

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Drought Mitigation Center Faculty Publications

Drought -- National Drought Mitigation Center

2000

Drought Preparedness and Response in the Context of Sub-Saharan Africa

Donald A. Wilhite

University of Nebraska - Lincoln, dwilhite2@unl.edu

Follow this and additional works at: <http://digitalcommons.unl.edu/droughtfacpub>

Wilhite, Donald A., "Drought Preparedness and Response in the Context of Sub-Saharan Africa" (2000). *Drought Mitigation Center Faculty Publications*. 34.

<http://digitalcommons.unl.edu/droughtfacpub/34>

This Article is brought to you for free and open access by the Drought -- National Drought Mitigation Center at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Drought Mitigation Center Faculty Publications by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Published in *Journal of Contingencies and Crisis Management* 8:2 (June 2000), pp. 81–92.
Copyright © 2000 Blackwell Publishers Ltd. Used by permission.

Drought Preparedness and Response in the Context of Sub-Saharan Africa

Donald A. Wilhite

National Drought Mitigation Center, University of Nebraska, Lincoln, Nebraska 68583-0749, USA,
email dwilhite@unlnotes.unl.edu

Abstract

Although drought is a normal, recurring feature of climate, little progress has been made in drought management in most parts of the world. A United Nations study of selected Sub-Saharan African countries revealed that most states have little experience in proactive planning for drought. Only Botswana and South Africa have made serious efforts to develop drought preparedness and response. The lack of contingency planning for drought events in the region results from limited financial resources, inadequate understanding of drought impacts, and poor coordination among government agencies. A ten-step planning process, originally developed in 1991 for U.S. states, is suggested as an organizational tool for Sub-Saharan countries to use in the development of drought plans. The process, which emphasizes risk management rather than crisis management, is based on three primary components: (1) monitoring and early warning, (2) vulnerability and impact assessment, and (3) mitigation and response. The steps in the process are generic; they can be adapted and applied to the various settings of Sub-Saharan Africa.

Introduction

Drought is considered by many to be the most complex but least understood of all natural hazards, affecting more people than any other hazard (Hagman, 1984; Wilhite, 1992a). For example, in Sub-Saharan Africa, the droughts of the early to mid-1980s were reported to have adversely affected more than 40 million people (Office of Foreign Disaster Assistance, 1990). The 1991–92 drought in southern Africa affected 20 million people and resulted in a deficit of cereal supplies of more than 6.7 million tons (SADCC, 1992). Lessons from Africa and elsewhere show that drought results in significant impacts regardless of the level of development, although the character of these impacts will differ profoundly (Benson and Clay, 1998; 1999; Wilhite, 1999a; Wilhite and Vanyarkho, 1999).

Drought is a normal feature of climate and its recurrence is inevitable. However, there remains much confusion within the scientific and policy community about its characteristics. It is precisely this confusion that explains, to some extent, the lack of progress in drought management in most parts of the world. The purpose of this article is threefold. First, an overview of the concept of drought will be provided to help readers understand the complexity of the hazard. Second, the status of drought preparedness and drought policy and planning needs will be discussed for selected countries in Sub-Saharan Africa. This discussion is based on a recently completed project sponsored by the United Nations Office to Combat Desertification and Drought (U.N. Sudano-Sahelian Office/UNSO). Third, policy and planning needs will be discussed in the context of a ten-step drought planning process first published in 1991 (Wilhite, 1991) and subsequently revised and updated for various audiences (Wilhite, 1992b; Wilhite, 1996; Wilhite, Hayes, Knutson and Smith, 1999). The goal is to demonstrate how this planning methodology could be employed, with appropriate modifications, to address future drought policy and planning needs in Sub-Saharan Africa and other regions.

Drought as a Natural Hazard

Drought differs from other natural hazards such as floods, tropical cyclones, and earthquakes in several ways. First, the onset and end of a drought is difficult to determine because the effects of drought accumulate slowly over a considerable period of time and may linger for years after the termination of the event. Hence, drought is often referred to as a creeping phenomenon. Second, the absence of a precise and universally accepted definition of drought adds to the confusion both in terms of recognition and its degree of severity. Realistically, definitions of drought must be region, application, or impact specific. This is one explanation for the scores of definitions that have been developed.¹ Third, drought impacts are nonstructural and spread over a larger geographical area than damages from other natural hazards. The nonstructural characteristic of drought impacts has certainly hindered the development of accurate, reliable, and timely estimates of severity and, ultimately, the formulation of drought contingency plans by most governments.

Drought occurs in virtually all climatic regimes. It occurs in high as well as low rainfall areas. It is a temporary aberration, in contrast to aridity, which is a permanent feature of climate in low rainfall areas (Bruins and Berliner, 1998). Drought is the consequence of a natural reduction in the amount of precipitation during an extended period of time, usually a season or more in length. Other climatic factors such as high temperatures, high winds, and low relative humidity are often associated with drought. These factors can significantly aggravate the severity of the event. Drought is also related to the timing and effectiveness of the rains: principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages, rainfall intensity, and number of rainfall events. Thus, each drought year is unique in its climatic characteristics and impacts.

Drought severity is dependent not only on the duration, intensity, and geographical extent of a specific drought episode but also on the demands made by human activities and vegetation on a region's water supplies. The characteristics of drought, along with its

far-reaching impacts, make it difficult, though not impossible, to identify and quantify its effects on society, economy, and environment.

