

Changing the drought management paradigm: The role of national drought policies

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Resumo

O objetivo deste trabalho é mostrar um conjunto de passos genéricos ou diretrizes que os países podem usar para estabelecer princípios abrangentes de uma política nacional de secas, com a finalidade de reduzir riscos de impactos desses desastres naturais. Essa política seria implementada nos níveis subnacionais, isto é, estadual ou local, por meio do desenvolvimento de planos de preparação e de mitigação de secas. Seguindo esses princípios, um país pode significativamente mudar a forma como se prepara e responde à seca. As diretrizes são genéricas, a fim de possibilitar governos a escolherem aqueles passos e componentes que são mais aplicáveis à sua situação. A metodologia de avaliação de risco embutida é desenhada para guiar os governos por meio de processo de avaliação e priorização de impactos e identificação de ações de mitigação,

Abstract

The intent of the drought policy development and planning process is to provide a set of generic steps or guidelines that nations can use to develop the overarching principles of a national drought policy aimed at risk reduction through a national drought policy commission. This policy would be implemented at the sub-national (i.e., provincial, state or local) level through the development and implementation of drought mitigation and preparedness plans that follow the framework or principles of the national drought policy. Following these guidelines, a nation can significantly change the way they prepare for and respond to drought. The guidelines are generic in order to enable governments to choose those steps and components that are most applicable to their situation. The risk assessment methodology embedded is designed to guide governments through the process of evaluating

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além de instrumentos que podem ser usados para reduzir efeitos negativos de futuros episódios de secas. Ambos os processos, de desenvolvimento de políticas e de planejamento, devem ser vistos como contínuos, avaliando de forma permanente a exposição e a vulnerabilidade cambiantes do país e como os governos e as partes envolvidas trabalham em parceria para reduzir riscos.

and prioritizing impacts and identifying mitigation actions and tools that can be used to reduce the impacts of future drought episodes. Both the policy development process and the planning process must be viewed as ongoing, continuously evaluating the nation's changing exposure and vulnerabilities and how governments and stakeholders can work in partnership to lessen risk.

Palavras-chave: Política de secas. Processo de planejamento sobre secas. Impactos de secas. Ações de mitigação de secas.

Keywords: *Drought policy. Drought planning process. Impacts of droughts. Drought mitigation actions.*

1. Introduction

The implementation of a drought policy based on the philosophy of risk reduction can alter a nation's approach to drought management by reducing the associated impacts (risk). This concept helped motivate the World Meteorological Organization's (WMO) Congress, at its Sixteenth Session held in Geneva in 2011, to recommend the organization of a "High-level Meeting on National Drought Policy (HMNDP)." Accordingly, WMO, the Secretariat of the United Nations Convention to Combat Desertification (UNCCD), and the Food and Agriculture Organization of the United Nations (FAO), in collaboration with a number of UN agencies, international and regional organizations, and key national agencies, organized and held the HMNDP in Geneva from 11 to 15 March 2013. The theme of the HMNDP was "Reducing Societal Vulnerability – Helping Society (Communities and Sectors)."

Concerns about the spiraling impacts of drought on a growing number of sectors, the current and projected increase in the incidence of drought frequency and severity, and the outcomes and recommendations emanating from the HMNDP have drawn increased attention from governments, international and regional organizations, and non-governmental organizations. These impacts, regardless of the setting, can only be partially attributed to deficient or erratic rainfall. Drought is a complex natural hazard, and the impacts associated with it are the result of numerous climatic factors and a wide range of societal factors that define the level of societal resilience. Population growth and redistribution and changing consumption and production patterns are two of the factors that define the vulnerability of a region, economic sector, or population group. Some other factors include poverty and rural vulnerability; increasing water demand due to urbanization; poor soil and water management practices, climate variability

and change; changes in land use; environmental degradation; and greater awareness of the need to preserve the integrity of ecosystems. Although the development of drought policies and preparedness plans can be a challenging undertaking, the outcome of this process can significantly increase societal resilience to these climatic shocks.

1.1. National drought policy: Background

Simply stated, a national drought policy should establish a clear set of principles or operating guidelines to govern the management of drought and its impacts. The overriding principle of drought policy should be an emphasis on risk management through the application of preparedness and mitigation measures (HMNDP, 2013). This policy should be directed toward reducing risk by developing better awareness and understanding of the drought hazard and the underlying causes of societal vulnerability along with developing a greater understanding of how being proactive and adopting a wide range of preparedness measures can increase societal resilience. Risk management can be promoted by encouraging the improvement and application of seasonal and shorter-term forecasts, developing integrated monitoring and drought early warning systems and associated information delivery systems, developing preparedness plans at various levels of government, adopting mitigation actions and programs, creating a safety net of emergency response programs that ensure timely and targeted relief, and providing an organizational structure that enhances coordination within and between levels of government and with stakeholders. The policy should be consistent and equitable for all regions, population groups, and economic sectors and consistent with the goals of sustainable development.

