, Switzerland. http://www.ifrc.org;

Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought Risk Reduction Practice in Somaliland

Type: Combined cash distribution & cash for work

Title: Somaliland (drought and chronic food insecurity)

Implementer: Oxfam GB

Key partners: Horn Relief, Norwegian People's Aid, local partners

Project period or timeframe: January 2005-June 2005

Estimated cost: USD 48,450 distributed as grants, ~ USD 236,808 payment for work; no estimation of supporting program costs

Summary (including key components):

Oxfam GB and their partners implemented a cash distribution and cash-for-work program in Togdheer and Bari/Nugaato, Somaliland, to respond to chronic food insecurity brought on by four consecutive years of drought. The goals of the combined effort were to meet the immediate food and water needs of the affected population while also providing an opportunity to assist individuals with repaying debts, maintaining their existing assets, and improving environmental conditions. Cash grants of USD 50 per month were distributed to 969 of the poorest households-headed by the elderly, disabled, or vulnerable women--over a period of four months. A cash-for-work program was offered to 2,691 households; individuals participating in the cash-for-work program received USD 88 per month ($4 per day for 22 working days per month) for four months. The money was distributed by a money transfer company in the presence of local leaders to ensure security and trust.

Results:

The post-program evaluation done by Oxfam indicated that the injection of cash into the households and community economies did prevent the food crisis from escalating. Project successes were identified as improved local economies with no inflation and the ability of the population to meet their basic needs. Inflation did not occur because there had been pre-intervention discussion with local businesses by both local religious leaders and program personnel to ensure that the businesses did not dramatically increase the price of goods and that they stocked a sufficient quantity of goods to meet the demands of the population. Additionally, the relatively small amount of money provided to program recipients on a monthly basis served to prevent inflation.

Lessons Learned:

The Oxfam experience demonstrates the importance of using community-based approaches throughout both the identification of program recipients and the implementation of the program. However, the post-program analysis indicated that long-term security of the individuals and communities had not increased, which reveals the need to couple short-term assistance and recovery programs with long-term programs.

For more information:

Source: International Federation of Red Cross and Red Crescent Societies, "Proceeding of the Cash and Vouchers Seminar. May 18-19, 2006, Geneva, Switzerland. http://www.ifrc.org

Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought Risk Reduction Practice in South Africa

Type: Policy

Title: Drought policy in South Africa

Implementer: South African government

Key partners: South African government, National Consultative Forum

Project period or timeframe: Early 1990s - ongoing

Estimated cost: Unknown

Summary (including key components):

A common experience of the South African climate is drought, which challenges the many subsistence farmers who rely on rainfall for their crops. Impacts of drought in previous years were blamed partly on poor rangeland management, particularly overgrazing, which has led to increased awareness of the need for better agricultural practices such as stocking limits. In the early 1990s, the drought policy strove to encourage risk management, to assist farmers financially, to protect natural resources, to promote the best use of resources for individual farmers, and to help farmers maintain a nucleus breeding herd during a drought. Farmers must adopt certain resource conservation and long-term sustainability measures, such as grazing capacities to be eligible for financial aid. The recognition of drought as a normal part of South Africa's climate forced producers to reconsider their agricultural and risk management practices. An agricultural risk insurance bill was developed in 2002 that sought to supplement farmers' and producers' incomes for those most susceptible to crop and livestock losses from natural disasters. A drought management strategy was also taking shape in 2003-2004.

Results:

South Africa's policy on drought risk reduction is continuing to evolve. Encouraging agricultural risk management strategies, insurance and assistance programs and the development of a national drought management strategy are all components of the on-going discussion over appropriate drought policy.

Lessons Learned:

The focus of the drought policy was on aid for commercial stock farmers, but other farmers such as subsistence and crop farmers were neglected. It remains for the South African government to balance its policy between risk management strategies for large agricultural businesses and small farmers with fewer resources

For more information:

Source of information: Wilhite, Donald A. (ed.), Drought and Water Crises: Science, Technology, and Management Issues, CRC Press, Boca Raton, FL, 2005.

Summary prepared by: NDMC

Drought Risk Reduction Practice in Ethiopia

Type: Cash for work/employment generation scheme

Title: The experience of the Ethiopian Red Cross Society in cash for work

Implementer: Ethiopian Red Cross Society

Key partners: International Federation of the Red Cross

Project period or timeframe: July-October 2002

Estimated cost: unknown

Summary (including key components):

The Ethiopian Red Cross Society implemented a cash-for-work program in the West Harraghe zones of the Oromia region and the South Wollo zone of the Amara region. The goal of the program was to promote development and preparedness of the affected communities through the provision of relief resources. The program was implemented following a governmental assessment and declaration of the drought-affected area and population. Approximately 80% of the identified population, which primarily consisted of farmers, was hired for community development and conservation programs. The efforts were administered by 37 Ethiopian Red Cross Society employees.

Results:

Direct program results include the construction of roads, the implementation of soil conservation measures such as hillside terracing, water quality improvement, and the protection of water resources, in both remote and more easily accessible areas. The migration rate of the population was also reduced and the economy became more robust. The improved infrastructure, conservation of natural resources, and ability of the targeted population to purchase food and make longer-term investments in their economic security has increased the preparedness capacity of the community.

Lessons Learned:

The Ethiopian Red Cross suggested that local leaders should have been more involved in the program throughout its duration and that there should have been increased coordination between all involved parties to more effectively monitor the progress of the program's activities. It was also suggested that the implementation of activities occur only after baseline data about the population and magnitude of the impacts has been collected and analyzed. The implementation of programs that created a more prepared and resilient population could be seen as having lessened the dependency of the population on relief resources.