Drought has both a natural and social component (fig. 1). The risk associated with drought for any region is a product of both the region's exposure to the event (i.e., probability of occurrence at various severity levels) and the vulnerability of society to the event. The natural event (i.e., meteorological drought) is a result of the occurrence of persistent large-scale disruptions in the global circulation pattern of the atmosphere. Exposure to drought varies spatially and there is little, if anything, that we can do to alter drought occurrence. Vulnerability, on the other hand, is determined by social factors such as population, demographic characteristics, technology, policy, and social behavior. These factors change over time, and thus vulnerability is likely to increase or decrease in response to these changes. Subsequent droughts in the same region will have different effects because societal characteristics will have changed. The thrust of this article is to emphasize that much can be done to lessen societal vulnerability to drought through proactive preparedness and response planning.

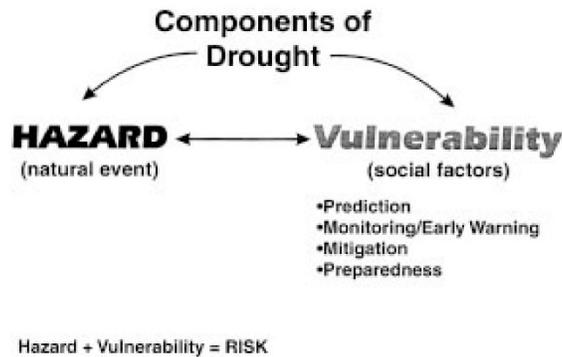


Figure 1. Components of Drought

Drought Preparedness Status, Constraints, and Future Needs in Sub-Saharan Africa

Drought is a major threat to sustainable livelihoods in many parts of Sub-Saharan Africa, in particular in dryland areas of arid and semi-arid regions (Glantz, 1987). Recent drought events have had serious economic, social, and environmental consequences and have resulted in land degradation, human migrations or relocations, famine, diseases, and loss of human life (UNSO, 1999). In 1986, approximately 185 million people living in the dryland areas of Africa were at risk and 30 million were immediately threatened (Dinar and Keck, 1999). It is estimated that 65 million hectares of productive land have become desertified on the southern edge of the Sahara in the past 50 years (United Nations, 1986). Drought has affected nearly all of the countries in western, eastern, and southern Africa in the past two decades and in many cases on more than one occasion. These droughts have resulted in a recurring deficiency of food supplies and the need for interventions by governments and international donors to alleviate food shortages to avert major losses of human life.

For example, the 1991–92 drought in southern Africa resulted in a deficit of more than 6.7 million tons of cereal supplies, which affected more than 20 million people (Dinar and Keck, 1999). Past drought response programs have been reactive and have done little, if anything, to reduce the impacts of future droughts.

In 1997, a project was initiated under sponsorship of UNSO (1999) to assess the status of drought preparedness and mitigation activities in selected Sub-Saharan African countries. UNSO commissioned country and regional consultants to prepare country and regional assessments. Before these reports were initiated, a set of guidelines was prepared for each country to ensure a greater level of consistency in the final products. This approach not only facilitated assessment but also simplified synthesis of this material.

The conclusions summarized here are drawn from eleven southern African countries: Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe.² Three main questions were addressed as part of this summarization process. First, what is the status of drought preparedness (i.e., the institutional capacity) within each country? Second, what constraints exist with regard to policy and plan development? Third, what are the primary drought policy and planning needs? These questions were evaluated from the perspective of the critical components of a drought preparedness plan: (1) monitoring and early warning; (2) vulnerability and impact assessment; and (3) mitigation and response (Wilhite, 1999b).

Some of the common themes on the current status of drought preparedness and institutional capacity included:

- there is no permanent government body to deal with drought issues;
- drought response is often coordinated through natural disaster authorities;
- drought relief is directed toward human relief, protection of key assets, and recovery;
- post-drought evaluation of response is usually not undertaken;
- formal drought contingency plans are rare and mainly directed at response actions;
- drought and famine early warning systems commonly coexist;
- vulnerability assessment of sectors, groups, and areas at risk often exist;
- mitigation actions focus on economic diversification and poverty reduction;
- drought management is increasingly viewed as part of the development process; and
- drought policies are usually lacking.

As expected, there is a wide range of institutional capacity to respond to drought emergencies in southern Africa. Although some countries have a detailed organizational structure in place to coordinate the actions of government at various levels, as well as those of donors and nongovernmental organizations (NGOs), most have not developed a permanent institutional capacity. One of the common problems with drought and other natural hazards is maintaining interest in planning beyond the relatively short window of oppor-

tunity that follows the hazard event, given the on-again, off-again nature of these phenomena. Interest in drought contingency planning quickly wanes in the post-drought period when precipitation conditions have returned to normal or above-normal levels.