As vulnerability to and the incidence of 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. Mitigating the effects of drought requires the use of all components of the cycle of disaster management (Figure 1), rather than only the crisis management portion of this cycle. Typically, when drought occurs, governments and donors have followed with impact assessment, response, recovery, and reconstruction activities to return the region or locality to a pre-disaster state. Historically, little attention has been given to preparedness, mitigation, and prediction/early warning actions (i.e., risk management) and the development of risk-based national drought management policies that could reduce future impacts and lessen the need for government and donor interventions in the future. Crisis management only addresses the symptoms of drought, as they manifest themselves in the impacts that occur as a direct or indirect consequence of drought. Risk management, on the other hand, is focused on identifying

where vulnerabilities exist (particular sectors, regions, communities, or population groups) and addresses these risks through systematically implementing mitigation and adaptation measures that will lessen the risk to future drought events. Because societies have emphasized crisis management in past attempts at drought management, countries have generally moved from one drought event to another with little, if any, reduction in risk. In addition, in many drought-prone regions, another drought event is likely to occur before the region fully recovers from the last event. If the frequency of drought increases in the future, as projected for many regions, there will be less recovery time between these events.

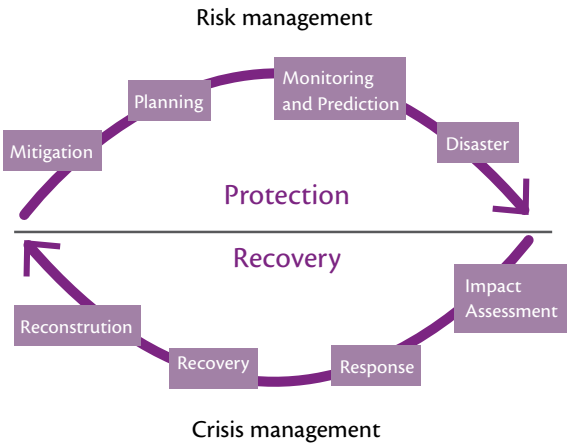


Figure 1. Cycle of Disaster Management

Source: National Drought Mitigation Center, University of Nebraska-Lincoln (UNL)

Progress on drought preparedness and policy development has been slow for a number of reasons. It is certainly related to the slow-onset characteristics of drought and the lack of a universal definition. Drought shares the distinction of being a creeping phenomenon with climate change in terms of getting people to recognize changes that occur slowly over a long period of time. These characteristics of drought make early warning, impact assessment, and response difficult for scientists, natural resource managers, and policy makers. The lack of a universal definition often leads to confusion and inaction on the part of decision makers since scientists may disagree on the existence and severity of drought conditions (i.e., the onset and recovery time differences between meteorological, agricultural and hydrological drought). Severity is also difficult to characterize since it is best evaluated on the basis of multiple indicators and indices, rather than on the basis of a single variable or index. The impacts of drought are also largely

non-structural and spatially pervasive. These features make it difficult to assess the effects of drought and to respond in a timely and effective manner. Drought impacts are not as visual as the impacts of other natural hazards, making it difficult for the media to communicate the significance of the event and its impacts to the public. Public sentiment to respond is often lacking in comparison to other natural hazards that result in loss of life and property.

Associated with the crisis management approach is the lack of recognition that drought is a normal part of the climate. Climate change and associated projected changes in climate variability will likely increase the frequency and severity of drought and other extreme climatic events. In the case of drought, the duration of these events may also increase and, thus, the period between severe drought episodes may be reduced, which leads to a reduction in recovery time. Therefore, it is imperative for all drought-prone nations to adopt a more risk-based approach to drought management in order to increase resilience to future episodes of drought.

It is important to note that each occurrence of drought provides a window of opportunity to move toward a more proactive risk management policy. Immediately following a severe drought episode, policy makers, resource managers, and all affected sectors are aware of the impacts that have occurred and the deficiencies that existed in the government's response. This is the appropriate time to approach policy makers with the concept of developing a national drought policy and preparedness plans in order to increase societal resilience.

1.2. Drought policy development: A template for action

To provide guidance on the preparation of national drought policies and planning techniques, it is important to define the key components of drought policy, its objectives, and steps in the implementation process. An important component of national drought policy is increased attention to drought preparedness in order to build institutional capacity to deal more effectively with this pervasive natural hazard

A constraint to drought preparedness has been the dearth of methodologies available to policy makers and planners to guide them through the planning process. Drought differs in its characteristics between climate regimes, and impacts are locally defined by unique economic, social, and environmental characteristics. A methodology developed by Wilhite (1991) and revised to incorporate greater emphasis on risk management (WILHITE *et al.*, 2000; WILHITE *et al.*, 2005) has provided a set of generic steps that can be adapted to any level of government (i.e., local, state or provincial, or national) or geographical setting for the development of a drought mitigation plan.

The Integrated Drought Management Program (IDMP) recognizes the urgent need to provide nations with guidelines for the development of national drought management policies (<http://droughtinformation.org>). To achieve this goal, the drought preparedness planning methodology referred to above has been modified to define a generic process by which governments can develop a national drought policy and drought preparedness plans at various levels of government that support the principles of that policy. A policy development process was published by IDMP (WMO and GWP, 2014) and readers of this article are referred to that publication for a more detailed version of this process. What is provided in this paper is a more generalized version of this policy development process. The goal of this 10-step process is to provide a template for governments and organizations to follow to reduce societal vulnerability to drought. A national drought policy can be a stand-alone policy or a subset of a natural disaster risk reduction, sustainable development, integrated water resources or climate change adaptation plan that may already exist.