For more information:

Source: International Federation of Red Cross and Red Crescent Societies, "Proceeding of the Cash and Vouchers Seminar. May 18-19, 2006, Geneva, Switzerland. http://www.ifrc.org

Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought Risk Reduction Practice in Beijing, China

Type: Operational activities

Title: Drought Monitoring Index on the national and global basis

Implementer: Beijing Climate Center, China Meteorological Administration (CMA)

Key partners: National Satellite Meteorological Center, CMA

Project period or timeframe: On-going

Estimated cost: unknown

Summary (including key components):

Drought monitoring has always been one of the priorities to the operational efforts of the Beijing Climate Center (BCC), China Meteorological Administration (CMA). The operational drought monitoring system was developed at the BCC. Several routine products for China and the globe are produced on a daily basis from real-time station-based and satellite-derived data. All of those products are available to the worldwide community for free downloading from the webpage of BCC. Some new products, such as the extreme high temperature and the heat waves are currently being developed.

Results:

Some relevant drought monitoring products in BCC's web site:

1. Daily global and regional drought monitoring based on the cumulative days without precipitation;
2. Daily global weather and climate extreme events including the monitoring on the temperature anomaly, daily minimum and maximum temperature, and precipitation;
3. Daily integrated drought monitoring for China on the basis of standard precipitation index;
4. Soil relative humidity for China issued every 10 days and derived from the station-collected data;
5. Satellite-based drought monitoring for China issued every 10 days;
6. Monthly major and extreme climate events in China including drought and flooding.

Lessons Learned:

More station-based observation data in the worldwide range is needed to improve the present drought monitoring products. In addition, more efforts should be made on the application of satellite-based data to drought monitoring efforts.

For more information:

Submitted by: Dong Wenjie, China Meteorological Administration, dongwj@cma.gov.cn
Website: http://bcc.cma.gov.cn/en/
Other contact, affiliation, e-mail: Beijing Climate Center, bcc@cma.gov.cn

Summary prepared by: NDMC

Drought Risk Reduction Practice in the Indo-German Watershed, India

Type: Community-based Program

Title: Indo-German Watershed Development Program, Darewadi Village, India

Implementer: Watershed Organization Trust

Key partners: National Bank for Agriculture and Rural Development (NABARD)

Project period or timeframe: 1992-2001

Estimated cost: 8.7 million rupees (including voluntary labour costs)

Summary (including key components):

The Darewadi village and surrounding area in the Ahmednagar district of Maharashtra state in India was faced with near complete desertification, limited agricultural production and the seasonal migration of villagers to find work were also characteristic of the region. In response to situations such as in Darewadi, the Indian government developed the Indo-German Watershed Development Program which is coordinated by the Watershed Organization Trust (WOTR), an independent state NGO and the National Bank for Agriculture and Rural Development (NABARD). Restoration activities such as tree and grassland planting and a switch to more sustainable crops were coupled with community-led pilot projects to promote soil and water conservation (education, water harvesting, and irrigation techniques) over a five year time span. The projects are carried out on both privately and publicly held land. Communities are considered eligible for participation in the program if they are affected by drought, if the land-ownership within the region is relatively equally distributed, and if their geographical position within a watershed is conducive to the restoration activities. The communities also have to agree to a ban on tree cutting and grazing in areas where the restoration activities are to take place and provide voluntary labour that equals 15-20% of the project's total costs. The restoration activities and pilot projects are carried out by community members after receiving technical and organizational training and economic assistance from WOTR. An unpaid Village Watershed Committee, appointed by the Village Assembly, oversees the implementation of the projects, monitors the grazing and tree cutting bans, organizes labour and wages, and imposes fines on any violators.

Results:

The Indo-German Watershed Program has been widely successful throughout regions of India. It was particularly successful in Darewadi where after 5 years of the restoration activities, 65% of the trees and grasses that were planted on 395 hectares or previously denuded terrain and grazing biomass increased 170 percent. Crops such as maize, wheat and other vegetables were being sustainably grown and irrigated hectares of land increased from 197 to 342 ha. The project's funding ceased in 2001 but Darewadi has continued to experience a rise in the water table, grazing biomass, and amount of land under irrigation. The seasonal migration of villagers ceased as a result of stabilized agricultural production and wages. Importantly, the community members also gained leadership, technical and organization skills and community unity.

Lessons Learned:

The program had long range success most likely as a result of community buy-in and leadership. The cost of the program was high and similar programs with similar costs may not be possible in many regions. The World Resource Institute's assessment of the program identified a lack of involvement by women and the inability of the landless members of the community to enjoy all the benefits of the program.

For more information:

Source: http://www.wotr.org/wdindoger.htm

Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought Risk Reduction Practice in Andhra Pradesh, India

Type: Education on sustainable natural resource management and community empowerment

Title: Rayalaseema Watershed Area Development Programme (RWDP), Andhra Pradesh, India

Implementer: Krushi, Action for Food Production (AFPRO)

Key partners: German NGO Brot für die Welt, Christian Aid UK, Oxfam (India) Trust, and Hyderabad-based Centre for World Solidarity

Project period or timeframe: 1991-2003

Estimated cost: unknown

Summary (including key components):

Krushi Action for Food Production (AFPRO) began the Rayalaseema Watershed Area Development Program in 1991. The program was implemented in the Chittoor district where there were many marginal poor farmers with no capital to invest in their land or operation. Problems within the watershed included: insufficient water from shallow wells for irrigation, migration of marginal and landless farmers to cities to find work, women being paid less than men, low wages for farm work, and insufficient sanitation and hygiene contributing to poor public health. The Krushi AFPRO group met with individual farmers to prepare plans for each farm. Components of the plans often included well remediation, reducing runoff and erosion from fields through the use of bunds, diversion channels, gully plugs, contour trenches, earthen bunds and weirs, planting trees for fruit, fuel, and timber, planting crops for fodder, and digging rain catchments.

