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Chapter 6 Planning for Drought: A Methodology

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Chapter 6

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Donald A. Wilhite

Introduction

Developing a national or provincial drought policy and plan is a complicated but essential first step toward a reduction of societal vulnerability. Until recently, nations had devoted little effort toward drought planning, preferring instead the crisis management approach. Presently, an increasing number of nations are pursuing a more proactive approach that emphasizes the principles of risk management and sustainable development. Because of the multitude of impacts associated with drought and the numerous governmental agencies that have responsibility for some aspect of monitoring, assessment, mitigation, and planning, developing a policy and plan must be an integrated process within and between levels of government. This chapter outlines in considerable detail a generic process that can be adopted by governments that desire to develop a more comprehensive approach to drought management.

Developing a Drought Plan: The Setting

The factors that may stimulate governments to develop drought plans are numerous and vary from one country to another. These factors may be external, such as the call for the development of drought plans by the World Meteorological Organization (WMO) in 1986 (Obasi, 1986), or internal, such as the occurrence of severe drought and concomitant economic, social, and environmental impacts that significantly affect a nation's economy and progress toward development goals. Although both external and internal factors are important, internal support ultimately must be present for the process to move ahead. Unfortunately, the response efforts of many nations have had little, if any, effect on reducing vulnerability. In fact, vulnerability to drought has increased in some settings because of

relief recipients' expectations for assistance from government or donors. If farmers or other relief recipients expect government or donors to assist them during times of distress, this practice will discourage or be a disincentive for self-reliance. In marginal agricultural regions, the provision of relief to farmers may promote land use practices that may not be sustainable in the long term. Disincentives to proper management of the natural resource base characterize the provision of relief in most countries.

The decision to prepare a drought plan almost always rests with a high-ranking political official. This official may initiate the plan development process; if not, the official must be convinced of the need for a plan and the benefits that will accrue if the process is to go forward. This may be a formidable and time-consuming task. Proponents of a plan must begin by determining support for the planning process within key government agencies and assess what expertise exists within the country to assist with the process. Consensus building is an important part of the process that (if done properly) will enhance the chances of successfully initiating and completing the plan. In some cases, a national or regional water resources management or development plan may already exist and a drought plan, once completed, could be incorporated into this broader strategy.

Although the principles of drought planning have been known for some time, progress toward preparedness in most countries has been conspicuously absent. This lack of progress would indicate that impediments or constraints to drought planning exist and must be addressed if the planning process is to be successful.

Constraints to Drought Planning

Institutional, political, budgetary, and human resource constraints often make drought planning difficult (Wilhite and Easterling, 1987b). One major constraint that exists worldwide is a lack of understanding of drought by politicians, policy makers, technical staff, and the general public. Lack of communication and cooperation among scientists and inadequate communication between scientists and policy makers on the significance of drought planning also complicate efforts to initiate steps toward preparedness. Because drought occurs infrequently in some regions, governments may ignore the problem or give it low priority. Inadequate financial resources to provide assistance and competing institutional jurisdictions between and within levels of government may also serve to discourage governments from undertaking planning. Other constraints include technological limits such as difficulties in predicting and detecting drought, insufficient data bases, and inappropriate mitigation technologies.

Policy makers and bureaucrats should understand that droughts, like floods, are a normal feature of climate. Their recurrence is inevitable. Drought manifests itself in ways that span the jurisdiction of numerous bureaucratic organizations (e.g., agricultural, water resources, health, and so forth) and levels of government (e.g., national, state, and local). Competing interests, institutional rivalry, and the desire to protect their agency missions (i.e., "turf protection") impede the development of concise drought assessment and response initiatives. To solve these problems, policy makers and bureaucrats, as well as the general public, must be educated about the consequences of drought and the advantages

of preparedness. Drought planning requires input by several disciplines, and decision makers must play an integral role in this process.

The development of a drought plan is a positive step that demonstrates governmental concern about the effects of a potentially hazardous and recurring phenomenon. Planning, if undertaken properly and implemented during nondrought periods, can improve governmental ability to respond in a timely and effective manner during periods of crisis. Thus, planning can mitigate and, in some cases, prevent some impacts while reducing physical and emotional hardship. Planning is a dynamic process that must incorporate new technologies and take into consideration socioeconomic, agricultural, technological, and political trends.