1.3. Drought policy: characteristics and the way forward

As a beginning point in the discussion of drought policy, it is important to identify the various types of drought policies that are available and have been utilized for drought management. The most common approach followed by both developing and developed nations is *post-impact government (or nongovernment) interventions*. These interventions are normally relief measures in the form of emergency assistance programs aimed at providing money or other specific types of assistance (e.g., livestock feed, water, food) to the victims (or those experiencing the most severe impacts) of the drought. This reactive approach, characterized by the hydro-illogical cycle, Figure 2, is seriously flawed from the perspective of vulnerability reduction since the recipients of this assistance are not expected to change behaviors or resource management practices as a condition of the assistance. Although drought assistance provided through emergency response interventions may address a short-term need, it may in the longer term actually decrease the coping capacity of individuals and communities by fostering greater reliance on these interventions rather than increasing self-reliance. This reliance on the government for relief is contrary to the philosophy of encouraging self-reliance through an investment in appropriate mitigation actions that can improve drought coping capacity. Government assistance or incentives that encourage these investments would be a philosophical change in how governments respond and would promote a change in the expectations of livestock producers as to the role of government in these response efforts. The more traditional approach of providing relief is also flawed in terms of the timing of assistance being provided. It often takes weeks or months for assistance to be received, at times well beyond the window of when the relief would be of greatest value in addressing the impacts of drought. In addition, those livestock producers who previously employed appropriate

risk reduction techniques are likely ineligible for assistance since the impacts they experienced were reduced and therefore do not meet the eligibility requirements. This approach rewards those that have not adopted appropriate resource management practices.

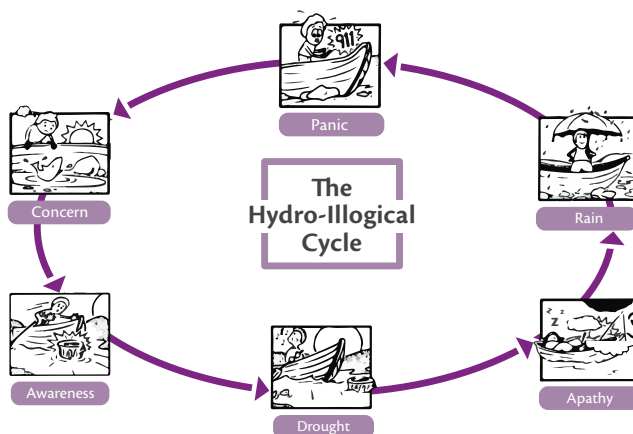


Figure 2. Hydro-illogical cycle

Source: National Drought Mitigation Center, University of Nebraska-Lincoln (UNL)

Although there is at times a need to provide emergency response to various sectors (i.e., post-impact assessment interventions), it is critically important for the purpose of moving toward a more proactive risk management approach that the two drought policy approaches described below become the cornerstone of the policy process.

The second type of drought policy approach is the development and implementation of *policies and preparedness plans*, which would include organizational frameworks and operational arrangements developed in advance of drought and maintained between drought episodes by government or other entities. This approach represents an attempt to create greater institutional capacity focused on improved coordination and collaboration within and between levels of government and with stakeholders in the primary impact sectors and with the plethora of private organizations with a vested interest in drought management (i.e., communities, natural resource or irrigation districts or managers, utilities, agribusiness, farm organizations, and others).

The third type of policy approach emphasizes the development of *pre-impact government programs or measures* that are intended to reduce vulnerability and impacts. This approach could be considered a subset of the approach listed above. In the natural hazards field, these types

of programs or measures are commonly referred to as mitigation measures. Mitigation in the context of natural hazards is different from mitigation in the context of climate change, where the focus is on reducing greenhouse gas (GHG) emissions. Mitigation in the context of natural hazards refers to actions taken in advance of drought to reduce impacts in the future. Drought mitigation measures are numerous, but they may be more confusing to the general public in comparison to mitigation measures for earthquakes, floods and other natural hazards where the impacts are largely structural. Impacts associated with drought are generally non-structural, and thus the impacts are less visible, more difficult to assess in a timely fashion (e.g., reductions in crop yield), and do not require reconstruction as part of the recovery process. Drought mitigation measures would include establishing comprehensive early warning and delivery systems, improved seasonal forecasts, increased emphasis on water conservation (demand reduction), increased or augmented water supplies through greater utilization of ground water resources, water reutilization and recycling, construction of reservoirs, interconnecting water supplies between neighboring communities, drought preparedness planning to build greater institutional capacity, and awareness building and education. In some cases, such water resource augmentation measures are best developed jointly with a neighboring state (or country), or at least such measures should be coordinated if they might have an impact on the other riparian state (or downstream use in general). Insurance programs, currently available in many countries, would also fall into this category of policy types.

Principal elements of a drought risk reduction policy framework

Drought policy should emphasize four principle components during the development process: (1) risk and early warning, including vulnerability analysis, impact assessment, and communication; (2) mitigation and preparedness, including the application of effective and affordable practices; (3) awareness and education, including a well-informed public and a participatory process; and (4) good governance and an effective policy framework, including political commitment and responsibilities (UNISDR, 2009). Another important component of this framework is the inclusion of policy options for emergency response and relief. In all cases, when severe drought occurs, governments and other organizations must provide some form of emergency relief to those sectors most affected. However, it is crucial, as a part of a drought risk reduction policy, for this assistance to be provided in a form that does not run counter to the goals and objectives of the national drought policy, which would include a strong emphasis on the sustainability of the natural resource base.

1.4. National drought management policy: a process

The challenge that nations face in the development of a risk-based national drought management policy is complex. It requires political will at the highest level possible and a coordinated approach within and between levels of government and with the diversity of stakeholders that must be engaged in the policy development process. A national drought policy could be a stand-alone policy. Alternatively, as noted previously, it could contribute to or be a part of a national policy for disaster risk reduction with holistic and multi-hazard approaches that is centered on the principles of risk management.