Results:

The villagers learned many methods of sustainable natural resource management and put them into practice using available resources. The villagers learned about watersheds and management skills to care for them. A watershed association was also created to disburse the RWDP funds for water and soil conservation activities. Wells were repaired and now provide sufficient water for drinking and irrigation, despite 5 years of drought from 1998-2003. The amount of cultivable land has increased. Crop production also increased and led to improved nutrition for community members through a greater variety of foods; the health and number of livestock and animals has improved. People also learned about issues relating to pay, such as standard wages, disparate pay for men and women, and negotiating for better pay. Women bonded together in self-help groups to create income-producing activities and combat discrimination.

Lessons Learned:

Overall, marginalized communities became more influential in the watershed institutions through increased representation and involvement. People became informed about various organizations and networks, which led to greater knowledge and resources. Better skills in water and soil conservation and watershed management led to more efficient use of the resources available and better prepared to deal with the impacts of drought.

For more information:

Source: Helga Stamm-Berg, Helga.Stamm-Berg@gtz.de
Website: www.sustainet.org
Other contact: V. Nandagopal, Krushi, krushi_samstha@rediffmail.com

Summary prepared by: NDMC

Drought Risk Reduction Practice in Australia

Type: Policy

Title: Australian National Drought Policy

Implementer: Australian government

Key partners: Australian government, Drought Policy Review Task Force

Project period or timeframe: January 1993 - ongoing

Estimated cost: Exact cost is unknown. From 1993-1996, expenditures between federal and state governments approached $690 million.[1] During 2002-2003 drought, expenditures exceeded AU$1 billion.

Summary (including key components):

The Australian National Drought Policy was built on the principles of sustainable development, risk management, productivity growth, and structural adjustment in the agricultural sector. The policy stressed preparedness rather than disaster response, given the propensity of the Australian climate toward drought. Assistance with improved risk management and productivity was given through the main agricultural program, the Rural Adjustment Scheme. The Rural Adjustment Scheme decided when an area was experiencing 'exceptional circumstances' in terms of weather, at which point financial support became available. The Rural Adjustment Scheme also stressed improved risk management by encouraging farmers to have financial reserves for times of crisis. The Rural Adjustment Scheme was replaced by new programs called Agriculture-Advancing Australia that were very similar to the one they replaced. Interest rate subsidies were replaced by welfare relief. Another change was the spatial drought declaration. A entire state would qualify for exceptional circumstances once a state had 80% of its land in exceptional circumstances.

Results:

The 2002-2003 drought seemed to suggest that the risk management approach was beneficial as farmers had AU$2 billion in reserves to help them through the drought. Overall the plan was seen as too expensive, inefficient, and inequitable and was generally considered to be a failure.

Lessons Learned:

Australia discovered that it is difficult to implement a drought policy that emphasizes risk management during a severe drought. It became apparent that an official definition of 'exceptional circumstances' and drought were needed to allow those affected to know when the program would be triggered and to know what actions would be taken once exceptional circumstances have been recognized. An official definition would also have helped in depoliticizing the issue. Another difficulty was the delineation of the drought-affected area because areas adjacent to the assistance-eligible areas were suffering from drought also, but to a lesser degree. Buffer zones were created so that those neighbouring the drought declaration area could apply for aid as well.

For more information:

Sources of information: Wilhite, Donald A. (ed.), Drought and Water Crises: Science, Technology, and Management Issues, CRC Press, Boca Raton, FL, 2005.

1Botterill and Wilhite (eds.), From Disaster Response to Risk Management: Australia's National Drought Policy, Springer, Norwell, MA, 2005.

Summary prepared by: NDMC

Drought Risk Reduction Practice in Great Britain-Online Education

Type: Online Education Program

Title: "Cool Planet"

Implementer: Oxfam GB

Key partners:

Project period or timeframe: on-going

Estimated cost: unknown

Summary (including key components):

Oxfam GB developed an online education module that focuses on all aspects of global citizenship including understanding disasters such as drought and measures that can be taken to reduce societal vulnerability to drought. The education module was developed by the Oxfam Development Education team with close integration of advice from educators in England, Scotland and Wales. Teachers and students (ages 5-16) in England, Scotland and Wales are the primary audience of the education module but it is accessible by any individual who has internet access. By focusing on images and real world case studies, the "Water for All" portion of the Cool Planet education module integrates water supply statistics, causes and occurrences of water shortages (including drought), solutions to water shortages that focus on community-led initiatives and also allows students to develop their own local actions. The activity set ends with suggestions for how to effect positive change and celebrate water. Students can complete the activities online or they can be adapted and presented in a regular classroom setting. Teachers are also able to find professional development resources to gain information and ideas about using case studies in a classroom setting and teaching about controversial and distant issues. Oxfam GB has also assembled an extensive list of additional resources, curriculum and notes for teachers. Grant programs are offered by Oxfam GB to facilitate education programs in schools.

Results:

The Oxfam Cool Planet education module has been integrated into the curriculum of schools throughout England, Wales and Scotland. No formal evaluation is available.

Lessons Learned:

The online educational module provides a breadth of information, resources and curriculum options that can be adapted for a variety of ages and regions. Importantly, the education program focuses on instructing teachers and students in the developed world about the impacts that disasters such as drought can have on the developing world. Online educational modules can be excellent resources for students and teachers however access to the internet or high speed internet access can limit the number of people that can utilize the resources. Education about natural disasters and water resources can lead to increased awareness and promote behaviours that can reduce a society's vulnerability to drought.

For more information:

Source of information: http://www.oxfam.org/coolplanet./

Summary prepared by: NDMC

Drought Risk Reduction Practice in the Netherlands

Type: Project for drought policy development and implementation in the Netherlands.