Botswana and South Africa clearly stand apart from the other countries included in this assessment in terms of their experiences and current status of drought contingency planning. Although Botswana does not have a clearly identified drought policy and plan, it has had a long history with various types of drought programs. Drought preparedness planning is part of development planning, and the institutional structure is well defined, with local involvement at the district level. In South Africa, the National Consultative Drought Forum was established in 1992 and is made up of representatives of government, church organizations, trade unions, and NGOs. The Forum has led to a shift from an exclusive emphasis on commercial farmers to a more comprehensive program that includes rural farmers, rural poor, and farm workers. Policy changes included greater equity for recipients of assistance. Drought policies have increasingly focused on improving levels of self-reliance, reducing risk in the agricultural sector, and stabilizing income. The National Drought Management Committee was established in 1995 with similar structures at the provincial and local levels of government. The primary objectives of this committee are to develop national disaster management policy, propose and review new legislation, promote community participation in disaster management, promote the establishment of an integrated disaster information system, and ensure risk reduction at the national level. The current government in South Africa is looking at additional drought policy revisions (Department of Constitutional Development, 1999).

No drought policy or plan currently exists in Angola, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Swaziland, Zambia, or Zimbabwe, although some infrastructure does exist in most of these countries to respond to drought conditions, but usually on a reactive or ad-hoc crisis management basis. Two early warning systems are often in place, one focusing on monitoring climate and water supply conditions and the other emphasizing issues associated with food security. Vulnerable sectors, peoples, or regions have been identified in many of these countries. Mitigation actions and programs have been limited to date. Mitigation actions are defined as those instituted in advance of, or during, drought that reduce the impacts from the event. Response actions are generally a joint effort between government authorities, donors, NGOs, and others. Most of these countries have made considerable progress in coordinating and incorporating the capacities of donors and NGOs in drought-related emergency responses. For example, in Swaziland, a consortium of NGOs has been identified to address the needs of vulnerable population groups.

Numerous constraints to drought policy and plan development were identified in the country reports. These included:

- poor quality of meteorological networks;
- minimal understanding of drought impacts;
- lack of institutional capacity;
- low level of NGO involvement in drought management;
- lack of understanding of household vulnerability;

- inadequacy of financial resources for drought management and human resources development;
- need for expanded extension services;
- inequitable access to land;
- limited coordination between government agencies;
- reduced response/mitigation capability due to lack of drought policy and plan.

Many of these constraints are addressed directly in the ten-step drought planning process discussed in the next section of this article.

Future drought policy and planning needs were also identified in the country reports. Many of these needs are aimed at addressing the constraints referred to previously. In many countries it was reported that recommendations on drought policies and specific mitigation actions had been made in government reports or as a result of workshops focused on future drought preparedness planning and response needs. In many cases, however, these recommendations have not been implemented. For example, Namibia has developed a series of drought policy recommendations based on the elements of the ten-step drought planning process. The goal of the Namibian policy is to develop an efficient, equitable, and sustainable approach to drought management that shifts responsibility from the government to the farmer. The tenets of that policy are to (1) ensure that household food security is not compromised by drought; (2) encourage and help farmers adopt a self-reliant approach to drought risk; (3) preserve reproductive capacity of the national livestock herd during drought; (4) ensure a continuous supply of potable water to communities and livestock; (5) prevent degradation of the natural resource base; (6) enable rural inhabitants and the agricultural sector to recover quickly following drought; (7) ensure the health status of all Namibians; and (8) finance drought relief programs efficiently by establishing an independent and permanent national drought fund.

Increased interagency coordination and the need to enhance institutional capacity were also considered important. Other needs identified included expanded meteorological networks and more comprehensive early warning systems, improved vulnerability assessments and vulnerability tracking systems, increased community participation and involvement, expanded NGO involvement in drought management, and the development of strategic grain reserves.

Methodology for Drought Preparedness Planning

In 1991, a ten-step planning process for states in the United States was published as a methodology for plan development (Wilhite, 1991). This process was intended to be generic and adaptable to the needs of any level of government in any drought-prone region. The influence of this planning process is clearly evident in plans that have been or are being developed at various levels of government in every drought-prone region³ (Wilhite, 1996; Wilhite, 1999b). This process has also been widely disseminated in Africa through workshops, training seminars, conferences and published reports (e.g., Wilhite, 1992b). The recent UNSO review (UNSO, 1999) of the status of drought preparedness and mitigation in

Sub-Saharan Africa provided clear evidence of the influence of the planning process in attempts by many countries to become better prepared for future drought events.

The original planning process, although recognizing the need for developing mitigation tools to reduce the impacts of drought, did not place as much attention on mitigation as is warranted today, given the growing emphasis on risk management in addressing the impacts associated with natural hazards. When first published, this planning process focused more attention on improving governmental response to drought emergencies through the development of greater institutional capacity directed at creating an appropriate organizational structure, improving monitoring capability, defining a more explicit decision-making authority for implementing response measures, and improving the information flow and coordination between and within levels of government.

The ten-step planning process was presented and used as a basis for discussions on drought preparedness planning at a series of regional drought training seminars organized by the International Drought Information Centre, University of Nebraska (Wilhite, 1996). These seminars were held in eastern and southern Africa, Asia, and Latin America from 1989 to 1993, with sponsorship from the U.N. Environment Program, World Meteorological Organization, and U.S. National Oceanic and Atmospheric Administration. One of the challenges presented to participants of these training seminars was to modify the ten-step planning process to fit the needs of participating countries. Following this series of workshops, the planning process was published by the U.N. Environment Program (Wilhite, 1992b). This process continues to be revised as necessary to keep the process current (Wilhite, 1996; Wilhite, Hayes, Knutson and Smith, 1999). Drought planning workshops conducted by the National Drought Mitigation Center (NDMC) in the United States, Mexico, Brazil, and South Africa since 1997 have also used the ten-step process as an organizational tool to facilitate the development of drought preparedness plans with mitigation and risk/vulnerability assessments as key components.