The policy would provide a framework for shifting the paradigm from one traditionally focused on a reactive crisis management to one that is focused on a proactive risk-based approach that is intended to increase the coping capacity of the country and thus create greater resilience to future episodes of drought.

The formulation of a national drought policy, while providing the framework for a paradigm shift, is only the first step in vulnerability reduction. The development of a national drought policy must be intrinsically linked to the development and implementation of preparedness and mitigation plans at the sub-national level (provincial/state and local). These plans will be the instruments through which a national drought policy is executed.

The 10-step process that is provided below is intended to provide a template or roadmap that countries can follow in the development of a national drought management policy and drought preparedness/mitigation plans at the sub-national level. In other words, the process is not intended to be prescriptive, but rather to be adapted by countries to reflect their institutional infrastructure, legal framework, etc. This process has been modified from a 10-step drought planning process or methodology developed in the United States for application at the state level. Currently, 47 of the 50 U.S. states have developed drought plans, and the vast majority of these states have followed the guidelines provided by the 10-step process in the preparation or revision of drought plans (<http://drought.unl.edu/Planning/PlanningInfoByState.aspx>). This drought planning methodology has also been followed in other countries in the development of national drought strategies. The process, originally developed in the early 1990s, has been revised numerous times, placing greater emphasis on mitigation planning with each revision. Now, this original methodology has been modified once again to reflect an emphasis on capacity development for a national drought management policy, including the development of drought preparedness plans that are necessary in support of a national policy.

The 10 steps below provide an outline of the process for policy and preparedness planning. As indicated above, the process is intended to be generic, i.e., applying this methodology in

each country setting would require adapting it to the current institutional capacity, political infrastructure, legal frameworks, and technical capacity. The reader is referred to a more complete description of this policy development process recently published by the IDMP (WMO and GWP, 2014).

The 10 steps in the drought policy and preparedness process are:

- Step 1:** *Appoint* a national drought management policy commission
- Step 2:** *State* or *define* the goals and objectives of a risk-based national drought management policy
- Step 3:** *Seek* stakeholder participation; *define* and resolve conflicts between key water use sectors, considering also transboundary implications
- Step 4:** *Inventory* data and financial resources available and *identify* groups at risk
- Step 5:** *Prepare/write* the key tenets of a national drought management policy and preparedness plans, which would include the following elements:
 - Monitoring, early warning and prediction
 - Risk and impact assessment
 - Mitigation and response
- Step 6:** *Identify* research needs and *fill* institutional gaps
- Step 7:** *Integrate* science and policy aspects of drought management
- Step 8:** *Publicize* the national drought management policy and preparedness plans and *build* public awareness
- Step 9:** *Develop* educational programs for all age and stakeholder groups
- Step 10:** *Evaluate* and *revise* national drought management policy and supporting preparedness plans

Step 1: *Appoint* a national drought management policy commission

The process for creating a national drought management policy should begin with the establishment of a national commission to oversee and facilitate policy development. Given the complexities of drought as a hazard and the cross-cutting nature of managing all aspects - monitoring, early warning, impact assessment, response, mitigation, planning - there exists a critical need to coordinate the activities of many agencies/ministries of government at various levels and the private sector, including key stakeholder groups, and civil society. To ensure a coordinated process, the president/prime minister or other key political leader must take the lead in establishing a national drought policy commission. Otherwise, it may not garner the full support and participation of all relevant parties.

The purpose of the commission is twofold. First, the commission will supervise and coordinate the policy development process. This includes bringing together all of the necessary resources of the national government. By pooling the government's resources, this initial phase will likely require only minimal new resources coupled with a redirection of existing resources (e.g., financial, data, human) in support of the process. Second, once the policy is developed, the commission will be the authority responsible for the implementation of the policy at all levels of government. The principles of this policy will be the basis for the development and implementation of preparedness or mitigation-based plans at the sub-national level. In addition, the commission will be tasked with the activation of the various elements of the policy during times of drought. The commission will coordinate actions, implement mitigation and response programs or delegate this action to local or provincial/state government, and either initiate policy recommendations to the president or other appropriate political leader and/or the appropriate legislature body or implement specific recommendations within the authority of the commission and the ministries represented.

Step 2: *State* or *define* the goals and objectives of a risk-based national drought-management policy

Drought is a normal part of climate and there is considerable evidence and growing concern that the frequency, severity, and duration of droughts are increasing in many parts of the world—or will increase in the future as a result of anthropogenic climate change. The HMNDP was convened largely in response to this concern, as well as the ineffectiveness of the traditional crisis management approach or response to the occurrence of drought. The ultimate goal of HMNDP was to provide a forum and launch initiatives to create more drought-resilient societies.

Following the formation of the commission, its first official action should be to establish specific and achievable goals for the national drought policy and a timeline for implementing the various aspects of the policy, as well as a timeline for achieving these goals. Several guiding principles should be considered as the commission formulates a strategy to move from crisis management to a drought risk reduction approach. First, assistance measures, if employed, should not discourage agricultural producers, municipalities, and other sectors or groups from the adoption of appropriate and efficient management practices that help to alleviate the effects of drought (i.e., assistance measures should reinforce the goal of increasing resilience or coping capacity to drought events). Those assistance measures employed should help to build self-reliance to future drought episodes. Second, assistance should be provided in an equitable (i.e., to those most affected), consistent, and predictable manner to all without regard to economic circumstances, sector, or geographic region. It is important to emphasize that the assistance provided is not counter-productive or a disincentive for self-reliance. Third, the protection of the natural and agricultural resource base is paramount, so any assistance or mitigation measures adopted must not run counter to the goals and objectives of the national drought policy and long-term sustainable development goals.