Title: Netherlands Drought Study

Implementer: RIZA (Institute for Inland Water Management and Waste Water Treatment), Rijkswaterstaat (the Directorate-General for Public Works and Water Management).

Key partners: Dutch water boards, provinces, ministries involved and directorate-general for Public Works and Water Management, Arcadis, HKV, KIWA and Korbee & Hovelynck.

Project period or timeframe: 2002-2005

Estimated cost: Unknown.

Summary (including key components):

The Netherlands Drought Study is an integrated survey of water policies for and during periods when water is scarce. The challenges posed by water shortages on agriculture, navigation, energy production, drinking water supply, maintenance of dikes, recreation, nature and urban areas were investigated both for current and future conditions that consider development and climate change. The different sectors were studied through an integrated modelling approach that uses hydrological and impact models; round table meetings were also convened by region and sector. In addition, expert knowledge in certain sectors was been included. The goal of the study is the proposal of policy strategies and measures to prevent or reduce the impact of drought. It also will define an acceptable level of drought damage when the costs of mitigation measures are greater than their benefits.

Results:

The project had 2 main deliverables:

- Operating Procedure Water Shortage Website. This website provides: (a) water shortage information by region, and (b) regional policy/decision-making information concerning other water related aspects (e.g. water quality, limitation excess water); (c) education about drought, conservation measures and opportunities to become involved in the decision-making process.
- Water Shortage Challenge. The theoretical maximum water shortage and the associated damage (e.g. lower yields, higher costs, lower quality etc.) per sector. It also identifies possible measures to be taken and a cost-benefit analysis of those measures.

The outcome of the project serves as a basis for the political decision-making process which will be integrated into the National Administrative Agreement on Water developed in 2003. The agreement aims at a healthy water system in terms of both quantity and quality and considers all sectors. A final comprehensive and consistent policy should be in place by 2009 with a draft policy developed by 2008.

Lessons Learned:

The reduction of drought risk is a complex process that needs to address a balance between many sectors. Quality data and appropriate analysis tools (hydrological and impact models) are required to quantify the impacts, to explore likely measures and to anticipate to future developments (e.g. global climate change). During the recent 2006 drought period the experiences gained from the Netherlands Drought Study greatly helped to monitor the severity of the drought and to discuss the situation and measures with various sectors. Improvements in forecasting capabilities would increase the effectiveness of the drought policy and mitigation measures. Good communication is required to come to an accepted drought policy. Cost benefit analyses can help to identify damages that need to be accepted because long term costs for mitigating measures are higher than benefits.

For more information:

Source: Dr.ir. Henny A.J. van Lanen, Wageningen University, Hydrology and Quantitative Water Management Group, henny.vanlanen@wur.nl

Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought Risk Reduction Practice in El Salvador

Type: Project

Title: Drought Response and Mitigation Project

Implementer: International Federation of Red Cross and Red Crescent Societies

Key partners: The Spanish Red Cross, the Salvadorian Red Cross Society and the Regional Delegation, Inter-American Institute for Cooperation in Agriculture, El Salvador Post-Harvest Coordinating Unit

Project period or timeframe: 2002 - ongoing

Estimated cost: US$ 258,000

Summary (including key components):

During 1998-2001, subsistence farmers, especially in eastern El Salvador, suffered from sporadic rainfall. Many crops in 62 municipalities were devastated by drought and resulted in losses of up to 80% of the crops and 38% of farmers' incomes. The Drought Response and Mitigation Project was developed by the Spanish Red Cross, the Salvadorian Red Cross Society and the Regional Delegation to reduce drought impacts, assist with the technical aspects of diversification and marketing of crops, increase income, enrich daily diets, reforest with fruit trees and conserve soil to improve environmental conditions. Food aid was also given to farmers. Those most in need began a program of agricultural recovery, in which they received a farm kit containing tools to plant their crops. Emphases were placed on sustainable agricultural techniques, organic fertilizers and irrigation systems for small plots. Training and technical assistance was given to increase production and assist with storing and marketing crops.

Results:

The National Society saw the rewards of addressing drought vulnerability through long-term strategies. Approximately 300 families, or 1,500 people, were helped through this project and became better able to farm more effectively and efficiently. About 75% of those involved in the project were women who took on a greater role of leadership and decision-making in the communities. Children learned that there is an alternative to migrating away from their communities for employment. Crops were able to be grown in the summer with the help of irrigation systems. Those helped by the project have continued to practice the new methods they learned in place of traditional methods of farming.

Lessons Learned:

Women's participation in the project was essential because they were aware of the community's most pressing needs. Better management of water resources through the use of irrigation led to increased production. The participation of a breadth of stakeholders combined with the increased production and the technical assistance provided served to better prepare the community to mitigate the risks posed by drought.

For more information:

Source of information: Drought in El Salvador: response and mitigation (PDF) at http://www.ifrc.org/docs/pubs/disasters/reduction/ElSalvador-droughts-en.pdf

Summary prepared by: NDMC

Drought Risk Reduction Practice in the United States and North America

Type: Drought Monitoring

Title:

Implementer: United States Drought Monitor and North American Drought Monitor

Key partners: National Drought Mitigation Center, USDA, NOAA, Mexican and Canadian weather services

Project period or timeframe: Ongoing

Estimated cost:

Summary (including key components):

Drought Monitoring for both the United States and for North America includes the collaboration and cooperation of many groups, agencies and universities. The United States Drought Monitor (USDM) is a weekly project that allows for the depiction of drought conditions across the country, providing information and both long and short-term droughts. The National Drought Mitigation Center (NDMC) along with NOAA and USDA share the responsibility of producing this product with the help of over 200 contributors each week. Data for this product consists of precipitation, drought indices, soil moisture, river/stream flow, satellite data, snow depth information and reservoir storage. The USDM has progressed over the last 7 years and is now used in policy making and disaster declarations. The North American Drought Monitor (NADM) is a collaborative effort that was built upon the model of the USDM. The NADM is a monthly product made in conjunction with partners in both Canada and Mexico. Participants provide information for their region and this data is put into a final product, showing drought status for all of North America.

