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Managing drought risk in a changing climate: The role of national drought policy

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ABSTRACT

There is increasing concern worldwide about the ineffectiveness of current drought management practices that are largely based on crisis management. These practices are reactive and, therefore, only treat the symptoms (impacts) of drought rather than the underlying causes for the vulnerabilities associated with impacts. Through the adoption of national drought policies that are focused on risk reduction and complemented by drought mitigation or preparedness plans at various levels of government, the coping capacity of nations to manage droughts can be improved. The time for adopting an approach that emphasizes drought risk reduction is now, given the spiraling impacts of droughts in an ever-increasing number of sectors and the current and projected trends for the increased frequency, severity and duration of drought events in association with a changing climate. This paper discusses the underlying concepts of drought, the principles and objectives of national drought policies and a drought planning process that has been effective in the preparation of drought mitigation plans.

1. Introduction

In recent years, concern has grown worldwide that droughts may be increasing in frequency, severity, and duration given changing climatic conditions and documented increases in extreme climate events (Sivakumar, 2012; Peterson et al., 2013). Responses to drought by governments throughout the world are generally reactive – poorly coordinated and untimely – and are typically characterized as "crisis management" (Wilhite and Pulwarty, 2005). In addition, the provision of drought relief or assistance to those most affected has been shown to increase vulnerability to future drought episodes by reducing self-reliance and increasing dependence on government and donor organizations. Thus, it is imperative that emergency relief be provided in such a manner that it provides a safety net for those elements of society that are most vulnerable while promoting self-reliance and the principles of a national drought policy based on the concept of risk reduction.

As a direct result of the increase in drought frequency, severity and duration, and the narrowing of the gap between water supply and demand, there has been a remarkable increase in the impacts associated with drought in both developing and developed countries. Although agriculture has typically been the first and most affected sector, many other sectors, including energy production, tourism and recreation, transportation, urban water supply, and the environment, have also experienced significant losses.

Despite the increase in droughts and spiraling impacts, no concerted efforts have been made at the global level to initiate a dialogue on the formulation and adoption of national drought policies that provide a framework for a proactive, risk-based management for dealing with drought events. Without a coordinated national drought policy that includes comprehensive monitoring, early warning and information systems, impact assessment procedures, risk management measures, drought preparedness plans, and emergency response programs, nations will continue to respond to drought in a reactive, crisis management mode. Countries that have not developed such systems, even in part, to develop and inform strategic response options often illustrate a broader lack of institutional flexibility and preparedness and thus higher vulnerability (IPCC, 2012).

In order to address the issue of national drought policy, the World Meteorological Organization (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 partners, organized the High-level Meeting on National Drought Policy (HMNDP) in Geneva, Switzerland, 11–15 March 2013 (WMO, 2013a).

The goal of HMNDP was to provide practical insight into useful, science-based actions to address key drought issues and various

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strategies to cope with drought. National governments must adopt policies that engender cooperation and coordination at all levels of their administration in order to increase their capacity to cope with extended periods of water shortage resulting from drought. The ultimate goal of this effort is to create more drought resilient societies and ensure food security and the sustainability of natural resource systems at the domestic level.

2. The Enigma of drought

Drought differs from other natural hazards in several ways. First, drought is a slow-onset natural hazard often referred to as a creeping phenomenon (Gillette, 1950). Because of the creeping nature of drought, its effects accumulate slowly over a substantial period of time. Therefore, the onset and end of drought is difficult to determine and scientists and policy makers often disagree on the basis (i.e., criteria) for declaring an end to drought. Should drought's end be signaled by a return to normal precipitation and, if so, over what period of time does normal or above-normal precipitation need to be sustained for the drought to be declared officially over? Do precipitation deficits that emerged during the drought event need to be erased for the event to end and how much moisture will it take and over what time period? Do reservoirs and ground water levels need to return to normal or average conditions? Impacts linger for a considerable period of time following the return of normal precipitation, so is the end of drought signaled by meteorological or climatological factors or diminishing impacts?

Second, the absence of a precise and universally accepted definition of drought adds to the confusion about whether or not a drought exists and, if it does, its degree of severity. Realistically, definitions of drought must be region and application (or impact) specific (Wilhite and Glantz, 1985). This is one explanation for the scores of definitions that exist. For this reason, the search for a universal definition of drought is of little value. Policy makers are often frustrated by disagreements among scientists on whether or not a drought exists and its degree of severity.

