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## Chapter 51 Reducing Societal Vulnerability to Drought: Future Challenges

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## Chapter 51

# Reducing Societal Vulnerability to Drought: Future Challenges

Donald A. Wilhite

## Introduction

The preceding chapters have provided a comprehensive treatment of drought from many disciplinary perspectives, in the context of many economic, social, political, and geographical settings. Although it would be an insurmountable task to synthesize this information in one chapter, it is important to distill some of the more salient points from previous chapters. The intent of this chapter is to reiterate some of the principal features of drought and the challenges that lie before us in the twenty-first century if we are to make progress in reducing societal vulnerability to drought.

Drought, like many other fields of scientific inquiry, is extremely complex. A full understanding of all aspects of the issue is beyond the grasp of any one scientist. Likewise, addressing the myriad of problems associated with drought is beyond the scope of a single discipline. It requires collaboration between many physical and social scientists to advance our understanding of this phenomenon. Scientists and policy makers must also interact to build awareness and understanding of the issues associated with improved drought management.

## Is Drought a Natural Hazard?

One of the primary frustrations that I have experienced over the years is the lack of inclusion of drought as a natural hazard by scientists and emergency managers working in the field of natural hazard management. At times, drought is not totally excluded but is given

only token recognition. This lack of recognition of the importance of drought by the natural hazards community has been an impediment to obtaining adequate research support and, in many instances, an obstacle to building awareness among policy makers at the local, national, regional, and international level. This lack of awareness has resulted in an underappreciation of drought and its far-reaching impacts, and it has perpetuated the process of dealing with drought in a crisis management mode when the knowledge and technology necessary to improve preparedness and mitigate impacts is readily available.

US comedian Rodney Dangerfield is well known for the line "I don't get no respect." He then proves his point by recounting situations in which he gets no respect. I often consider drought to be the Rodney Dangerfield of natural hazards. It is often ignored because it differs from other natural hazards. These differences include its slow onset and insidious nature, duration, lack of structural impacts, relatively small loss of human life, and spatial coverage. What is important is the recognition that drought produces impacts equal to or exceeding those associated with floods, earthquakes, and hurricanes. These impacts are often more difficult to quantify, but they should not be disregarded in national or global efforts to develop a plan of action to reduce vulnerabilities. Drought is a natural hazard, too.

### **What Are the Characteristics of Drought?**

Regardless of geographic setting, many of the authors in these volumes pointed out that drought is a normal part of the climate. The geographical coverage provided by the case studies in this book reinforces the fact that drought occurs in virtually all regions of the world. It is erroneous to consider drought as a problem of subhumid, semiarid, and arid regions alone. Because of its insidious nature, it is difficult to determine its onset, development, and end. This fact emphasizes the importance of developing comprehensive monitoring or early warning systems that track all of the essential elements of the hydrologic system for drought-prone regions. Satellite-derived data is also proving to be of significant value in drought monitoring. Use of appropriate and reliable drought indices is critical in summarizing many of these elements for decision makers at many levels. Drought predictions, while still imprecise for many regions, are improving and can be an important tool in anticipating drought occurrence and implementing timely and effective strategies well in advance of dry conditions. These forecasts are particularly useful if they are provided a season or more in advance. Our improved understanding of the ENSO phenomenon is greatly enhancing our ability to provide seasonal forecasts for many regions.

### **Can We Define Drought?**

Scientists, natural resource managers, and other decision makers continue the search for a universal definition of drought. It is apparent from the numerous case studies included in this volume that the search for a universal definition of drought is a fruitless endeavor. Characterizations of drought must vary by disciplinary perspective, region, economic sector, and application. Although all types of drought originate with a deficiency of precipitation over an extended period of time (i.e., meteorological drought), other types of

drought (e.g., agricultural, hydrologic) are associated with deficiencies in other components of the hydrologic system (e.g., soil moisture, reservoir and lake levels, groundwater levels, streamflow, and snowpack). Even within sectors (e.g., agriculture), definitions of drought will vary according to application. For example, crops respond differently to precipitation shortages depending on the timing of the deficiency and other factors. The causes and characteristics of drought also vary according to climatic regime. Therefore, definitions of drought must be regionally specific.

Four elements are important to include in the construct of a useful definition of drought. First, definitions must include some measure of intensity or the magnitude of the precipitation deficiency. Second, duration is an important distinguishing feature of drought (in comparison to other natural hazards) and must be linked to intensity to determine the severity of the event. Third, a threshold should be selected as a reference point to determine the onset of drought. Fourth, the threshold chosen should be linked to specific impacts in one or more sectors. Thresholds typically have been chosen arbitrarily and, as a result, have not captured the importance of this linkage to impacts in one or more sectors. This factor has limited the usefulness of definitions in triggering specific response or mitigation programs.

#### **Drought: Natural or Social Phenomenon?**

It is clear that some of the misunderstanding about drought and society's capacity to mitigate its effects is the direct result of the fact that many people consider drought to be purely a physical phenomenon. We may ask, if drought is a natural event, what control do we have over its occurrence and the impacts that result? Drought results from a deficiency of precipitation over an extended period of time. This precipitation deficiency is a natural event. The frequency or probability of occurrence of these deficiencies varies spatially and represents a location's exposure to the occurrence of drought. Some regions have greater exposure than others, and we do not have the capacity to alter that exposure.