Results:

The efforts of both the USDM and NADM has allowed for drought depictions for large areas based on information, data and feedback from those areas affected. The USDM has continued to improve, based on data availability, to show droughts at fine resolution. The USDM has also allowed users of the information to better plan and mitigate for droughts, even if they are not currently experiencing a drought. The NADM has brought together groups from three countries to work towards a common goal of helping to prepare for droughts effectively.

Lessons Learned:

The efforts used in both the USDM and NADM are changing constantly. The advent of technology and the more timely distribution of data has allowed for even more scrutiny of the data before each product is released. Even so, there are still areas that are lacking good climate data or the means to collect these data which means the drought depiction in those regions relies heavily on local contributions, model data, or satellite data.

For more information:

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Website: USDM: http://drought.unl.edu/dm/
NADM: http://www.ncdc.noaa.gov/oa/climate/monitoring/drought/nadm/

Summary prepared by:

Drought Risk Reduction Practice in the United States

Type: Tool

Title: Drought Impact Reporter

Implementer: National Drought Mitigation Center

Key partners: Department of Computer Science and Engineering at the University of Nebraska-Lincoln, GIS Workshop, Inc.

Project period or timeframe: Project began in 2005 and is ongoing

Estimated cost: USD 300,000 for development; USD 50,000 for annual operating

Summary (including key components):

The Drought Impact Reporter was designed to become the first national archive of drought-related impacts for the United States. Information about impacts is needed if drought officials are going to respond to and plan for droughts appropriately. The tool is comprised of an interactive map that allows a user to retrieve impacts by selecting an impact category, location, and time period. These impacts are referenced down to a county level. A second important component of the tool is the archive of drought impacts that is being built based both on historical drought information as well as real-time drought-related impacts. The tool includes a feature where any user can enter drought impact information into the data base, which provides local information that otherwise might not be available.

Results:

The Drought Impact Reporter has been tremendously successful thus far. The tool's website has provided high visibility and the information is being used by media and within policy-related discussions on various federal, states and local levels. As a result of the information collected by the Drought Impact Reporter, an assessment of drought impacts for 2006 was developed. More than 2000 impacts were entered into the database for the year, and 48 states reported at least one drought impact during the year. Texas led the nation with 531 reported impacts. A collection of economic impacts was also compiled using the tool. Analyses like this one will now be possible with the existence of this tool so that comparisons can be made between events, as well as vulnerability assessments illustrating how impacts may be changing with time.

Lessons Learned:

Although designed to be a comprehensive collection of drought impacts, one lesson learned involving the tool was that the tool was not comprehensive enough. As a result of this lesson, a revised Drought Impact Reporter tool is now under development that will attempt to capture more relevant information that has not been available up to now. This revision will include local condition reports and an accounting for all media-related reports concerning drought conditions. In addition, greater efforts are required (and will be undertaken) to promote regular input from stakeholder groups such as those representing agricultural producers, water managers, natural resources managers, and officials.

For more information:

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Summary prepared by:

Drought Risk Reduction Practice in Hualapai Tribe, USA

Type: Development of drought plans

Title: Cooperative drought contingency plan for the Hualapai Tribe

Implementer: Hualapai Tribe; Hualapai Tribe Department of Natural Resources, Arizona, United States

Key partners: United States Bureau of Reclamation, National Drought Mitigation Center

Project period or timeframe: 2003-2006

Estimated cost: $200,000

Summary (including key components):

The United States Bureau of Reclamation provided funding for the Hualapai Tribe of Arizona, United States, to develop a comprehensive drought plan. The Hualapai Tribe's Department of Natural Resources took the primary lead in developing the plan but the process ultimately became a collaborative endeavour between several tribal and federal agencies. Community meetings were held to gather feedback from tribal members throughout the development of the plan. In developing the plan, the tribe first identified the most vulnerable physical and social sectors of the reservation and tribal population. Based on this understanding, a range of appropriate drought mitigation and response actions were then identified, including the development of a drought early warning system. The plan is to be reviewed and adapted as necessary on a bi-annual basis. The Hualapai Tribal Council approved and adopted the plan in January 2004 after soliciting comments and review by the cooperating partners. At the request of the Hualapai Tribe, the National Drought Mitigation Center evaluated the Hualapai Drought Plan and conducted a drought exercise to educate tribal members and agency personnel on their roles in implementing the plan, and also to identify potential barriers to the plan's full implementation.

Results:

The Hualapai Tribe has developed a collaborative drought mitigation and response plan. A majority of tribal members indicated that the drought planning process was successful and had served to foster community buy-in. However, several collaborators felt that there were significant gaps and/or overlaps in the specific aspects of the plan that should be addressed in future revisions. The drought exercise also identified a number of barriers to the plan's full implementation. The barriers centred primarily on a lack of monitoring capabilities; incomplete inventory and identification of existing and potential resources; insufficient funds, training, education, and personnel to implement the plan; and political and administrative constraints.

Lessons Learned:

Project partners felt that the collaborative and transparent process used by the Hualapai Tribe, which sought both public and external agency input, is an effective way to create a plan that is both comprehensive and responsive. Utilizing the media and other avenues to disseminate information to the public throughout the process was seen as a key component to reduce conflict and increase education and buy-in. The Hualapai planning process was also successful in striving to address both long-term mitigation and short-term drought response planning. Despite implementation barriers that must be addressed, the NDMC evaluation identified the efforts of the Hualapai as both a positive and important step in reducing the vulnerability of the tribe to the impacts of drought.