It is sometimes difficult to determine the benefits of drought preparedness versus the costs of being unprepared. There is little doubt that preparedness requires financial and human resources that are, at times, scarce. This cost has been and will continue to be an impediment. Preparedness costs are fixed and occur now while drought costs are uncertain and will occur later. Further complicating this issue is the fact that the costs of drought are not solely economic. They must also be stated in terms of human suffering, damage to biological resources, and the degradation of the physical environment, items whose values are inherently difficult to estimate. Post-drought evaluations have shown assessment and response efforts of governments with a low level of preparedness to be largely ineffective, poorly coordinated, untimely, and inefficient in terms of the allocation of resources. Although government expenditures for drought relief are significant and unanticipated, they are usually poorly documented. However, a few examples do exist. During the droughts of the mid-1970s in the United States, specifically 1974, 1976, and 1977, the federal government spent more than $7 billion on drought relief programs (Wilhite et al., 1986). As a result of the drought of 1988, the federal government spent $3.9 billion on drought relief programs and $2.5 billion on farm credit programs (Riebsame et al., 1990). A disaster relief package was also passed by the U.S. Congress in August 1989 in response to a continuation of drought conditions. Between 1970 and 1984, state and federal government in Australia expended more than A$925 million on drought relief under the Natural Disaster Relief Arrangements (Wilhite, 1986). The Republic of South Africa spent R2.5 billion for drought relief from the mid-1970s to the mid-1980s (Wilhite, 1987). When compared to these expenditures, a small investment in mitigation programs in advance of drought would seem to be a sound economic decision. Congressman George E. Brown, Jr., of California recently suggested that perhaps using as little as one-tenth of one percent of U.S. federal drought relief dollars for preventive measures might lower the costs of future drought relief measures by tens, if not hundreds, of millions of dollars (Brown, 1989). Although this example is from the United States, the principal applies to other political settings. Thus, the rationale for implementing preventive measures must be weighed not only against a retrospective analysis of relief costs but also against future relief costs and savings accrued through reduced economic, social, and environmental impacts. Though difficult to quantify, these savings will be significant.

It is equally important to remind decision makers and policy officials that, in most instances, drought planning efforts will use *existing* political and institutional structures at appropriate levels of government, thus minimizing start-up and maintenance costs. It is

also quite likely that some savings may be realized as a result of improved coordination and the elimination of some duplication of effort between agencies or levels of government. Also, plans should be incorporated into general natural disaster and/or water management and development plans wherever possible. This reduces the cost of preparedness substantially. Politicians and many other decision makers simply must be better informed about drought, its impacts, and alternative management approaches and how existing information and technology can be used more effectively to reduce impacts, and at a relatively modest cost.

Developing a National Drought Policy and Plan: A Methodological Approach

A planning process was developed recently in the United States to facilitate the preparation of drought plans by state government decision makers (Wilhite, 1990; 1991). This process has been evolving since 1987, when it was first conceived to synthesize the discussions and recommendations of participants of an international symposium and workshop on drought (Wilhite and Easterling, 1987c; 1989). The process was further modified through direct interaction with foreign governments through a series of training seminars on drought management and preparedness. These seminars have been organized and conducted by the International Drought Information Center since 1989.[1] The framework described below presents ten steps considered essential in the planning process (fig. 1). The first four steps actually involve appraising the resources available to support plan development and designing tactics to gain public support for the process. However, the process is intended to be flexible (i.e., governments can add, delete, or modify steps as necessary).

Appointment of National Drought Commission
(Step 1)

Statement of Drought Policy and Plan Objectives
(Step 2)

Avoiding and Resolving Conflict
between Environmental and Economic Sectors
(Step 3)

Inventory of Natural, Biological, and Human Resources
and Financial and Legal Constraints
(Step 4)

Development of Drought Plan
(Step 5)

Identification of Research Needs and Institutional Gaps
(Step 6)

Synthesis of Scientific and Policy Issues
(Step 7)

Implementation of Drought Plan
(Step 8)

Development of Multilevel Educational
and Training Programs
(Step 9)

Development of Drought Plan
Evaluation Procedures
(Step 10)

Figure 1. The ten-step methodology proposed for the development of a national drought plan (Wilhite, 1991 and 1993).

Step 1: Appointment of National Drought Commission

The planning process is initiated through the appointment of a national drought authority or commission (NDC). The appropriate name for this group (e.g., *commission*, *committee*, or *task force*) will vary from region to region. The NDC has two purposes. First, during plan development, the NDC will supervise and coordinate the development of the plan. Second, after the plan is implemented and during times of drought when the plan is activated, the NDC will assume the role of policy coordinator, reviewing alternative policy response options and making recommendations to political officials. The NDC is central to this planning process and will be referred to throughout the discussion of the proposed methodology.

The NDC should include representatives of the most relevant mission agencies, recognizing the multidisciplinary nature of drought, its diverse impacts, and the importance of both the assessment and response components in any comprehensive plan, and how this plan must be integrated with long-term development objectives. Agencies to consider for inclusion on the commission are meteorological services, agriculture, water resources, planning, public water supply, natural resources, environmental protection, health, finance, economic and rural development, emergency management, and tourism. A representative from the head of state's office should also be included. Consideration should be given to including key representatives from universities, media (or a public information specialist), and environmental and/or special public interest groups. The purpose of including a representative of the media or a public information specialist is to guarantee that the NDC gives attention to promoting public awareness of drought and associated water issues and the mitigative actions that might be required of government during times of shortage. The actual make-up of this committee would be highly variable from one country to another, reflecting different political infrastructures and the unique combination of economic, social, and environmental impacts associated with drought. Care must be taken to keep the commission membership relatively small so that size does not become in itself a constraint or impediment to the completion of the planning process.