As vulnerability to drought has increased globally, greater attention has been directed to reducing risks associated with its occurrence through the introduction of planning to improve operational capabilities (i.e., climate and water supply monitoring, building institutional capacity) and mitigation measures that are aimed at reducing drought impacts. This change in emphasis is long overdue. For example, losses associated with natural hazards in the United States averaged more than \$54 billion per year between 1992 and 1996 (Carolwicz, 1996), and the Federal Emergency Management Agency (FEMA, 1995) estimates annual losses because of drought in the United States at \$6–8 billion per year. Mitigating the effects of drought requires the use of all components of the cycle of disaster management (fig. 2), rather than only the crisis management portion of this cycle.

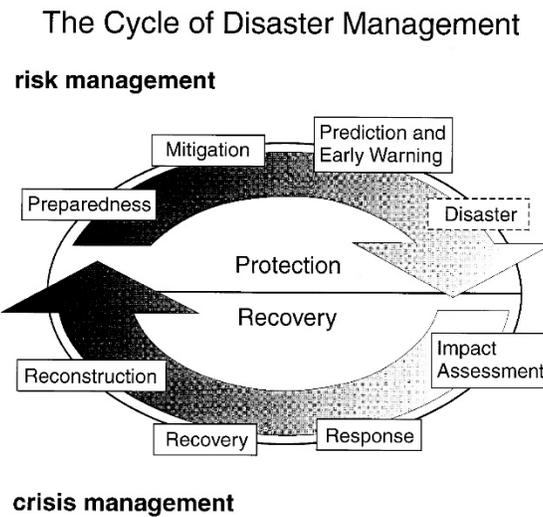


Figure 2. The Cycle of Disaster Management

In the past, when a natural hazard event and resultant disaster occurred, governments followed with impact assessment, response, recovery, and reconstruction activities to return the region or locality to its predisaster state. Little attention has been given to preparedness, mitigation, and prediction and early warning actions (i.e., risk management) that could reduce future impacts and lessen the need for government intervention in the future. Because of this emphasis on crisis management, society has generally moved from one disaster to another with little, if any, reduction in risk. In fact, many response measures instituted by governments, international organizations, and donors have actually increased vulnerability by increasing dependency on internal or external assistance. All components of the cycle of disaster management should be addressed in a comprehensive hazards mitigation plan, but greater attention needs to be placed on predisaster activities than has occurred in the past.

The country and regional reports from the UNSO project cited above show that the evolving organizational structures for drought management in Africa are similar to those found in the United States and elsewhere. The goal of the ten-step planning process (fig. 3) is to derive a plan that is dynamic, reflecting changing government policies, technologies, natural resources management practices, and increasing and shifting populations. It is intended to serve as a checklist to identify the issues that should be addressed in plan development, with appropriate modifications. An overview of the steps included in the planning process follows.

<i>Step 1</i>	<i>Appoint</i> a drought task force
<i>Step 2</i>	<i>State</i> the purpose and objectives of the drought plan
<i>Step 3</i>	<i>Seek</i> stakeholder participation and resolve conflict
<i>Step 4</i>	<i>Inventory</i> resources and <i>identify</i> groups at risk
<i>Step 5</i>	<i>Prepare/write</i> the drought plan
<i>Step 6</i>	<i>Identify</i> research needs and fill institutional gaps
<i>Step 7</i>	<i>Integrate</i> science and policy
<i>Step 8</i>	<i>Publicize</i> the drought plan, build public awareness
<i>Step 9</i>	<i>Develop</i> education programs
<i>Step 10</i>	<i>Evaluate</i> and <i>revise</i> the drought plan

Figure 3. The 10-step Planning Process.

Step 1: Appoint a Drought Task Force

The drought planning process is initiated through the appointment of a Drought Task Force. The task force has two purposes. First, the task force will supervise and coordinate plan development. Second, after the plan is developed and eventually activated during times of drought, the task force will coordinate actions, implement mitigation and response programs, and make policy recommendations to the appropriate person or elected official and legislative body. The task force should reflect the multidisciplinary nature of drought and its impacts, by including representatives of national government, state or provincial government, districts, and villages. It is also imperative that experts from universities be included where appropriate. A representative from the president or prime minister's office or governor's office should be a member of the task force.

Step 2: State the Purpose and Objectives of the Drought Preparedness Plan

As its first official action, the Drought Task Force should state the general purpose for the drought preparedness plan. Members of the task force should consider many questions as they define the purpose of the plan, such as the:

- purpose and role of government in drought mitigation and response efforts;
- scope of the plan;
- most drought-prone areas;
- most vulnerable economic and social sectors;
- role of the plan in resolving conflict between water users and other vulnerable population groups during periods of shortage;
- current trends (e.g., land and water use, population growth) that may increase/decrease vulnerability and conflicts in the future;
- resources (human and economic) that the government and others are willing to commit to the planning process;

- legal and social implications of the plan; and
- principal environmental concerns caused by drought.