For more information:

Source of information: http://www.colorado.edu/hazards/research/qr/qr183/qr183.html

Summary prepared by: NDMC

Drought Risk Reduction Practice in Northeast Brazil-Environmental Education

Type: Knowledge and Research Project (KaR) funded by DFID

Title: Sustainable Use of Water Resources - Role of Environmental Education and Gender Roles in Northeast Brazil

Implementer: Mott MacDonald (UK), UFRPE and UFPE (Brazilian Academic Institutions), University of Birmingham (UK)

Key partners: State and Municipal Government, community members and local NGOs

Project period or timeframe: 2003-2005.

Estimated cost: unknown

Summary (including key components):

The Project focused on Groundwater in the IWRM - Integrated Water Resources Management Framework. The Environmental Education Program was initiated in the second year of the two-year KaR Project (2003-2005). It had a significant impact as it presented a new educational model not found in any school settings in rural Brazil. It brought together teachers, who are primarily women who had formal training, and farmers, who are primarily men without formal education and were mostly illiterate. Such integration was very important and gave credibility to the program because the teachers belong to a group of women who have high status at the community level and the farmers who were well respected. Furthermore, this program presented a new educational model which combined theory and practice in a way that recognized traditional knowledge held by farmers, which placed high value on agriculture. An important impact in regards to drought mitigation was that this program highlighted the relevance of aspects related to rural livelihood and introduced ways of monitoring the availability of water by students and community members in general. Historically, the educational model followed by both rural and urban schools had been heavily modelled on urban life. This has had a very negative impact on rural students, particularly those who inhabit the drought prone areas of Northeast Brazil, as it contributed to out migration. The main goal of the Environmental Education Program was to raise the students' awareness about how to mitigate the impacts of drought.

Results:

The Program was very successful through the introduction of measures to mitigate the effects of drought. Its focus on education and the involvement of well respected women and men creates the possibility for long-term sustainable practices by the community.

Lessons Learned:

The Program showed the importance of involving different partners: local community members, teachers, NGOs, International Organizations and Government Officials in the implementation of long-term sustainable drought mitigation measures.

For more information:

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Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought Risk Reduction Practice in Northeast Brazil-Million Cisterns Program

Type: NGOs Initiative

Title: One Million Cisterns Program P1MC

Implementer: ASA - The Articulation of NGOs Working in the Semi-Arid Region of Northeast Brazil

Key partners: Several Ministries and ANA - The National Agency of Water

Project period or timeframe:

Estimated cost: unknown

Summary (including key components):

The adoption of Rainwater Harvesting has become an important measure to mitigate the drought in Northeast Brazil. The P1MC, as this program is referred to, is distinct from various mitigation measures implemented before, not only for focusing on the needs of the poor, but for stressing the importance of education as the basis for all its actions. In such a context, the program broadens the understanding and the practice of "dealing" with the problems faced by the semi-arid ecosystem in a sustainable way. Considering these factors, it can be said that this is a program based on long-term mitigation measures, which gives priority to educational actions rather than to technical ones. The local population (women and men) participate in training workshops about water management and also learn how to build cisterns as they take part in the construction process. The Program was initially funded by the World Bank, but has also been receiving funds from FEBRABAN - The Federation of Banks in Brazil, International NGOs and donations.

Results:

The Program has been very successful and aims at the construction of one million cisterns within the period of five years.

Lessons Learned:

The Million Cisterns program serves as an example of the importance of the articulation between government organizations (GOs) and non-government organizations (NGOs) in the implementation of long term drought mitigation measures.

For more information:

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Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought Risk Reduction Practice in Northeast Brazil-Women's Engagement

Type: Case Study

Title: engagement on drought mitigation measures in Northeast Brazil

Implementer: Local and International NGOs

Key partners: This is a case study compiled by Adelia Branco through a research project during the late 1990's.

Project period or timeframe:

Estimated cost: unknown

Summary (including key components):

Northeast Brazil is the poorest region of the country and one of the poorest of the world. Most of its territory is located on a semi-arid region and is periodically affected by droughts. Due to the ineffective role of the government on incorporating women's needs in the top-down drought mitigation measures, women in Northeast Brazil not only migrate in search for jobs in cities, but most importantly, organize themselves on action groups with the support of NGOs. The mobilization of those rural women in groups is very important, as during a drought crisis many of them become the heads of their households when their husbands migrate to urban centers in search for jobs. Those women are usually referred to as "widows of the drought". Many of them had to beg for food at neighbouring cities to provide for their offspring as they were not targeted on policies devoted to mitigate the drought.

Results:

: Several NGOs have succeeded in helping women to organize in groups. The groups meet regularly and during the meetings women discuss their own problems and learn several skills such as sewing, lace making and artcrafts. Such training is supported and monitored by local NGOs and initiated with funds from International NGOs. Women are encouraged to form cooperatives and to commercialize their products. The income earned is very important for the survival of the households and also improves the low self-esteem of those women. Besides enabling women to have an income generating activity, the discussions in group are also of a political nature and women usually become aware of the economic and socio-political nature of the drought through a consciousness raising process. Those women are exposed to an empowerment process and have actually been able to organize themselves and become visible to policy-makers.

Lessons Learned:

Women are important agents of change in times of crisis. Women usually comprise the most vulnerable sector of the population and, in the majority of the cases, do not benefit from policies focused on drought mitigation .Disasters usually offer opportunities for change and women to engage in efficient bottom-up mitigation measures. In the case presented, women have therefore attracted the attention of policy-makers, who have been considering gender differences in the design and implementation of drought mitigation measures.