The NDC will need to consider at a later time whether it would be prudent to formalize the plan through the legislative (or some other) process. The danger in not formalizing the plan is that a change in political or administrative leadership may lead to the decay of the plan's infrastructure. It must be emphasized that political interest in drought quickly wanes when the crisis is over, as the hydro-illogical cycle illustrates (fig. 2). Concern and panic during a drought are swiftly replaced by apathy once the rains have returned and

drought conditions have abated. Likewise, institutional memory is short. A drought plan (and associated infrastructure) that is ad hoc by nature may cease to exist in a relatively short time. Formalizing the plan after its completion will guarantee that the infrastructure is in place to assist future generations in managing water resources during periods of scarcity. In the United States, several states have formalized their plan through the legislative process (e.g., South Carolina). Other states have chosen to make it an addendum to their emergency management plan, a comprehensive plan that addresses a variety of natural and human-induced disasters.

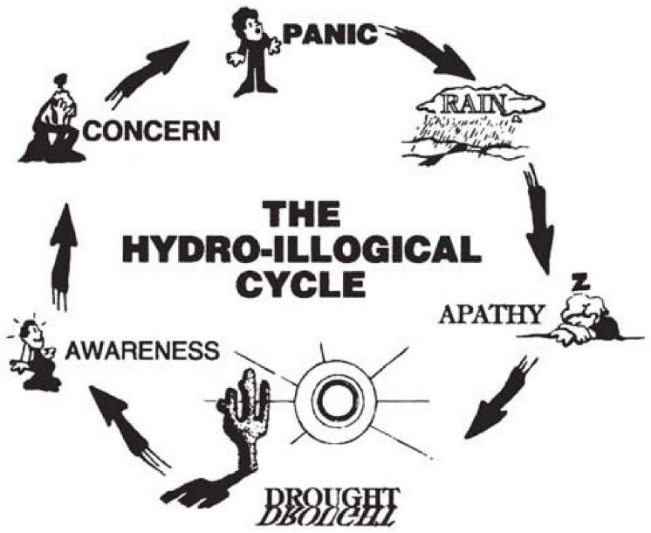

Figure 2. The hydro-illogical cycle.

Step 2: Statement of Drought Policy and Planning Objectives

As their first official action, the NDC must formulate a national drought policy and the objectives of the drought plan. The objectives of a drought *policy* differ from those of a drought *plan.* A clear distinction of these differences must be made at the outset of the planning process. A drought *policy* will be broadly stated and should express the purpose of government involvement in drought assessment, mitigation, and response programs. Ultimately, the goal of a national policy should be to reduce vulnerability to drought by encouraging sustainable development. Drought *plan* objectives are more specific and action-oriented. Typically, the objectives of drought policy have not been stated explicitly by government. What generally exists in many countries is a *de facto policy,* one defined by the most pressing needs of the moment. Ironically, under these circumstances, it is the specific instruments of that policy (such as relief measures) that define the objectives of the policy. Without clearly stated drought policy objectives, the effectiveness of assessment and response activities is difficult to evaluate.

The objectives of drought policy will differ considerably between countries. Based on a comparative analysis of drought assessment and response efforts in the United States and Australia, Wilhite (1986) proposed three objectives of a national policy. First, assistance

should encourage or provide incentives for agricultural producers, municipalities, and other water-dependent sectors or groups to adopt appropriate and efficient management practices that help to alleviate the effects of drought. Relief measures relied on in Australia, the United States, and other countries have discouraged self-reliance by encouraging the adoption of management practices that are inappropriate or unsustainable in a particular setting. This objective emphasizes accepting drought as a normal part of climate and preparing for or managing drought risks as a routine course of business. Second, assistance, if provided, should be given in an equitable, consistent, and predictable manner to all without regard to economic circumstances, industry, or geographic region. Assistance can be provided in many forms or as technical aid. Whatever the form, those at risk must know what to expect from government during drought so that they can better prepare to manage that risk. The role of nongovernmental organizations (NGOs) in assistance efforts must also be precisely defined so that these groups complement governmental assistance efforts.

Third, the importance of protecting the natural and agricultural resource base must be recognized. This objective emphasizes the importance of promoting development that is sustainable in the long term. Clearly, many government programs and development projects have been shortsighted, increasing vulnerability to future episodes of drought. For example, agricultural policies that encourage the expansion of agriculture into marginal land areas are not sound when evaluated in the context of sustainability. The development of a national drought policy should lead to an evaluation of all pertinent government programs to ensure that they are not inconsistent with the goals of that policy.

At the initiation of the planning process, members of the NDC should consider many questions pertaining to the development of a national drought policy, including the following:

- What is the purpose and role of government in assessing and responding to drought?
- What should be the scope of the plan (i.e., will it concentrate primarily on agricultural issues or will it be multi-impact in design)?
- What consideration should be given to food supply and distribution or maintaining the nutritional status of various population groups?
- What are the most drought-prone areas of the country?
- What are the most vulnerable sectors of the nation's economy?
- What are the principal social and environmental concerns associated with drought?
- Who are the most vulnerable population groups?
- Will the drought plan be a vehicle to resolve conflict between water users during periods of shortage?
- What resources (human and financial) is the government (and donor organizations) willing to commit to the planning process and in support of the plan once it is completed?
- What are the legal and social implications of the plan?

Following the development of a national drought policy, the next action of the NDC is to identify the specific objectives of the plan. Drought planning is defined as actions taken by individual citizens, industry, government, NGOs, and others in advance of drought for the purpose of mitigating some of the impacts and conflicts associated with its occurrence (Wilhite, 1991). To be successful, drought planning must be integrated between levels of government, involving the private sector, where appropriate, early in the planning process. In the case study section of this book, it will be demonstrated that some governments are now taking a more proactive approach to drought management. For the majority of nations, however, much remains to be done.