A generic statement of purpose is to provide governments with an effective and systematic means of assessing drought conditions, developing mitigation actions and programs to reduce risk in advance of drought, and developing response options that minimize economic stress, environmental losses, and social hardships during drought.

The task force should then identify the specific objectives of the plan. Drought plan objectives will of course vary between countries and should reflect unique physical, environmental, socioeconomic, and political characteristics. Objectives that government should consider include the following:

1. Collect, analyze and disseminate drought-related information in a timely and systematic manner.
2. Establish criteria for declaring drought and triggering various mitigation and response activities.
3. Provide an organizational structure that assures information flows between and within levels of government, as well as with nongovernmental organizations, and define the duties and responsibilities of all agencies with respect to drought.
4. Maintain a current inventory of drought assistance programs used in assessing and responding to drought emergencies, and provide a set of appropriate action recommendations.
5. Identify drought-prone areas and vulnerable sectors, population groups, and environments.
6. Identify mitigation actions that can be taken to address vulnerabilities and reduce drought impacts.
7. Provide a mechanism to ensure timely and accurate assessments of drought's impacts on agriculture, livestock production, industry, municipalities, wildlife, health, and other areas, as well as specific population groups.
8. Keep the public informed of current conditions and response actions by providing accurate, timely information to media in print and electronic form.
9. Establish and pursue a strategy to remove obstacles to the equitable allocation of water during shortages and provide incentives to encourage water conservation.
10. Establish a set of procedures to continually evaluate and exercise the plan and periodically revise the plan so it will stay responsive to the needs of the people and government ministries.

Step 3: Seek Stakeholder Participation and Resolve Conflict

Social, economic, and environmental values often clash as competition for scarce water resources intensifies. Therefore, it is essential for task force members to identify all citizen groups that have a stake in drought planning (stakeholders) and their interests. These groups must be involved early and continuously to enable fair representation and effective drought management and planning. Airing concerns early in the process gives participants

a chance to develop an understanding of one another's various viewpoints and to generate collaborative solutions.

Step 4: Make an Inventory of Resources and Identify Groups at Risk

An inventory of natural, biological, and human resources, including the identification of constraints that may impede the planning process, may need to be initiated by the task force. The amount and variety of information available will vary considerably between settings. It is important to determine the vulnerability of these resources to periods of water shortage that result from drought. *Resources* include, for example, physical and biological resources, infrastructure, and capital available to government. The most obvious natural resource of importance is water; where is it located, how accessible is it, and of what quality is it? *Biological resources* refer to the quantity and quality of grasslands, rangelands, forests, wildlife, and so forth. *Human resources* include the labor needed to develop water resources, lay pipelines, haul water and livestock feed, process citizen complaints, provide technical assistance, and direct citizens to available services. In addition, representatives of government determine what local, state/provincial, federal/national agencies or NGOs may need to be enlisted for action.

In drought preparedness planning, making the transition from crisis to risk management is difficult because historically little has been done to understand and address the risks associated with drought. To solve this problem, areas of high risk should be identified, as should actions that can be taken before a drought occurs to reduce those risks. Risk is defined by both the exposure of a location to the drought hazard and the vulnerability of that location to periods of drought-induced water shortages (Blaikie, Cannon, Davis, and Wisner, 1994). Drought is a natural event; it is important to define the exposure (i.e., the frequency of occurrence of drought according to intensity and duration) of various parts of the country to the drought hazard. Some areas are likely to be more at risk than others. Vulnerability, on the other hand, is defined by social factors such as land use patterns, government policies, social behavior, water use, population, economic development, diversity of economic base, cultural composition, and so forth. The Drought Task Force should address these issues early in the planning process so they can provide more direction to the committees and working groups that will be developed under Step 5 of the planning process.

Step 5: Prepare and Write a Drought Preparedness Plan

This step describes the process of establishing relevant committees to develop the plan's components and write the plan. The drought preparedness plan should have three primary components: monitoring and early warning, vulnerability and impact assessment, and mitigation and response. It is recommended that committees be established with their own specific tasks and goals. A well-established communication and information flow must be kept between the various committees and the Drought Task Force to ensure effective planning.

Monitoring committee

A reliable assessment of water availability and the outlook for the near- and long-term is valuable information in both dry and wet periods. During a drought, the value of this information increases. The monitoring committee should include representatives from agencies with responsibilities for monitoring climate and water supply, and traditionally meteorological, hydrological, and agricultural services. It is recommended that data and information on each of the relevant indicators (e.g., precipitation, temperature, evapotranspiration, long-range weather forecasts, soil moisture, streamflow, ground water, reservoir and lake levels, and snowpack) be considered in the committee's evaluation of the water situation and outlook for the country. The agencies responsible for collecting, analyzing, and disseminating data and information will vary according to each country's infrastructure. The monitoring committee should meet regularly, especially in advance of the peak demand season.

Following each meeting, reports should be prepared and disseminated to the Drought Task Force, as well as to donors, NGOs, and the media. The chairperson of the monitoring committee should be a permanent member of the Drought Task Force. In many countries, this will be someone from the department of meteorological services. If conditions warrant, the Drought Task Force would brief the prime minister or president about the contents of the report, including any recommendations for specific actions. It is essential for the public to receive a balanced interpretation of changing conditions. The monitoring committee should work closely with public information specialists to keep the public well informed.