As with other natural hazards, drought has both a physical and a social component. It is the social factors, in combination with our exposure, that determines societal vulnerability. Some of the social factors that determine our vulnerability are level of development, population growth and its changing distribution, demographic characteristics, demands on water and other natural resources, government policies (sustainable versus nonsustainable), technological changes, social behavior, and trends in environmental awareness and concerns. It is obvious that well-conceived policies, preparedness plans, and mitigation programs can greatly reduce vulnerability to drought.

#### **What Do We Know about the Impacts of Drought?**

The impacts of drought are usually classified by type as economic, social, or environmental. Traditionally, greater emphasis has been placed on identifying and quantifying the economic impacts associated with drought, particularly those associated with agriculture. Agriculture is usually the first sector affected and, as a result, these impacts are better understood and more easily quantified. We are becoming more aware of the impacts of

drought on other economic sectors such as energy, transportation, water supply, recreation, and tourism, as well as on the development process. However, greater attention must be directed to these areas. Likewise, social and environmental impacts are not well understood and are difficult to quantify.

It is clear that the impacts of drought are considerable and differ remarkably between developing and developed countries. Early warning systems, preparedness plans, and mitigation programs must reflect these differences to be effective.

### **Will Preparedness Plans and Mitigation Programs Reduce Future Vulnerability?**

The information available on the impacts associated with drought is at times sketchy but still illustrates an escalating trend of losses in both developing and developed countries. Factors contributing to this escalation of impacts were discussed previously and do not differ substantially from the causes for escalating impacts for other natural hazards. In the 1990s, for example, the total losses from natural disasters is estimated at US\$400 billion. This is up from losses of US\$40 billion in the 1960s. Losses attributable to natural disasters in the United States averaged more than US\$54 billion per year between 1992 and 1996, or about US\$1 billion per week (Natural Disaster Reduction Research Initiative 1997). Losses of this magnitude are unacceptable, and a global collaborative effort is necessary to reduce these losses to more reasonable levels. Although the International Decade for Natural Disaster Reduction (IDNDR) has had a goal of reducing property loss and loss of life, a very small percentage of this effort has been directed specifically to drought.

It is clear that investments in preparedness and mitigation will pay large dividends in reducing the impacts of drought. A growing number of countries are realizing the potential advantages of drought planning. Governments are formulating policies and plans that address many of the deficiencies noted from previous response efforts—efforts that were largely reactive. Most of the progress made in drought preparedness and mitigation has been accomplished in the past decade or so. Although the road ahead will be difficult and the learning curve steep, the potential rewards are numerous. The crisis management approach of responding to drought has existed for many decades and is ingrained in our culture. The victims of drought have become accustomed to government assistance programs. In many instances, these misguided and misdirected government programs and policies have promoted the nonsustainable use of natural resources. Many governments have now come to realize that drought response in the form of emergency assistance programs only reinforces poor or nonsustainable actions.

Policies that encourage self-reliance and the sustainable use of natural resources will be more effective in the long term and will reduce the need for government intervention. A challenge for the future is to identify and quantify the sectors and peoples at risk from drought. Once this step is completed, policies, plans, and mitigation programs can be formulated to address these vulnerabilities in a systematic manner.

## **Will Global Warming Exacerbate Drought and Its Impacts?**

One of the conclusions of the Intergovernmental Panel on Climate Change (Houghton et al. 1996) is that the warmer temperatures expected with global warming will lead to a more vigorous hydrologic cycle. This change in the hydrologic cycle may lead to more severe droughts for some places and less severe droughts for others. Our skill at projecting which regions may have more severe droughts is not very precise at the moment. Certainly, increasing temperatures will increase evaporation and transpiration and the number of extremely hot days. These changes in conjunction with potential changes in the amount, seasonal distribution, and form of precipitation may result in substantial changes in regional hydrology. It is likely that the frequency of drought and the magnitude and types of impacts that result will be altered. Those nations that adopt preparedness plans in the near term will be better able to respond to longer-term changes in climate, if they occur. Even if the frequency and intensity of drought does not increase, nations that adopt drought policies and plans now that promote risk management and self-reliance will be able to deal more effectively with continuing climate variability and drought, a normal part of climate for virtually all regions.

### **Summary**

Collectively, the chapters in this book provide an abundance of information on the characteristics and impacts of drought, as well as the lessons learned in previous response efforts. Policies, plans, and mitigation measures that have been effective (and ineffective in some cases) have been discussed in the context of many geographical settings and from many disciplinary perspectives. As I reviewed each of these chapters, I was impressed time and time again by the magnitude and complexity of the economic losses, social costs, and environmental damage that results from drought; the difficult task of developing and implementing preparedness plans and mitigative actions; and the progress that has been made in reducing the number of people and systems at risk from extended periods of water shortage. Continuing that progress is the challenge before us.

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