A general statement of purpose for a drought plan is to provide government with an effective and systematic means of assessing and responding to drought conditions. Drought plan objectives will, of course, vary between countries, and they should reflect the unique physical, environmental, socioeconomic, and political characteristics of those countries. Objectives that should be considered include the following:

1. To provide timely and systematic data collection, analysis, and dissemination of drought-related information.
2. To establish proper criteria to identify and designate drought-affected areas and to trigger the initiation and termination of various assessment and response activities by governmental agencies, NGOs, and others during drought emergencies.
3. To provide an organizational structure that assures information flow between and within levels of government and defines the duties and responsibilities of all agencies with respect to drought.
4. To develop a set of appropriate emergency and longer-term programs to be used in assessing and responding to periods of water shortage.
5. To provide a mechanism to ensure the timely and accurate assessment of drought impact on agriculture, industry, municipalities, wildlife, health, and other areas as appropriate.
6. To provide accurate and timely information to the media in order to keep the public informed of current conditions and response actions.
7. To establish and pursue a strategy to remove obstacles to the equitable allocation of water during shortages and to provide incentives to encourage water conservation.
8. To establish a set of procedures to evaluate and revise the plan on a continuous basis in order to keep the plan responsive to national needs.

It is suggested that each country consider these objectives and add to, delete, or modify them as appropriate.

Step 3: Resolving Conflict between Environmental and Economic Sectors

Political, social, and economic interests often clash during drought conditions as competition for scarce water resources intensifies, and it may be difficult to achieve compromises under these circumstances. To reduce the risk of conflict between water users during periods of shortage, it is essential for the public to receive a balanced interpretation of changing

conditions through the media and from other sources. The NDC should ensure that frequent, thorough, and accurate news releases are issued to explain changing conditions and complex problem areas that exist and situations in which solutions will require compromises on both sides. To lessen the potential for conflict, the views of citizens and environmental and other special interest groups[2] must be considered in the drought planning process at an early stage. Although the level of involvement of these groups will no doubt vary from one setting to another, the power of these interest groups in policy making is worth noting. Public interest organizations in some countries have initiated and participated in the development of natural resource policies and plans for some time and have extensive experience with this process. The involvement of these groups in determining appropriate policy goals strengthens the overall policy and plan. Moreover, this involvement ensures that the diverse values of society are represented adequately in the policy and plan. Creating an advisory group made up of representatives of these groups is recommended as a means of addressing their concerns.

If it is determined that the public should be involved in drought planning, then that involvement should commence early in the planning process. A drought advisory council (DAC) should be established by the NDC to facilitate this involvement. The DAC should be a permanent feature of the drought plan, assisting the NDC in the flow of information and the resolution of conflicts between water users during severe drought periods.

Public interests and environmental concerns are best addressed early and often in the drought planning process. It is highly desirable to enhance communication between the public and the government at all levels in a drought situation (i.e., assessment, policy formulation, and response effort). The communication networks of public interest and environmental groups can greatly assist government in both dissemination of information and creation of and feedback on mitigation attempts.

Step 4: Inventory of Natural, Biological, and Human Resources and Financial and Legal Constraints

An inventory of natural, biological, and human resources, including the identification of financial and legal constraints, may need to be initiated by the NDC. In most cases, much information already exists concerning available resources, particularly in the natural and biological resource areas. It is also 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, human expertise, infrastructure, and capital available to government. The most obvious natural resource of importance is water: Where is it located, how accessible is it, 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 pipeline, haul water and hay, process citizen complaints, provide technical assistance, and direct citizens to available services. In addition, representatives of government determine what local, state, or national agencies may be called into action.

Financial constraints would include costs of hauling water or hay, new program or data collection costs, and so forth. These costs must be weighed against the losses that may result in the absence of the drought plan. It should also be recognized that the financial

resources available to government vary annually and from one administration to another. This may provide additional incentives for governments to formalize drought plans through the legislative or another process (see Step 1), thus assuring that funds to carry out existing programs are available. *Legal constraints* include user water rights, existing public trust laws, methods available to control usage, requirements for public water suppliers, and emergency and other powers of political and government officials during water shortages.

An inventory of these resources would reveal assets and liabilities that might enhance or inhibit fulfillment of the objectives of the planning process. This systematic survey should include resources available at various levels of government and the often unique resources available at universities. A comprehensive assessment of available resources would provide the information necessary for further action by the NDC. The NDC may also want to undertake an examination of the drought plans available in adjacent and/or climatically similar countries.

Step 5: Development of the Drought Plan

The NDC will be the coordinating body for the development of a drought plan. Once completed, the plan is envisioned to follow a stepwise or phased approach as water conditions deteriorate and more stringent actions are needed. Thresholds must be established such that, when exceeded, certain actions are triggered within government agencies, as defined by the structure of the plan.

A drought plan should have three primary organizational components: monitoring or early warning, assessment of impact, and response. These three organizational components are discussed in detail below. The names given to the components are intended to be generic, principally referring to the function of the committees. Formal linkages will need to be incorporated in the plan for it to function properly and be responsive to provincial and local needs and evolving conditions. An organizational chart illustrating the linkages between the components of the drought plan is shown in figure 3.