The monitoring committee has six primary objectives:

1. Adopt a workable definition of drought that could be used to phase in and phase out drought assistance programs initiated in response to drought. It may be necessary to adopt more than one definition of drought in identifying impacts in various economic, social, and environmental sectors.
2. Establish drought management areas (i.e., subdivide the country into more conveniently sized districts by political boundaries, shared hydrological characteristics, climatological characteristics, or other means such as drought probability or risk).
3. Develop a drought monitoring system. The responsibility for collecting, analyzing, and disseminating the data is often divided between various ministries or agencies. The challenge of the monitoring committee is to coordinate and integrate the analysis, so decision makers and the public receive early warning of emerging drought conditions. Drought early warning systems and other complementary systems to monitor food security and famine issues are in place in many countries.
4. Inventory data quantity and quality from current observation networks. A variety of networks exist that monitor key elements of the hydrologic system. Meteorological data are important but represent only one part of a comprehensive monitoring system. Other physical indicators must be monitored to reflect impacts of drought on agriculture, households, industry, energy production, and other water users.
5. Determine the data needs of primary users. Soliciting input on expected new products or obtaining feedback on existing products is critical to ensure that products

meet the needs of primary users and therefore will be used in decision-making. Training on how to use or apply products in routine decision-making is also essential.

6. Develop and/or modify current data and information delivery systems. People need to be warned of drought as soon as it is detected, but often are not. Information needs to reach people in time for them to use it in making decisions.

Vulnerability and impact assessment committee

Drought impacts cut across many sectors and across normal divisions of responsibility for government ministries (Wilhite and Vanyarkho, 1999). As discussed in Step 4, impacts are the result of exposure to the drought hazard (i.e., the probability of occurrence) and a combination of economic, environmental, and social factors. Therefore, to reduce vulnerability to drought, it is essential to identify relevant impacts and assess their underlying causes.

Information on drought's impacts and their causes is crucial for reducing risk before drought occurs and for appropriate response during drought. The membership of the vulnerability and impact assessment committee should represent economic sectors, social groups, and ecosystems most at risk from drought. The committee's chairperson should be a member of the Drought Task Force.

The most effective approach to follow in determining the vulnerability to, and impacts of, drought is to create a series of working groups under the aegis of the vulnerability and impact assessment committee. The responsibility of the committee and working groups is to assess sectors, population groups, and ecosystems most at risk and identify appropriate and reasonable mitigation measures to address these risks. Working groups would be composed of technical specialists representing each of the sectors, groups, or ecosystems at risk. The chair of each working group, as a member of the vulnerability and impact assessment committee, would report directly to the latter. With this model, the responsibility of the committee is to direct the activities of each of the working groups and make recommendations to the Drought Task Force on mitigation actions. The number of working groups will vary considerably, reflecting important impact sectors.

A methodology for assessing and reducing the risks associated with drought has recently been completed as a result of collaboration between the National Drought Mitigation Center (NDMC) and the Western Drought Coordination Council's (WDCC) Mitigation and Response Working Group (Knutson, Hayes and Philips, 1998).⁴ The guide focuses on identifying and prioritizing drought impacts, determining their underlying causes, and choosing actions to address the underlying causes. This methodology can be employed by each of the working groups. Such an effort requires an interdisciplinary analysis of impacts and management options available.

The choice of specific actions to deal with the underlying causes of the drought impacts will depend on the economic resources available and related social values. Typical concerns are associated with cost and technical feasibility, effectiveness, equity, and cultural perspectives. This process has the potential to lead to the identification of effective and appropriate drought risk reduction activities that will reduce long-term drought impacts,

rather than ad hoc responses or untested mitigation actions that may not effectively reduce the impact of future droughts.

Mitigation and response committee

Mitigation and response actions could fall under the responsibility of the Drought Task Force or could be assigned to a separate committee. The task force, working in cooperation with the monitoring/early warning and vulnerability/impact assessment committees, should have the knowledge and experience to understand drought mitigation techniques, risk analysis (economic, environmental, and social aspects), and drought-related decision-making processes at all levels of government. The task force, as originally defined, is composed of senior policy makers from various ministries and, possibly, representatives from NGOs. Therefore, they are in an excellent position to recommend and implement mitigation actions, request assistance through various programs, or make policy recommendations to the legislative body or the prime minister/president. Mitigation and response actions must be determined for each of the principal impact sectors identified by the vulnerability and impact assessment committee.⁵

Writing the plan

With input from each of the committees and working groups, the Drought Task Force, with the assistance of professional writing specialists, will undertake the assignment of drafting the drought preparedness plan. After several iterations, it is recommended that public meetings, discussions, or hearings be held to explain the purpose, scope, and operational characteristics of the plan.

Step 6: Identify Research Needs and Fill Institutional Gaps

As research needs and gaps in institutional responsibility become apparent during the planning process, the Drought Task Force should compile a list of those deficiencies and make recommendations to the appropriate ministry on how to remedy them. Step 6 should be carried out concurrently with Steps 4 and 5. For example, the monitoring committee may recommend establishing or enhancing an existing ground water monitoring program. Another recommendation may be to initiate research on the development of a climate or water supply index to help monitor water supplies and trigger specific actions by government.