For more information:

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Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought Risk Reduction Practice in Western Venezuela

Type: Establishment of seed networks

Title: Recovering degraded soil and establishing agro-ecological seed networks

Implementer: Institute for the Production and Investigation of Tropical Agriculture (IPIAT)

Key partners:

Project period or timeframe: 2003 - ongoing

Estimated cost: unknown

Summary (including key components):

IPIAT has worked successfully to improve agro-ecological methods in the western part of Venezuela. As a result, farmers in Barinas and Portuguesa were interested in farming that does not require the use of agro-chemicals. The problem remained that farmers still faced a lack of seeds for each growing season. The remedy was to create systems of agro-ecologically grown seeds, begin a soil recovery process, and make it easier to get seeds. The first step involved the IPIAT team educating farmers about problems such as soil erosion, insufficient soil organic matter, and agro-chemical contamination in the soil. Various agro-ecological techniques were suggested to the farmers, such as agro-ecological soil management, poly-cropping, and using green manure. The second step included teaching small farmers how to rehabilitate their land and to grow essential food crops and produce seeds. The third step involved having the farmers meet to share knowledge and information about farming and seed production. The agro-ecological growth and production of black and red beans for food and for seeds was encouraged to reduce the need for the import of these beans.

Results:

Several seed production networks were created and several agro-technology bases were expanded. Producers learned to better manage their natural resources through soil and water recovery with the result of approximately 200 acres of land being brought back into production and 123 producers in 23 communities using agro-ecological methods. They became more aware of the importance of the preservation of biodiversity and organized and campaigned against transgenic foods.

Lessons Learned:

The effort to establish agro-ecological seed networks and to teach producers better natural resource management techniques was successful. A lack of financial resources for the project resulted in people having to rent or share land to participate in the program. It became apparent that land reform was needed, which was addressed before local governments. The importance of the issues of land tenure and sustainable and agro-ecological farming were becoming clearer to the Venezuelan government. Better natural resource management techniques and agricultural practices can promote a more drought resilient communities and agricultural systems.

For more information:

Source: Institute for the Production and Investigation of Tropical Agriculture, http://www.ipiat.org.ve/index.htm

Summary prepared by: NDMC. Compilation by ISDR secretariat

Drought risk reduction practices (template) (please send to basabe@un.org)
Type: (policies, programs, projects, etc.):
Title:
Implementer:
Key partners:
Project period or timeframe:
Estimated cost (optional):
Summary including main components:
Results:
Lessons Learned:
For more information: Submitted by, affiliation, e-mail: Attachments: Website: Other contact, affiliation, e-mail:
Summary prepared by:

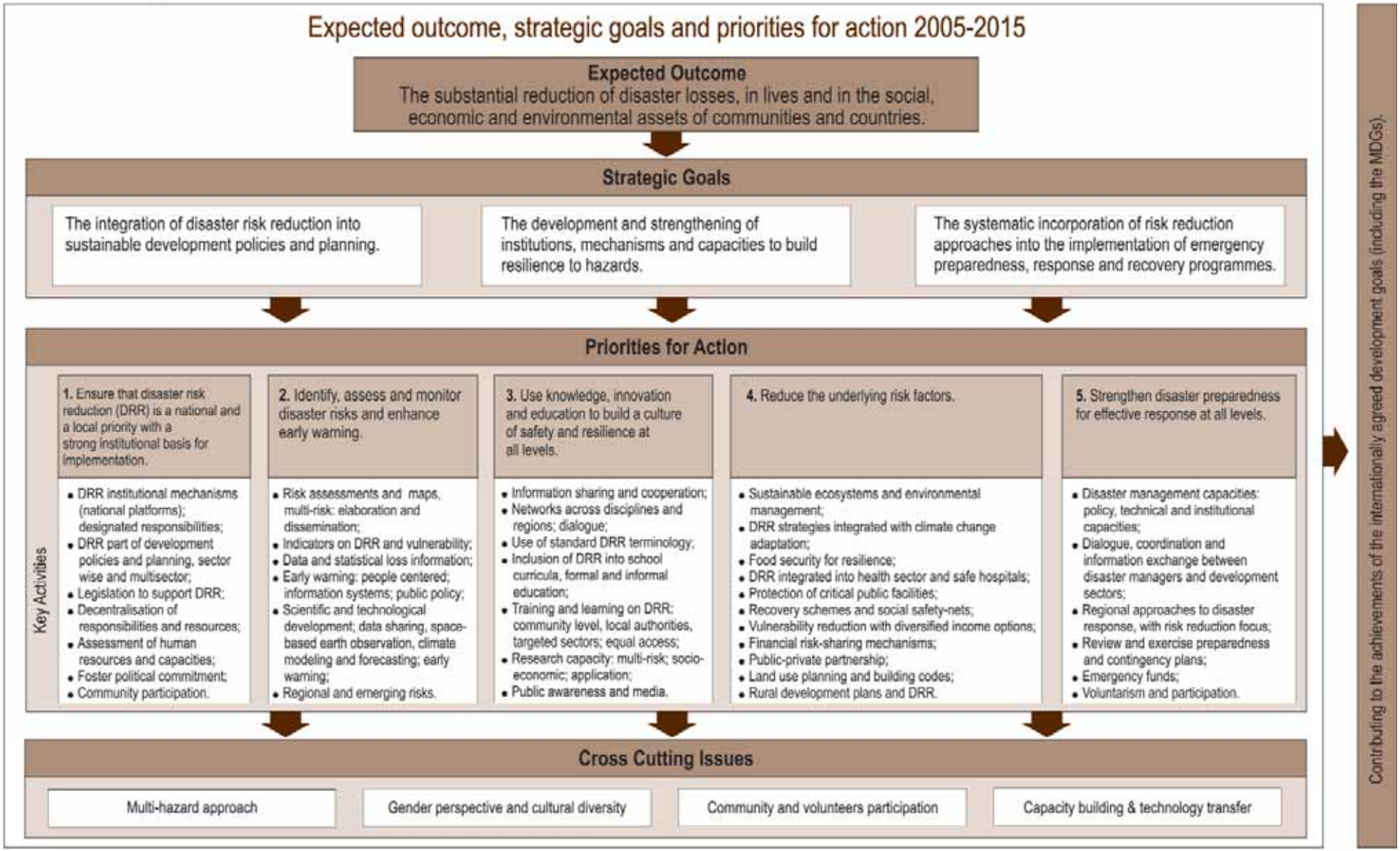
Annex 6

Summary

Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters

United Nations
International Strategy for Disaster Reduction

SUMMARY of the Hyogo Framework for Action 2005-2015:
Building the Resilience of Nations and Communities to Disasters