The organizational components shown in figure 3 represent the recommended structure of a national plan. It is essential that any national plan be integrated with provincial and local levels of government. These linkages are not depicted in the organizational chart. Each of the committees shown in figure 3 may have a counterpart at the provincial and local level, with well-established linkages to the national committees. These provincial and local committees will facilitate not only data collection and feedback on programs and policies but also the dissemination of informational products and advisories as well as the implementation of policies.

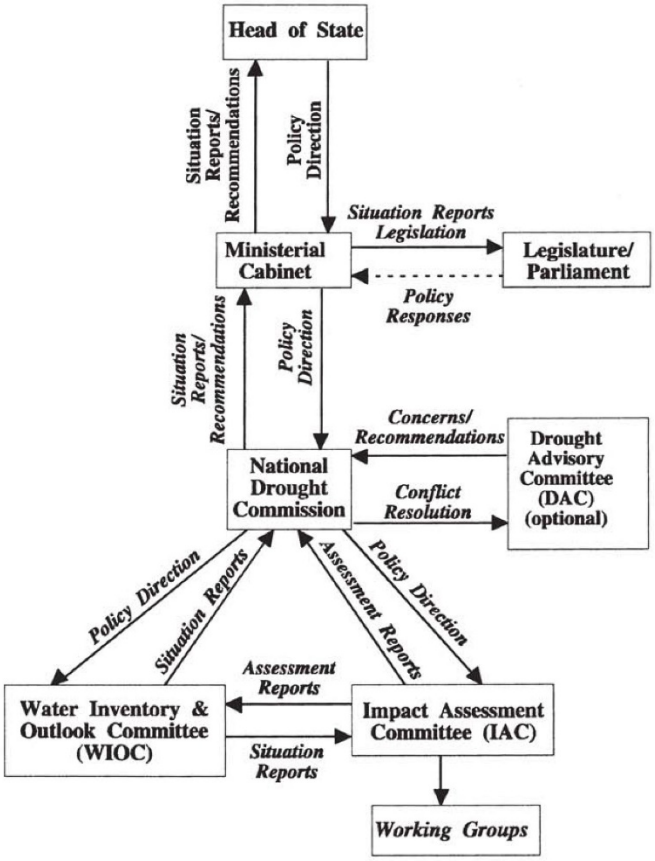

Figure 3. Linkages between the components of the drought plan.

Monitoring Component: Water Inventory and Outlook Committee (WIOC)
A water inventory and outlook committee (WIOC) must be established to monitor current and estimate likely future water availability and moisture conditions. The chairperson of this committee should be a permanent member of the NDC. The WIOC would have five primary duties during the plan development process.

1. Inventory data availability and current observational networks.
2. Determine primary user needs and develop and/or modify current data and information delivery systems.
3. Define drought and develop response triggers.
4. Develop an early warning system.
5. Identify drought management areas.

Membership of the committee should include representatives from agencies with responsibilities for forecasting and monitoring the relevant indicators of the water balance

(i.e., meteorological variables such as precipitation and temperature, soil moisture, snowpack, surface water storage, groundwater, and streamflow). Drought monitoring techniques are described in considerable detail in other chapters of this book. In some instances, many agencies at the national and other levels of government may have responsibility for monitoring these indicators. It is not necessary for all of these agencies to have representation on this committee. Rather, it is recommended that data and information on each of the applicable indicators be considered in the committee's evaluation of the water situation and outlook for the country.

It is important for the WIOC to be a permanent committee, meeting regularly to determine the status of and outlook for water conditions. The committee should meet on a monthly basis throughout the year or regularly just preceding and during the period of most concern. One advantage of regular meetings is that the committee will function as a team because of continuous interaction. Another advantage is that a permanent committee can be useful in the early warning of emerging and potentially serious water problems, whether they are due to shortage or surplus situations. It is common for shortage and surplus situations to exist simultaneously within a country. The frequency of WIOC meetings should be increased if conditions warrant.

Impact Component: Impact Assessment Committee (IAC)

During periods of drought, impacts will be far-reaching and cut across economic sectors and the responsibilities of various levels of government. The impact assessment committee (IAC) will represent those economic sectors most likely to be affected by drought (e.g., agriculture, transportation). The IAC should be composed of an interagency team of agency heads or their representatives, and its chairperson should be a permanent member of the NDC. It may also be advisable to include university scientists that have expertise in early estimations of impact. The IAC should consider both direct and indirect losses resulting from drought. Often drought assistance is provided only to those experiencing direct losses while agricultural businesses are largely ignored. Because of the obvious dependency of the IAC on the Water Inventory and Outlook Committee (WIOC), frequent communication between the two is essential.

Two approaches are proposed to assess the magnitude and diversity of impacts that are likely to result from drought. The first approach calls for the IAC to be responsible for determining impacts, drawing information from all available and reliable sources. The advantage of this approach is its simplicity, involving only a select group of agency heads or representatives. This approach will likely be successful in those countries where impacts are concentrated in a relatively few economic sectors (e.g., agriculture). The disadvantage of this approach is that unless an adequate reporting structure is in place to ensure that all impacts are identified and evaluated correctly, indirect effects may go undetected.