Third, drought impacts are nonstructural and spread over a larger geographical area than are damages that result from other natural hazards. Quantifying the impacts and providing disaster relief are far more difficult tasks for drought than for other natural hazards since these impacts can filter through economies and the environment for months, years and even decades. These characteristics of drought have hindered development of accurate, reliable, and timely estimates of severity and impacts (i.e., drought early warning and information systems) and, ultimately, the formulation of drought preparedness plans and drought policies. It is difficult for emergency managers that are tasked with the assignment of responding to drought to deal with the impacts because droughts often have large spatial coverage in comparison to floods, tropical storms, earthquakes, and other natural hazards and impacts vary by type and magnitude within the drought-affected area because of different economic, social, and environmental system vulnerabilities.

Drought is a temporary aberration, unlike aridity, which is a permanent feature of the climate. Seasonal aridity (i.e., a well-defined dry season) also needs to be distinguished from drought. There is considerable confusion among scientists and policy makers on the differentiation of these terms. For example, Pessoa (1987) presented a map illustrating the frequency of drought in Northeast Brazil in his discussion of the impacts of and governmental response to drought. For a significant portion of the Northeast region, he indicated that drought occurred between 81 and 100% of the time. Much of this region is arid and drought is an inevitable feature of its climate. But, drought is a temporary feature of climate so it cannot, by definition, occur 100% of the time.

Drought must be considered a relative, rather than absolute, condition. It occurs in both high and low rainfall areas and virtually all climatic regimes. The impacts of drought are, at times, enormous and result in economic and environmental impacts as well as personal hardship. Some countries are now finding it prudent to develop or consider national strategies and policies to manage droughts more effectively. Although this approach might be expected in drought-prone nations like Australia, South Africa, the United States, and India, it is less expected in Malaysia, China, and many European countries—areas normally considered as having a surplus of water.

The impacts of drought appear to be increasing in both developing and developed countries, a clear sign of unsustainable resource use and growing pressures on natural resources. Many factors are contributing to this trend and will be discussed in greater detail later in this paper. Adding to the concern regarding increasing societal vulnerability is concern over how the threat of climate change may increase the frequency, severity and, in the case of drought, duration of these extreme climatic events in the future. As pressure on finite water supplies and other limited natural resources continue to build, more frequent and severe droughts are cause for concern in both water short and water surplus regions where conflicts within and between countries are growing over access to a safe and dependable water supply. Reducing the impacts of future drought events is paramount as part of a national development strategy and a climate change adaptation plan.

Drought, like all natural hazards, has both a natural and social dimension. In most cases the social dimension is the factor that turns a hazard into a disaster. The risk associated with drought for any region is a product of both the region's exposure to the event (i.e., probability of occurrence at various severity levels) and the vulnerability of society to the event (Blaikie et al., 1994). The natural event (i.e., meteorological drought) is a result of the occurrence of persistent large-scale disruptions in the global circulation pattern of the atmosphere (Nicholls et al., 2005). Exposure to drought varies spatially and there is little, if anything, we can do to alter drought occurrence. Vulnerability, on the other hand, is determined by social factors such as population changes, population shifts (regional and rural to urban), demographic characteristics, technology, government policies, environmental awareness and degradation, water use trends, and social behavior. These factors change over time and thus vulnerability is likely to increase or decrease in response to these changes. Subsequent droughts in the same region will have different effects, even if they are identical in intensity, duration, and spatial characteristics, because the drought event is overlying a society that differs from the one that existed during a prior drought event.

All types of drought originate from a deficiency of precipitation (Wilhite and Glantz, 1985), although other factors such as high winds, high temperatures, and low relative humidity may exacerbate the drought's severity. When this precipitation deficiency spans an extended period of time (i.e., meteorological drought), its existence is defined initially in terms of these natural characteristics. However, the other common drought types (i.e., agricultural, hydrological, and socioeconomic) place greater emphasis on human or social aspects of drought and the management of natural resources, highlighting the interaction or interplay between the natural characteristics of the event and human activities that depend on precipitation to provide adequate water supplies to meet societal and environmental demands (Fig. 1). For example, agricultural drought is defined more commonly by the availability of soil water to support crop and forage growth than by the departure of normal precipitation over some specified period of time.