As the commission begins its work, it is important to inventory all emergency response and mitigation programs that are available through the various ministries at the national level. It is also important to assess the effectiveness of these programs and past disbursement of funds through these programs. A similar exercise should be implemented at the state or provincial level in association with the development of drought preparedness and mitigation plans.

To provide guidance in the preparation of national drought policies and planning techniques, it is important to define the key components of drought policy, its objectives, and steps in the implementation process. Commission members, supporting experts, and stakeholders should consider many questions as they define the goals of the policy:

- What is the purpose and role of government in drought mitigation and response efforts?
- What is the scope of the policy?
- What are the country's most vulnerable economic and social sectors and regions?
- Historically, what have been the most notable impacts of drought?
- Historically, what has been the government's response to drought and what has been its level of effectiveness?

- What is the role of the policy in addressing and resolving conflict between water users and other vulnerable groups during periods of shortage?
- What current trends (e.g., climate, drought incidence, land and water use, population growth) may increase/decrease vulnerability and conflicts in the future?
- What resources (human and financial) is the government able to commit to the planning process?
- What other human and financial resources are available to the government (e.g., climate change adaptation funds)?
- What are the legal and social implications of the plan at various jurisdictional levels, including those extending beyond the state borders?
- What principal environmental concerns are exacerbated by drought?

A generic statement of purpose for the drought policy and preparedness plans is to reduce the impacts of drought by identifying principal activities, groups, or regions most at risk and developing mitigation actions and programs that reduce these vulnerabilities. The policy should be directed at providing government 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.

Step 3: *Seek stakeholder participation; define and resolve conflicts between key water-use sectors, considering also transboundary implications*

As noted in Step 1, a public participation specialist is an important contributor in the policy development process because of the complexities of drought as it intersects with society's social, economic, and environmental sectors and the dependence of these sectors on access to adequate supplies of water in support of diverse livelihoods. As drought conditions intensify, competition for scarce water resources increases and conflicts often arise. These conflicts cannot be addressed during a crisis, and thus it is imperative for potential conflicts to be addressed during non-drought periods when tension between these groups is minimal. As a part of the policy development process, it is essential to identify all citizen groups (i.e., stakeholders), including

the private sector, that have a stake in the process and their interests. These groups must be involved early and continuously for fair representation to ensure an effective drought policy development process at the national and local (provincial) levels. In the case of transboundary rivers, international obligations under agreements that the state is a party to should also be taken into account. Discussing concerns early in the process gives participants a chance to develop an understanding of one another's various viewpoints, needs, and concerns, leading to collaborative solutions. Although the level of involvement of these groups will vary notably from country to country and even within countries, the power of public interest groups in policy making is considerable in many settings. In fact, these groups are likely to impede progress in the policy development process if they are not included in the process. The commission should also protect the interests of stakeholders who may lack the financial resources to serve as their own advocates. One way to facilitate public participation is to establish a citizens' advisory council (as noted in Step 1) as a permanent feature of the commission's organizational structure in order to keep information flowing and address/resolve conflicts between stakeholders.

A national drought-policy development process must be multi-level and multi-dimensional in its approach. Thus, the goals of state or basin plans should mirror or reflect national policy goals. State or provincial governments need to consider if district or regional advisory councils should be established and what their composition might be. These councils could bring stakeholder groups together to discuss their water-use issues and problems and seek collaborative solutions in advance of the next drought.

Step 4: *Inventory resources and identify groups at risk*

An inventory of natural, biological, human, and financial resources - including the identification of constraints that may impede policy development - may need to be initiated by the commission. In many cases, much information already exists about natural and biological resources through various provincial and national agencies/ministries. It is important to determine the vulnerability of these resources to periods of water shortage that result from drought. The most obvious *natural* resource of importance is water (i.e., location, accessibility, quantity, quality), but a clear understanding of other natural resources such as climate and soils is also important. *Biological/ecological resources* refer to the quantity and quality of grasslands/rangelands, forests, wildlife, wetlands, and so forth. *Human resources* include the labor needed to develop water resources, lay pipeline, haul water and livestock feed, process and respond to citizen complaints, provide technical assistance, provide counseling, and direct citizens to available services.

It is also imperative to identify constraints to the policy development process and to the activation of the various elements of the policy and preparedness plans as drought conditions develop. These constraints may be physical, financial, legal, or political. The costs associated with policy development must be weighed against the losses that will likely result if no plan is in place (i.e., the cost of inaction). As stated previously, the goal of a national drought policy is to reduce the risk associated with drought and its economic, social, and environmental impacts. Legal constraints can include water rights, existing public trust laws, requirements for public water suppliers, transboundary agreements (e.g., specifying that a certain volume or share of river flow across the border has to be guaranteed), and liability issues.

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 *et al.*, 1994). Drought is a natural event; it is important to define the exposure (i.e., frequency of drought of various intensities and durations) of various parts of the country, province, or watershed to the drought hazard. Some areas are likely to be more at risk than others because of greater exposure to the hazard, which inhibits or shortens the recovery time between successive droughts. As a result of current and projected changes in climate and the frequency or occurrence of extreme climatic events, such as droughts, it is important to assess historical as well as projected future exposure to droughts. Vulnerability, on the other hand, is affected by social factors such as population growth and migration trends, urbanization, changes in land use, government policies, water use trends, diversity of economic base, and cultural composition. The commission can address these issues early in the policy development process, but the more detailed work associated with this risk or vulnerability process will need to be directed to specific working groups at the state or provincial level as they embark on the process of drought preparedness planning. These groups will have more precise local knowledge and will be better able to garner input from local stakeholder groups.