The second approach establishes a series of working groups responsible for anticipating and identifying drought-related impacts in all economic sectors deemed to be important. The assessment (and quantification) of drought impacts is complicated and their detection is most difficult without a team of experts from each impact sector working in concert. Members of the IAC may not have the expertise necessary to identify the range of impacts that occur. Each of the working groups would be composed of specialists from various

impact sectors. The leader of each working group would be a member of the IAC and would report directly to the IAC. With this model, the responsibility of the IAC is to coordinate the activities of each of the working groups and make recommendations to the NDC. The number of impact sectors or working groups will vary considerably between countries. Working groups used by some states in the United States include municipal water use, wildfire protection, agriculture, industry, commerce, tourism, wildlife, energy, and health. A working group on environmental problems should be considered in most, if not all, instances.

A major point of concern here is that the IAC must give significant attention to the full range of impacts associated with drought and also determine how to target assistance to those economic sectors or vulnerable population groups as the need arises. One of the principal deficiencies of past response efforts has been the inability of government to direct the necessary form of assistance to the economic sector or population group in a timely manner. Assistance that is misdirected or untimely is of little or no value. The IAC must work closely with both the WIOC and the NDC (see next section, Response Component) to ensure that this does not occur.

Response Component: National Drought Commission

The third and final element of a drought plan is the response component. The purpose of this component is to act on the information and recommendations of the IAC and evaluate the range of assistance available from government and other sources to assist agricultural producers, municipalities, and others during times of emergency. Because this is a policy-making body, it would be composed of senior-level policy officials, precisely the same make-up as the NDC. Therefore, in addition to overseeing the plan development process, the NDC should assume the response role following plan development.

During the plan development process, the NDC should inventory all forms of assistance available during severe drought from government and nongovernment sources and evaluate these programs for their ability to address short-term emergency situations as well as long-term mitigation programs to reduce vulnerability to drought. The NDC may want to consider transferring this task to the IAC. The NDC (or IAC) should also recommend other forms of assistance programs that could be developed to respond to drought. During periods of drought, the NDC will make recommendations to the president or appropriate presidential representative concerning specific actions that need to be taken.

Drought assistance should be defined in a very broad way to include all forms of technical and relief programs available from government and nongovernment sources. Rational response options must be determined for each of the principal impact sectors identified by the IAC. These options should examine appropriate drought mitigation measures on three timescales: (1) short-term (reactive or emergency) measures implemented during the occurrence of drought, (2) medium-term (recovery) measures implemented to reduce the length of the post-drought recovery period, and (3) long-term (proactive) measures or programs implemented in an attempt to reduce societal vulnerability to future drought. In many instances, local input should be sought to determine the most rational forms of assistance needed by the various impact sectors.

Societal vulnerability to drought may be influenced substantially by non-drought-related actions taken or policies implemented during nondrought periods. The national drought policy formulated in Step 2 will be especially beneficial at this time. Government must consider the effects of emergency programs on long-term development objectives and guard against implementing emergency programs that draw resources from development programs or interfere with their fulfillment, as has happened in Brazil. Emergency programs should foster the achievement of development objectives.

Step 6: Identification of Research Needs and Institutional Gaps

Step 6 is to be carried out concurrently with Step 5. The purpose of this step is to identify research needed in support of the objectives of the drought plan and to recommend research projects to remove deficiencies that may exist. It is unlikely that research needs and institutional gaps will be known until the various committees formed in association with the drought planning process have been through the planning process. Compiling information on research needs and institutional gaps is a function of the NDC. For example, the WIOC may recommend establishing or enhancing an existing groundwater monitoring network. The NDC may find it desirable to create a multidisciplinary scientific advisory panel that could evaluate research proposals, establish funding priorities, and seek financial support from appropriate international or regional organizations, NGOs, or donor governments.

It is likely that institutional deficiencies will be identified as part of Step 6. Agency responsibilities or missions may need to be modified to support activities of the drought plan, modifications that may require legislative action.

Step 7: Synthesis of Scientific and Policy Issues

Previous steps in the planning process have considered scientific and policy issues separately, concentrating largely on assessing the status of the science or on the existing or necessary institutional arrangements to support the plan. An essential aspect of the planning process is the synthesis of the science and policy of drought and drought management. This is the purpose of Step 7.

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 existing policy constraints that affect drought response. A panel of researchers and policy experts recently concluded that communication and understanding between the science and policy communities is poorly developed and must be enhanced if the drought planning process is to be successful (Wilhite and Easterling, 1987a). Direct and extensive contact 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 NDC should consider various alternatives to bring these groups together.

Crucial to this integration process is the provision within the planning process of a means to facilitate scientific information exchange between scientists and policy makers.

Since this is not their primary mission, it is unlikely that scientists will freely devote extensive attention to tailoring and otherwise making available research results on a frequent or continuous basis. One way to achieve this interaction is to appoint a specific liaison person or group to facilitate the exchange of information.