Step 7: Integrate Science and Policy

An essential aspect of the planning process is integrating the science and policy of drought management. The policy maker's understanding of the scientific issues and technical constraints involved in addressing problems associated with drought is often negligible. Likewise, scientists generally have a poor understanding of policy constraints for responding to the impacts of drought. Communication and understanding between the science and policy communities is poorly developed and must be enhanced if the planning process is to be successful.

Good communication is required between the two groups in order to distinguish what is feasible from what is desirable for a broad range of science and policy issues. Integration

of science and policy during the planning process will also be useful in setting research priorities and synthesizing current understanding. The Drought Task Force should consider various alternatives to bring these groups together and maintain a strong working relationship.

Step 8: Publicize the Drought Preparedness Plan and Build Public Awareness

It is important to enlist the understanding and cooperation of the public. Brochures and information transmitted through the media need to explain how the drought preparedness plan is expected to relieve impacts of drought. People's memories may need to be refreshed ahead of time in circumstances that seem to develop towards water-use restrictions.

During drought occurrence, the task force should work with public information professionals to keep the public well informed of the current status of water supplies, drought impact and food security. Definitions of drought "trigger points" need to be explained in order to request voluntary restrictions in water use. Victims of drought need to be informed about the types of assistance available and how they can obtain access to assistance.

Step 9: Develop Education Programs

A broad-based education program is needed to raise awareness of water management issues, possible drought impacts on agriculture, livestock raising, and other sectors of society. The issue of food security in relation to drought has to be explained in nations and regions sensitive to food shortages. Moreover, the public should be informed in detail how to prepare themselves on the household level. It will help to maintain alertness during nondrought years.

Information has to be tailored to the needs of elementary and secondary schools, small businesses, industry, households, utilities, and other groups. The task force or a participating agency should consider developing presentations and educational materials for special events such as a water awareness week, environmental awareness days, relevant trade shows, specialized workshops, and other gatherings that focus on natural resource stewardship or management.

Step 10: Evaluate and Revise the Drought Preparedness Plan

The final step in the planning process is to create a detailed set of procedures to ensure adequate plan evaluation. Periodic testing, evaluation, and updating of the drought preparedness plan is essential to keep the plan responsive to local and national needs. To maximize the effectiveness of the system, two modes of evaluation must be in place: ongoing and post-drought evaluation.

Ongoing evaluation

An ongoing or operational evaluation keeps track of how societal changes such as new technology, government policies, population growth and shifts, political leadership, and other factors may affect drought risk and the operational aspects of the drought preparedness plan. Drought risk may be evaluated quite frequently while the overall drought preparedness plan may be evaluated less often. An evaluation under simulated drought

conditions (i.e., a drought exercise) is recommended before the drought plan is implemented. Additional simulations should be organized periodically as needed.

Post-drought evaluation

A post-drought evaluation documents and analyses the assessment and response actions of government, nongovernmental organizations, and others, and implements recommendations for improving the system. Without post-drought evaluations, it is difficult to learn from past successes and mistakes, as institutional memory fades.

Post-drought evaluation should include an analysis of the climatic and environmental aspects of the drought; its economic and social consequences; and the extent to which predrought planning was useful in mitigating impacts, in facilitating relief or assistance to stricken areas, and in postrecovery. Attention must also be directed to situations in which drought-coping mechanisms worked and where societies exhibited resilience; evaluations should not focus only on those situations in which coping mechanisms failed. Evaluations of previous responses to severe drought are also a good planning aid.

To ensure an unbiased appraisal, governments may wish to place the responsibility for evaluating drought and societal response in the hands of independent nongovernmental organizations such as universities and specialized research institutes.

Conclusion

Drought is an insidious natural hazard that is a normal part of the climate of virtually all regions, while it is strongly associated with many Sub-Saharan African countries. Drought should not be viewed as merely a physical phenomenon. Water shortages may also result from the demand placed on water supply by human-use systems. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration.

Previous responses to drought in Africa and most other countries of the world have been, for the most part, reactive (i.e., crisis management). This approach has been demonstrated to be ineffective, poorly coordinated, and untimely in all political and geographical settings; more importantly, it has done little to reduce the risks associated with drought. In fact, the economic, social, and environmental impacts of drought have increased significantly in recent decades. A similar trend exists for all natural hazards.

The ten-step planning process, which is revised in this paper, has been used at all levels of government in the United States and in many countries to guide the development of a drought preparedness plan. A concise description of how this planning process can be applied in various settings in Sub-Saharan African countries is presented in the text. The goal of this planning process is to derive a plan that is dynamic and incorporates greater emphasis on risk management and the adoption of appropriate mitigation actions. This approach is developed around the three primary components of a drought preparedness plan: monitoring and early warning, vulnerability and impact assessment, and mitigation and response. The ten steps included in this process are considered to be generic, enabling governments to choose those steps and components that are most applicable to their situation. With appropriate modifications, it is felt that this process could be helpful to many

African countries in addressing issues associated with drought preparedness as an integral part of planning for sustainable development.