Step 5: *Prepare/write* the key tenets of a national drought management policy and preparedness plans

Drought-preparedness/mitigation plans, as stated earlier, are the instruments through which a national drought policy is carried out. It is essential for these plans to reflect the principles of the risk-based national drought policy that is centered on the concept of risk reduction. What is defined below is the creation of institutional capacity that should be replicated within each state or province within a country, with formal communication and reporting links to a national drought commission.

At the outset, it is important to point out that preparedness planning can take two forms. The first form, response planning, is directed toward the creation of a plan that is activated only during drought events and usually for the purpose of responding to impacts. This type of planning is reactive and the responses that are forthcoming, whether from national or state government or donor organizations, are intended to address specific impacts on sectors, population groups, and communities and, therefore, reflect the key areas of societal vulnerability. In essence, responding to impacts through emergency measures addresses only the symptoms of drought (impacts), and these responses are usually untimely, poorly coordinated, and, often, poorly targeted to those most affected. As noted earlier, this largely reactive approach actually leads to an increase in societal vulnerability since the recipients of drought relief or assistance programs become dependent on government and other programs through the assistance provided to survive the crisis. This approach discourages the development of self-reliance and implementation of improved resource management practices that will reduce risk in the longer term. Stated another way, why should the potential recipients of emergency assistance institute more proactive mitigation measures if government or others are likely to bail them out of a crisis situation? Emergency measures are appropriate in some cases, particularly with regard to providing humanitarian assistance, but they need to be used sparingly and be compatible with the longer-term goals of a national drought policy that is focused on improving resilience to future events.

The second form of preparedness planning is mitigation planning. With this approach, the vulnerabilities to drought are identified as part of the planning process through the analysis of both historical and more recent impacts of droughts. These impacts represent those sectors, regions, and population groups that are most at risk. The planning process can then focus on identifying actions and governmental or non-governmental authorities that can assist in providing the necessary resources to reduce the vulnerability. In support of a risk-based national drought policy, mitigation planning is the best choice if risk reduction is the goal of the planning process. The discussion below shows how states/provinces might go about creating a plan that emphasizes mitigation.

Each state/provincial drought task force should identify the specific objectives that support the goals of the national drought policy. The objectives that should be considered include the following:

- Collect and analyze drought-related information in a timely and systematic manner.
- Establish criteria for declaring drought emergencies and triggering various mitigation and response activities.
- Provide an organizational structure and delivery system that ensures information flow between and within levels of government and to decision makers at all levels.

- Define the duties and responsibilities of all agencies with respect to drought.
- Maintain a current inventory of government programs used in assessing and responding to drought emergencies and in mitigating impacts in the longer term, if available.
- Identify drought-prone areas of the state and vulnerable economic sectors, individuals, or environments.
- Identify mitigation actions that can be taken to address vulnerabilities and reduce drought impacts.
- Provide a mechanism to ensure timely and accurate assessment of drought's impacts on agriculture, industry, municipalities, wildlife, tourism and recreation, health, and other sectors.
- Keep the public informed of current conditions and response actions by providing accurate and timely information to media in print and electronic form (e.g., via television, radio, and the internet).
- Establish and pursue a strategy to remove obstacles to the equitable allocation of water during shortages and establish requirements or provide incentives to encourage water conservation.
- Establish a set of procedures to continually evaluate and exercise the plan and periodically revise the plan so it will remain responsive to local needs and reinforce national drought policy.

The development of a drought mitigation plan begins with the establishment of a series of committees to oversee development of institutional capacity necessary for the plan, as well as its implementation and application during times of drought when the various elements of the plan are activated. At the heart of the mitigation plan is the formation of a state or provincial level drought task force that mirrors to a large extent the makeup of the national drought commission (i.e., representatives from multiple agencies/ministries, key stakeholder groups). The organizational structure for the drought plan reflects the three primary pillars of the plan: monitoring, early warning, and information delivery; risk and impact assessment; and mitigation, preparedness, and response. It is recommended that a committee be established to focus on the first two of these requirements; the drought task force can, in most instances, carry out the mitigation and response functions since these are heavily policy oriented.

These committees will have their own tasks and goals, but well-established communication and information flow between committees and the task force is a necessity to ensure effective planning.

Monitoring, Early Warning, and Information Delivery Committee

A reliable assessment of water availability - its outlook for the near and long term - is valuable information in both dry and wet periods. During drought, the value of this information increases markedly. A monitoring committee should be a part of each state or provincial committee since it is important to interpret local conditions and impacts and communicate this information to the national drought policy commission and its representative from the national meteorological service. In some instances, a monitoring committee may be set up for certain regions with similar climatic conditions and exposure to drought, rather than for each state or province. However, the makeup of this committee should include representatives from all agencies with responsibilities for monitoring climate and water supply. It is recommended that data and information on each of the applicable indicators (e.g., precipitation, temperature, evapotranspiration, seasonal climate forecasts, soil moisture, streamflow, ground water levels, reservoir and lake levels, and snowpack) be considered in the committee's evaluation of the water situation and outlook. The agencies responsible for collecting, analyzing, and disseminating data and information will vary considerably from country to country and province to province. Also, the data included in systematic assessments of water availability and future outlooks will need to be adjusted for each setting to include those variables of greatest importance for local drought monitoring. The primary objectives of the monitoring committee are discussed in detail in the IDMP (WMO and GWP, 2014) report referenced previously.