Step 8: Implementation of the Drought Plan

The drought plan should be implemented by the NDC to give maximum visibility to the program and credit to the agencies and organizations that have a leadership or supporting role in its operation. As with emergency response plans, all or a portion of the system should be tested under simulated drought conditions before it is implemented. It is also suggested that announcement and implementation occur just before the most drought-sensitive season to take advantage of inherent public interest. In an agricultural setting, this would be in advance of planting or at some other critical time during the growing season. The cooperation of the media is essential to publicizing the plan, and they must be informed fully of the rationale for the plan as well as its purpose, objectives, assessment and response procedures, and organizational framework. If a representative of the media or a public information specialist is a member of the NDC, as recommended, this person should be an invaluable resource in carrying out this step of the planning process.

Training of personnel who will be actively involved in the operation of the plan is also critical if the plan is to achieve its specified goals. This training should include not only persons in the principal national agencies involved in the activated plan, but also persons at the provincial and local levels of government who will provide valuable input into the decision-making process. The key players in the drought plan must thoroughly understand their responsibilities during drought and how these responsibilities relate to those of other organizations and levels of government. If they do not understand the plan and how it functions, it will fail.

In the absence of drought over several consecutive years, the NDC should conduct simulation exercises to keep leadership informed of their responsibilities during drought. This is a common practice in natural disaster mitigation (e.g., earthquakes, hurricanes); it should be no different for drought. Changes in political leadership, retirements, promotions, and transfers to other positions can disrupt the integrity of the plan.

Step 9: Development of Multilevel Education and Training Programs

Educational and training programs should concentrate on several points. First, a greater level of understanding must be established to heighten public awareness of drought and water conservation and the ways in which individual citizens and the public and private sectors can help to mitigate impacts in the short and long term. The educational process might begin with the development of a media awareness program. This program would include provisions to improve the media's understanding of the drought problem and the complexity of the management issues involved, as well as a mechanism to ensure the timely and reliable flow of information to all members of the media (e.g., via news conferences). Second, the NDC should initiate an information program aimed at educating the general population about drought and water management and what they can do as individuals to conserve water in the short run. Educational programs must be long-term in

design, concentrating on achieving a better understanding of water conservation issues among all age groups and economic sectors. If such programs are not developed, governmental and public interest in and support for drought planning and water conservation will wane during periods of nondrought conditions.

Step 10: Development of Drought Plan Evaluation Procedures

The final step in the establishment of a drought plan is the creation of a detailed set of procedures to ensure adequate evaluation. To maximize the effectiveness of the plan, two modes of evaluation must be in place:

1. An ongoing or operational evaluation program that considers how societal changes such as new technology, the availability of new research results, legislative action, and changes in political leadership may affect the operation of the plan.
2. A post-drought evaluation program that documents and critically analyzes the assessment and response actions of government, NGOs, and others as appropriate and implements recommendations for improving the system.

The first mode of evaluation is intended to express drought planning as a dynamic process, rather than a discrete event. The operational evaluation program is proposed to keep the drought assessment and response system current and responsive to national needs. Following the initial establishment of the plan, it should be monitored routinely to ensure that societal changes that may affect water supply and/or demand or regulatory practices are considered for incorporation. Accordingly, drought plans should be revised periodically.

The second mode of evaluation is the post-drought audit, which should be conducted or commissioned by governments in response to each major drought episode. Institutional memory fades quickly following drought as a result of changes in political administration, natural attrition of persons in primary leadership positions, and the destruction of critical documentation of events and actions taken. Post-drought evaluations should include an analysis of the physical aspects of the drought: its impacts on soil, groundwater, plants, and animals; 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 post-drought recovery. 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. Provisions must be made to implement the recommendations emanating from this evaluation process. Evaluations of previous responses to severe drought are recommended as a planning aid to determine those actions (both technical and relief) that have been most effective.

The post-drought evaluation review team should address the following questions as a part of the process:

- Was the drought plan followed? If not, why not?

- Were the actions taken and measures implemented effective in mitigating the impact of drought? Which actions and relief measures were effective and which were not?
- Should the plan have included other actions or assistance measures?
- Did aid reach all groups in the stricken area? If not, why not? How were the target groups for aid identified?
- Were the measures timely in relation to the events of the drought period?
- Was it possible to correct errors during the emergency?
- What financial and human resources were allocated to the relief effort? Where did the resources come from and how were they controlled?
- How efficient was the logistical support and the available infrastructure? What obstacles (if any) were encountered that reduced the efficiency of the response?
- How effective was the coordination of response efforts between government, NGOs, and other organizations? How did this cooperation affect the flow of information or assistance?
- Was media coverage accurate and realistic in providing details of the event? What kinds of media were involved? What role did they play in the emergency?

The post-drought evaluation process will identify numerous topics that may require research in order for them to be more adequately addressed during future drought episodes. For example, little is known about the effects of government drought assistance programs. Do they facilitate or hinder the recovery process? Extensive research may be required on the environmental and socioeconomic effects of prolonged rainfall deficiency on various hydrological features such as the depletion of soil water and shallow groundwater. Investigation of the effects of drought on land use, vegetation, and soil is essential to the impact assessment process.

To ensure an unbiased appraisal, governments should place the responsibility for evaluating drought and societal response to it in the hands of nongovernmental organizations such as universities and/or specialized agencies or corporations. An excellent example of this practice in operation is the evaluation of India's Food for Work Program. Although the program is implemented by state government, it is evaluated by an independent body, the Planning Commission (Wilhite and Easterling, 1989). Private foundations, research organizations, and international organizations should be encouraged to support post-drought evaluations.