Notes

1. Wilhite and Glantz (1985) analyzed more than 150 definitions in their classification study, and many more exist.
2. Only these country reports were summarized fully at the time of this writing.
3. The ten-step process was recently used by the state of Oklahoma in formulating a drought contingency plan. It is currently being used in Texas and in the Apalachicola-Chattahoochee-Flint River basin in Georgia, Alabama, and Florida in drought plan development. Hungary intends to launch a drought planning effort in 2000, using the ten-step process as its primary planning tool.
4. The methodology is available on the WDCC's website as a PDF document at <http://enso.unl.edu/wdcc/products/risk.pdf>.
5. Wilhite (1997) recently completed an assessment of drought mitigation technologies implemented by states in the United States in response to drought conditions during the late 1980s and early 1990s. However, the transferability of these technologies to specific situations in other locations needs to be evaluated.

References

- Benson, C., and Clay, E. (1998), *The Impact of Drought on Sub-Saharan African Economies: A Preliminary Examination*, World Bank technical paper no. 402, Washington D.C.
- Benson, C., and Clay, E. (1999), "The Economic Dimensions of Drought in Sub-Saharan Africa," in Wilhite, D. A. (Ed.), *Drought: A Global Assessment*, Routledge Publishers, London, pp. 287-311.
- Blaikie, P., Cannon, T., Davis, I., and Wisner, B. (1994), *At Risk: Natural Hazards, People's Vulnerability, and Disasters*, Routledge Publishers, London.
- Bruins, H. J., and Berliner, P. R. (1998), "Bioclimatic Aridity, Climatic Variability, Drought and Desertification: Definitions and Management Options," in Bruins, H. J., and Lithwick, H. (Eds), *The Arid Frontier: Interactive Management of Environment and Development*, Kluwer Academic Publishers, Dordrecht, pp. 97-116.
- Carolwicz, M. (1996), "Natural Hazards Need Not Lead to Natural Disasters," *EOS*, Volume 77, Number 16, pp. 149-153.
- Department of Constitutional Development (1999), *White Paper on Disaster Management*, Ministry for Provincial Affairs and Constitutional Development, Pretoria, South Africa.
- Dinar, A., and Keck, A. (1999), "Water Supply Variability and Drought Impact and Mitigation in Sub-Saharan Africa," in Wilhite, D. A. (Ed.), *Drought: A Global Assessment*, Routledge Publishers, London, pp. 129-148.
- FEMA (1995), *National Mitigation Strategy*, Federal Emergency Management Agency, Washington D.C.
- Glantz, M. H. (1987), *Drought and Hunger in Africa: Denying Famine a Future*, Cambridge University Press, Cambridge.
- Hagman, G. (1984), *Prevention before Cure: Report on Human and Natural Disasters in the Third World*, Swedish Red Cross, Stockholm.

- Knutson, C., Hayes, M. and Phillips, T. (1998), *How to Reduce Drought Risk*, A guide prepared by the Preparedness and Mitigation Working Group of the Western Drought Coordination Council, National Drought Mitigation Center, Lincoln, Nebraska.
- Office of Foreign Disaster Assistance (1990), *Annual Report*, Office of Foreign Disaster Assistance, Washington D.C.
- SADCC (1992), *Food Security Bulletin*, SADCC, Gaborone, Botswana.
- United Nations (1986), *Countries Stricken by Desertification and Drought*, General Assembly, Economic and Social Council, New York, 9 June.
- UNSO (1999), *Drought Preparedness and Mitigation in Sub-Saharan Africa*, United Nations Office to Combat Desertification and Drought, New York.
- Wilhite, D. A. (1991), "Drought Planning: A Process for State Government," *Water Resources Bulletin*, Volume 27, Number 1, pp. 29–38.
- Wilhite, D. A. (1992a), "Drought," in Nierenberg, W.A., *Encyclopaedia of Earth System Science*, Volume 2, Academic Press, San Diego, pp. 81–92.
- Wilhite, D. A. (1992b), *Preparing for Drought: A Guidebook for Developing Countries*, Climate Unit, United Nations Environment Program, Nairobi, Kenya.
- Wilhite, D. A. (1996), "A Methodology for Drought Preparedness," *Natural Hazards*, Volume 13, Number 3, pp. 229–252.
- Wilhite, D. A. (1997), "State Actions to Mitigate Drought: Lessons Learned," *Journal of the American Water Resources Association*, Volume 33, Number 5, pp. 961–68.
- Wilhite, D. A. (Ed.), (1999a), *Drought: A Global Assessment*. Volumes I and II, Routledge, London.
- Wilhite, D. A. (1999b), "Preparing for Drought: A Methodology," in Wilhite, D. A. (Ed.), *Drought: A Global Assessment*, Routledge Publishers, London, Volume 2, pp. 89–104.
- Wilhite, D. A., and Glantz, M. H. (1985), "Understanding the Drought Phenomenon: The Role of Definitions," *Water International*, Volume 10, Number 3, pp. 111–20.
- Wilhite, D. A., Hayes, M., Knutson, C. and Smith, K. H. (1999), *A Methodology for Drought Planning*, A report prepared for the Bureau of Reclamation, Denver, National Drought Mitigation Center, Lincoln, Nebraska.
- Wilhite, D. A., and Vanyarkho, O. (1999), "Drought: Pervasive Impacts of a Creeping Phenomenon," in Wilhite, D. A. (Ed.), *Drought: A Global Assessment*, Routledge Publishers, London, Volume I, pp. 245–255.