DRR= disaster risk reduction

www.unisdr.org

United Nations
International Strategy for Disaster Reduction

Continued
SUMMARY of the Hyogo Framework for Action 2005-2015:
Building the Resilience of Nations and Communities to Disasters

Implementation and Follow-Up

In order to achieve the strategic goals and act upon the priorities for action, the Framework identifies the following tasks for implementation and follow-up by States, regional and international organizations in collaboration with civil society and other stakeholders. The ISDR partners, in particular the Inter-agency Task Force on Disaster Reduction (IATF/DR)* and secretariat, are requested to assist in implementing the Hyogo Framework for Action.

General Considerations

- Implementation by different stakeholders, multi-sectoral approach; participation of civil society (NGOs, CBOs, volunteers), scientific community & private sector is vital.
- States primarily responsible; an enabling international environment is vital, incl. strengthened regional capacities.
- Build multi-stakeholder partnerships.
- Particular attention to:
  - Small island developing States: Mauritius Strategy;
  - Least developed countries;
  - Africa.
- States, regional and international organizations to foster coordination among themselves and a strengthened International Strategy for Disaster Reduction (ISDR).
- Follow-up integrated with other major conferences in fields relevant to DRR; reviews as appropriate.

Actors

Critical tasks

States

- Designate national coordination mechanisms for the implementation and follow up, communicate to the ISDR secretariat;
- National baseline assessments of the status of DRR;
- Publish and update a summary of national programme for DRR including international cooperation;
- Develop procedure for reviewing national progress including systems for cost benefit analysis and ongoing monitoring on risk;
- Consider acceding to, approving or ratifying relevant international legal instruments and make sure they are implemented;
- Promote the integration of DRR with climate variability and climate change into DRR strategies and adaptation to climate change; ensure management of risks to geological hazards.

Regional Organizations and Institutions

- Promote regional programmes including for technical cooperation, capacity development, the development of methodologies and standards for hazard and vulnerability monitoring and assessment, the sharing of information and effective mobilization of resources;
- Undertake and publish regional and sub-regional baseline assessments;
- Coordinate and publish reviews on progress and support needs, and assists countries in preparation of national summaries;
- Establish specialized regional collaborative centers;
- Support the development of regional mechanisms and capacities for early warning, including for tsunami.

International Organizations (including UN System and IFIs)

- Encourage the integration of DRR into humanitarian and sustainable development fields;
- Strengthen the capacity of the UN system to assist disaster-prone developing countries in DRR and implement measures for assessment of progress;
- Identify actions to assist disaster-prone developing countries in the implementation of the Hyogo Framework, ensure integration and that adequate funding is allocated; assist in setting up national strategies and programmes for DRR;
- Integrate actions into relevant coordination mechanisms (UNDG, IASC, RCs and UN Country Teams);
- Integrate DRR into development assistance frameworks such as CCA/UNDAF, PRSP;
- In collaboration with networks and platform support: data collection and forecasting on natural hazards and risks; early warning systems; full and open exchange of data;
- Support States with coordinated international relief assistance, to reduce vulnerability and increase capacities;
- Strengthen international mechanisms to support disaster stricken States in post-disaster recovery with DRR approach
- Adapt & strengthen inter-agency disaster management training for DRR and capacity building.

ISDR (Inter-Agency Task Force on Disaster Reduction and secretariat)

- Develop a matrix of roles and initiatives in support of follow-up to the Hyogo Framework;
- Facilitate the coordination of effective actions within the UN system and other international and regional entities to support the implementation of the Hyogo Framework, identify gaps, facilitate processes to develop guidelines and policy tools for each priority area;
- In broad consultation, develop generic, realistic and measurable indicators. These indicators could assist States in measuring progress in the implementation of the Hyogo Framework;
- Support national platforms and regional coordination;
- Register relevant partnerships with Commission on Sustainable Development;
- Stimulate the exchange, compilation, analysis and dissemination of best practices, lessons learnt;
- Prepare periodic review on progress towards achieving the objectives of the Hyogo Framework and provide reports to the UNGA and other UN bodies.

Resource Mobilization: States, Regional and International Organizations

- Mobilize resources and capabilities of relevant national, regional and international bodies, including the UN system;
- Provide and support the implementation of the HFA in disaster prone developing countries, including through financial and technical assistance, addressing debt sustainability, technology transfer, public-private partnership and North-South and South-South cooperation;
- Mainstream DRR measures into multilateral and bilateral development assistance programmes;
- Provide adequate voluntary financial contribution to the UN Trust Fund for DR to support follow-up activities to Hyogo Framework; review usage and feasibility for the expansion of this fund;
- Develop partnership to implement schemes that spread risks, reduce insurance premiums, expand insurance coverage and increase financing for post-disaster reconstruction, including through public and private partnerships. Promote an environment that encourages a culture of insurance in developing countries.

Source: Outcome of the World Conference on Disaster Reduction, Kobe, Hyogo, Japan, 18-22 January 2005

* The IATF/DR was replaced in 2007 by the Global Platform for Disaster Risk Reduction

www.unisdr.org

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International Strategy for Disaster Reduction

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