Summary

A methodology was presented to facilitate the development of a drought plan. This ten-step planning process presents the principal ingredients that should be considered by governments that would like to adopt a more proactive approach to drought management to provide a more effective, efficient, and timely response effort in the short term and reduce societal vulnerability in the long term. Governments are advised to consider this proposed

planning process carefully, modifying or adapting it to their particular circumstances by adding or deleting steps as necessary.

The case studies presented in the following chapters of this book reflect many of the considerations described in this chapter that must be addressed in the process of planning for drought. In most settings, planning has been an evolving process, influenced by years of frustration as countries attempted to address drought-related management issues via a reactive, crisis management approach. A growing number of governments have become increasingly aware of the inefficiencies of this approach and are striving to develop sensible national drought policies and plans.

About the Author

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Notes

1. To date, four seminars have been conducted. The first was held in Botswana in September 1989 for countries in the eastern and southern African regions. The second seminar was held in November 1989 in Brazil and focused on the drought-prone northeast region. The third seminar was held in Thailand in March 1991 for the Asian and Pacific regions. The most recent seminar was held in Uruguay in March 1993 for the Latin American and Caribbean regions. The primary sponsors for these seminars have been the U.S. National Oceanic and Atmospheric Administration, U.N. Environment Program, World Meteorological Organization, and University of Nebraska. The Organization of American States was a cosponsor for the Latin American training seminar. Reports of these meetings have been published in *Drought Network News*, the newsletter of the International Drought Information Center, University of Nebraska, Lincoln, Nebraska, U.S.A.
2. These terms are defined according to their meaning in the United States. Other terms may apply in other political settings. The primary difference between special and public interest groups is in what they represent. Where drought is concerned, special interest groups seek to influence policy to benefit their specific economic interests. For example, industry will want to assure sufficient water for corporate operations, and producers of agricultural goods want adequate water supplies for crops and livestock. Public interest groups represent the diverse values of the public domain. During drought, those groups representing natural resources or wildlife interests may be most prominent. Conservation and environmental groups may seek to prevent pollution or disruption of ecosystems. Economic self-interest is not the driving force for these groups. Economics, though, are generally used to define damages resulting from inadequate, inequitable, or inappropriate drought policies. Special and public interest groups may find themselves at odds during a drought crisis. Every effort should be made to incorporate nonlitigious conflict resolution throughout the drought planning process.

References

Brown, G. E. 1989. *National Agricultural Weather Information System Act.* Hearing before the Subcommittee on Department Operations, Research, and Foreign Agriculture of the Committee on Agriculture, U.S. House of Representatives on H.R. 1880. 101st Congress, 3 May.

Obasi, G. P. 1986. Drought Response Plans. Memo from the Secretary-General of WMO to Permanent Representatives of Members of WMO, 14 May. WMO, Geneva.

Riebsame, W. E.; S. A. Changnon, Jr.; and T. R. Karl. 1990. *Drought and Natural Resources Management in the United States: Impacts and Implications of the* 1987–*89 Drought.* Westview Press, Boulder, Colorado, U.S.A.

Wilhite, D. A; N. J. Rosenberg; and M. H. Glantz. 1986. Improving federal response to drought. *Journal of Climatology and Applied Meteorology* 25:332–42.

Wilhite, D. A 1986. Drought policy in the U.S. and Australia: A comparative analysis. *Water Resources Bulletin* 22:425–38.

Wilhite, D. A; and W. E. Easterling, eds. 1987a. *Planning for Drought: Toward a Reduction of Societal Vulnerability.* Westview Press, Boulder, Colorado, U.S.A.

Wilhite, D. A; and W. E. Easterling. 1987c. Drought policy: Toward a plan of action. *In* D. A. Wilhite and W. E. Easterling, eds. *Planning for Drought: Toward a Reduction of Societal Vulnerability*; Chapter 37. Westview Press, Boulder, Colorado, U.S.A.

Wilhite, D. A; and W. E. Easterling. 1987b. Introduction (Workshop Summary). *In* D. A. Wilhite and W. E. Easterling, eds. *Planning for Drought: Toward a Reduction of Societal Vulnerability*; Chapter 34. Westview Press, Boulder, Colorado, U.S.A.

Wilhite, D. A; and W. E. Easterling. 1989. Coping with drought: Toward a plan of action. *Eos* 70(7): 97,106–8.

Wilhite, D. A. 1987. The role of government in planning for drought: Where do we go from here? *In* D. A Wilhite and W. E. Easterling, eds. *Planning for Drought: Toward a Reduction of Societal Vulnerability*; Chapter 25. Westview Press, Boulder, Colorado, U.S.A.

Wilhite, D. A. 1990. *Planning for Drought: A Process for State Government.* IDIC Technical Report Series 90–91, University of Nebraska, Lincoln, Nebraska, U.S.A.

Wilhite, D. A. 1991. Drought planning: A process for state government. *Water Resources Bulletin* 27(1):29–38.

Wilhite, D. A. 1993. *Preparing for Drought: A Guidebook for Developing Countries.* United Nations Environmental Program, Nairobi, Kenya (in press).