Risk Assessment Committee

Risk is the product of exposure to the drought hazard (i.e., probability of occurrence) and societal vulnerability, represented by a combination of economic, environmental, and social factors. Therefore, in order to reduce vulnerability to drought, it is essential to identify the most significant impacts and assess their underlying causes. Drought impacts cut across many sectors and across normal divisions of government authority.

Membership of the risk assessment committee should include representatives or technical experts from economic sectors, social groups, and ecosystems most at risk from drought. The committee's chairperson should be a member of the drought task force to ensure seamless reporting. Experience has demonstrated that the most effective approach to follow in determining vulnerability to, and impacts of, drought is to create a series of working groups under the aegis of the risk-assessment committee. The responsibility of the committee and working groups is to assess sectors, population groups, communities, 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 those areas referred to above. The chair of each working group, as a member of the risk assessment committee, would report directly to the committee. Following this model, the responsibility of the risk assessment committee is to direct the activities of each of the working groups. These working groups will then make recommendations to the drought task force on mitigation actions to consider for inclusion in the mitigation plan. Mitigation actions are identified in advance and implemented in order to reduce the impacts of drought when it occurs. Some of these actions represent programs that are long term in nature while others may be actions that are activated when drought occurs. The activation of these measures at appropriate times is determined by the triggers (i.e., indicators and indices) identified by the monitoring committee in association with the risk assessment committee in relation to the key impacts (i.e., vulnerabilities) associated with drought.

The number of working groups will vary considerably between provinces, reflecting the principal impact sectors of importance to various regions within a country and their respective vulnerabilities to drought because of differences in the exposure to drought (frequency and severity) and the most important economic, social, and environmental sectors. More complex economies and societies will require a larger number of working groups to reflect these sectors. It is common for the working groups to focus on some combination of the following sectors: agriculture, recreation and tourism, industry, commerce, drinking water supplies, energy, environment and ecosystem health, wildfire protection, and health.

To assist in the drought mitigation planning process, a methodology is proposed to identify and rank (prioritize) drought impacts through an examination of the underlying environmental, economic, and social causes of these impacts, followed by the selection of actions that will address these underlying causes. What makes this methodology different and more helpful than previous methodologies is that it addresses the causes behind drought impacts. Previously, responses to drought have been reactive in nature and focused on addressing a specific impact, which is a symptom of the vulnerability that exists. Understanding why specific impacts occur provides the opportunity to lessen these impacts in the future by addressing these vulnerabilities through the identification and adoption of specific mitigation actions. A more complete description is included in the IDMP report (WMO and GWP, 2014).

Mitigation and Response Committee

It is recommended that mitigation and response actions be under the purview of the drought task force. The task force, working in cooperation with the monitoring and risk assessment committees, has the knowledge and experience to understand drought mitigation techniques,

risk analysis (economic, environmental, and social aspects), and drought-related decision-making processes. The task force, as originally defined, is composed of senior policy makers from various government agencies and, possibly, key stakeholder groups. Therefore, they are in an excellent position to recommend and/or implement mitigation actions, request assistance through various national programs, or make policy recommendations to a legislative body or political leader.

As a part of the drought planning process, the national drought policy commission should inventory all assistance programs available from national sources to mitigate or respond to drought events. Each provincial drought task force should review this inventory of programs available from governmental and non-governmental authorities for completeness and provide feedback to the commission for the improvement of these programs to address short-term emergency situations as well as long-term mitigation programs that may be useful in addressing risk reduction. In some cases, additional programs might be available from the provinces or states that have supplemented programs available at the national level. Assistance should be defined in a very broad way to include all forms of technical, mitigation, and relief programs available. As stated previously, the national drought commission should undertake a similar exercise with national programs and evaluate their effectiveness in responding to, and mitigating the effects of, previous droughts.

Writing the preparedness/mitigation plan

With input from each of the committees and working groups and the assistance of professional writing specialists, the drought task force will draft the drought mitigation plan. After completion of a working draft, it is recommended that public meetings or hearings be held at several locations to explain the purpose, scope, and operational characteristics of the plan and how it will function in relation to the objectives of the national drought policy. Discussion must also be presented on the specific mitigation actions and response measures recommended in the plan. A public information specialist for the drought task force can facilitate planning for the hearings and also prepare news stories announcing the meetings and providing an overview of the plan.

After the draft plan has been vetted at the state, provincial, or basin level, it should be submitted to the national drought commission for review to determine if the plan meets the requirements mandated by the commission. Although each state-level plan will contain different elements and procedures, the basic structure should conform to policy standards provided to the states at the outset of the planning process by the national drought commission.

Step 6: *Identify* research needs and *fill* institutional gaps

The national drought policy commission should identify specific research needs that exist that would contribute to a better understanding of drought - its impacts, mitigation alternatives, and needed policy instruments - leading to a reduction of risk. These needs are likely to originate from the state-level drought task forces that are implemented to develop mitigation plans. It will be the task of the commission to collate these needs into a set of priorities for future action and funding priorities.

Step 7: Integrate science and policy

An essential aspect of the policy and planning process is integrating the science and policy aspects of drought management. The policymakers' understanding of the scientific issues and technical constraints involved in addressing problems associated with drought is often limited. Likewise, scientists and managers may have a poor understanding of existing policy constraints for responding to the impacts of drought. In many cases, communication and understanding between the science and policy communities must be enhanced if the planning process is to be successful. This is a critical step in the development of a national drought policy. Members of the National Drought Policy Commission have a good understanding of the policy development process, and the political and financial constraints, associated with proposed changes in public policy. They are also aware of the difficulties inherent in a change in the paradigm for the recipients of drought emergency assistance to a new approach focused on drought risk reduction. However, those persons at the state or community level that are embedded in the preparedness-planning process are less aware of these constraints but have an excellent understanding of drought management actions, local conditions, and the key sectors affected and their operational needs. Linking the policy process with critical needs requires an excellent communication conduit from state-based drought task forces and the commission.

Step 8: Publicize the drought policy and plans, build public awareness and consensus

If there has been good communication with the public throughout the process of establishing a drought policy and plan, there may already be an improved awareness of goals of the drought policy, the rationale for policy implementation, and the drought planning process by the time the policy is ready to be implemented. The public information specialists that are engaged in this process at the commission level and at the state level are vital in this regard. Throughout the policy and planning development process, it is imperative for local and national media to be used effectively in the dissemination of information about the process.

Step 9: Develop Education Programs

A broad-based education program focused on all age groups is necessary to raise awareness of the new strategy for drought management, the importance of preparedness and risk reduction, short- and long-term water supply issues, and other crucial prerequisites for public acceptance and implementation of drought policy and preparedness goals. This education program will help ensure that people know how to manage drought when it occurs and that drought preparedness will not lose ground during non-drought years. It would be useful to tailor information to the needs of specific groups (e.g., elementary and secondary education, small business, industry, water managers, agricultural producers, homeowners, utilities). The drought task force in each state or province and participating agencies should consider developing presentations and educational materials for events such as a water awareness week, community observations of Earth Day and other events focused on environmental awareness, relevant trade shows, specialized workshops, and other gatherings that focus on natural resource stewardship or management.

Step 10: Evaluate and revise drought policy and mitigation plans

The tenets of a national drought policy and each of the preparedness or mitigation plans that serve as the implementation instruments of the policy require periodic evaluation and revision. This is in order to incorporate new technologies, lessons learned from recent drought events, changes in vulnerability, and so forth. The final step in the policy development and preparedness process is to create a detailed set of procedures to ensure an adequate evaluation of the successes and failures of the policy and the preparedness plans at all levels. Oversight of the evaluation process would be provided by the national drought policy commission, but the specific actions taken and outcomes exercised in the drought-affected states or provinces would need to have the active involvement of those specific drought task forces. The policy and preparedness process must be dynamic, otherwise, the policies and plans will quickly become outdated. Periodic testing, evaluation, and updating of the drought policy are needed to keep the plan responsive to the needs of the country, states, and key sectors. To maximize the effectiveness of the system, two modes of evaluation must be in place.

Ongoing evaluation

An ongoing or operational evaluation keeps track of how societal changes such as new technology, new research, new laws, and changes in political leadership may affect drought risk and the operational aspects of the drought policy and supporting preparedness plans. The risk associated with drought in various sectors (economic, social, and environmental) should be evaluated frequently, while the overall drought policy and preparedness plans may be evaluated

less often. An evaluation under simulated drought conditions (i.e., computer-based drought exercise) is recommended before the drought policy and state-level plans are implemented and periodically thereafter. It is important to remember that the drought policy and preparedness planning process is dynamic, not a discrete event.

Another important aspect of the evaluation process, and the concept of drought exercises, is linked to changes in government personnel, which in most settings occurs frequently. If the goals and elements of the national drought policy are not reviewed periodically and the responsibilities of all agencies revisited, whether at the national or state level, governmental authorities will not be fully aware of their roles and responsibilities when drought recurs. Developing and maintaining institutional memory is an important aspect of the drought policy and preparedness process.

Post-drought evaluation

A post-drought evaluation or audit documents and analyzes the assessment and response actions of government, non-governmental organizations, and others, and provides for a mechanism to implement recommendations for improving the system. Without post-drought evaluations of both the drought policy and the preparedness plans at the local level, it is difficult to learn from past successes and mistakes, as institutional memory fades.

2. Summary and conclusion

For the most part, previous responses to drought in all parts of the world have been reactive, reflecting what is commonly referred to as the crisis management approach. This approach has been ineffective (i.e., assistance poorly targeted to specific impacts or population groups), poorly coordinated, and untimely; 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 intent of the drought policy development and planning process included in this report and referenced (WMO and GWP, 2014) is to provide a set of generic steps or guidelines that nations can use to develop the overarching principles of a national drought policy aimed at risk reduction through a national drought policy commission. This policy would be implemented at the sub-national (i.e., provincial, state or local) level through the development and implementation of drought mitigation and preparedness plans that follow the framework or principles of the national drought policy. Following these guidelines, a nation can significantly change the way

they prepare for and respond to drought by placing greater emphasis on proactively addressing the risks associated with drought through the adoption of appropriate mitigation actions. These guidelines are generic in order to enable governments to choose those steps and components that are most applicable to their situation. The risk assessment methodology embedded in this process is designed to guide governments through the process of evaluating and prioritizing impacts and identifying mitigation actions and tools that can be used to reduce the impacts of future drought episodes. Both the policy development process and the planning process must be viewed as ongoing, continuously evaluating the nation's changing exposure and vulnerabilities and how governments and stakeholders can work in partnership to lessen risk.

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