

## **CHAPTER 11: DROUGHT POLICY AND PREPAREDNESS: THE AUSTRALIAN EXPERIENCE IN AN INTERNATIONAL CONTEXT\***

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### **1. Introduction**

Drought is a normal part of the climate for virtually all climate regimes. It is a complex, slow-onset phenomenon that affects more people than any other natural hazard and results in serious economic, social, and environmental impacts. Drought affects both developing and developed countries, but in substantially different ways (Wilhite 2000b, pp3-4). The impacts of drought are often an indicator of unsustainable land and water management practices, and drought assistance or relief provided by governments and donors can encourage land managers and others to continue these practices. This often results in a greater dependence on government and a decline in self-reliance.

Many people consider drought to be largely a natural or physical event. In reality, drought, like other natural hazards, has both a natural and a social component. The risk associated with drought for any region is a product of both the region's exposure to the event and the vulnerability of society to the event. Exposure to drought varies regionally and there is little, if anything, we can do to alter its occurrence. The natural event, commonly referred to as meteorological drought, is a result of the occurrence of persistent large-scale disruptions in the global circulation pattern of the atmosphere that result in significant regional deficiencies of precipitation over an extended period of time.

As vulnerability to drought has increased globally, greater attention has been directed to reducing risks associated with its occurrence through the introduction of planning to improve operational capabilities (for example, prediction capabilities, monitoring and early warning systems, building institutional capacity, education and training) and other mitigation measures that are aimed at reducing drought impacts. Typically, when a natural hazard event and resultant disaster has occurred, 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 (that is, risk management) that could reduce future impacts and lessen the need for government intervention in the future. Because of this emphasis on crisis management, many societies have generally moved from one disaster to another with little, if any, reduction

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in risk. In addition, in drought-prone regions, another drought event is likely to occur before the region fully recovers from the last event.

Vulnerability is determined by social factors. As population increases, so does pressure on natural resources. An increase in the number of people also suggests that more people will live in climatically marginal areas that will have greater exposure to drought. Population is also migrating from humid, water-surplus climates to more arid, water-deficient climates and from rural to urban settings for many locations. Urbanisation is placing more pressure on limited water supplies and the capacity of water supply systems to deliver that water to users, especially during periods of peak demand. An increasingly urbanised population is also increasing conflict between agricultural and urban water users, a trend that will only be exacerbated in the future. Increasingly sophisticated technology decreases our vulnerability to drought in some instances while increasing it in others. Greater awareness of our environment and the need to preserve and restore environmental quality is placing greater pressure on all of us to be better stewards of natural and biological resources. All of these factors emphasise that our vulnerability to drought is continually changing and who is most at risk from these changes must be evaluated. We should expect the impacts of drought in the future to be different, more complex, and more significant for some economic sectors, population groups, and regions. Improving drought management implies an attempt to use natural resources in a more sustainable manner. This will require a partnership between individuals and government.

This chapter will concentrate on three principal areas. First, progress in drought planning and preparedness is discussed from an international perspective. This will be followed by three case studies—the United States, sub-Saharan Africa and Australia. The latter will necessarily be brief in light of the earlier chapters in this book. The chapter will conclude with some observations about progress in implementing drought preparedness and risk management approaches, including current attempts to establish a global network aimed at improving levels of drought preparedness within and between regions.

## **2. Drought policy and preparedness: overview**

Although there has been considerable discussion regarding the adoption of risk-based drought policies and preparedness plans globally, Australia is one of the few countries that have actually implemented national programs or strategies. There are four key components in an effective drought risk reduction strategy (O’Meagher *et al* 2000, p115). These are the availability of timely and reliable information on which to base decisions; policies and institutional arrangements that encourage assessment, communication, and application of that information; a suite of appropriate risk management measures for decision makers; and actions by decision makers that are effective and consistent.

Article 10 of the UN Convention to Combat Desertification (UNCCD) states that national action programs should be established to ‘identify the factors contributing to

desertification and practical measures necessary to combat desertification and mitigate the effects of drought' (UNCCD 1999, p14). In the past ten years there has been considerable recognition by governments of the need to develop drought preparedness plans and policies to reduce the impacts of drought. Unfortunately, progress in drought preparedness during the last decade has been slow because many nations lack the institutional capacity and human and financial resources necessary to develop comprehensive drought plans and policies. Recent commitments by governments and international organisations combined with new drought monitoring technologies and planning and mitigation methodologies are cause, however, for optimism. The challenge is the implementation of these new policies, methodologies, and technologies. For example, at a meeting of ministerial delegations and representatives of donor organisations for the West Asian and North African countries on opportunities for sustainable investment in rainfed areas held in 2001, the importance of developing and implementing appropriate drought policies and plans was emphasised as an urgent need (Rabat Declaration 2001, p1). Adopting a regional approach to drought management and preparedness was identified as critical to this region, allowing governments that possess experience with drought policies and preparedness to share it with others through regional and global networks.

Drought planning is an integral part of drought policy. The objectives of drought planning will, of course, vary between countries and should reflect unique physical, environmental, socioeconomic, and political characteristics. A generic set of planning objectives has been developed that could be considered as part of a national, state/provincial, or regional planning effort (Wilhite, Hayes *et al* 2000, p697). These planning objectives have been followed or modified by numerous governments at various levels in the United States and elsewhere since the ten-step drought planning process (Wilhite 1991, p29) was originally developed. For example, the process has been followed in Brazil, Cyprus, and Morocco and will likely be applied in many other countries, as drought preparedness becomes a more common practice. These objectives are set out below.

- Collect, analyse, and disseminate drought-related information in a timely and systematic manner.
- Establish criteria for declaring drought and triggering various mitigation and response activities.
- Provide an organisational structure that assures information flow between and within levels of government, as well as with non-governmental organisations, and define the duties and responsibilities of all agencies with respect to drought.
- Maintain a current inventory of drought assistance and mitigation programs used in assessing and responding to drought emergencies, and provide a set of appropriate action recommendations.
- Identify drought-prone areas and vulnerable sectors, population groups, and 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, livestock production, industry, municipalities, wildlife, health, and other areas, as well as specific population groups.
- Keep the public informed of current conditions and mitigation and response actions by providing accurate, timely information to media in print and electronic form.
- Establish and pursue a strategy to remove obstacles to the equitable allocation of water during shortages and provide incentives to encourage water conservation.
- Establish a set of procedures to continually evaluate and exercise or test the plan and periodically revise the plan so it will remain responsive to the needs of the people and government ministries.

Drought plans in which mitigation is a key element should have three principal components: monitoring, early warning, and prediction; risk and impact assessment; and mitigation and response. A description of each of these components follows.

### **3. Drought monitoring, early warning, and prediction**

Effective drought early warning systems are an integral part of efforts worldwide to improve drought preparedness. Timely and reliable data and information must be the cornerstone of effective drought policies and plans. Monitoring drought presents some unique challenges because of drought's characteristics. In addition, several types of drought exist, and the factors or parameters that define it will differ from one type to another. For example, meteorological drought is principally defined by a deficiency of precipitation from expected or 'normal' over an extended period of time, while agricultural drought is best characterised by deficiencies in soil moisture. This parameter is a critical factor in defining crop production potential. Hydrological drought, on the other hand, is best defined by deficiencies in surface and subsurface water supplies (that is, reservoir, lake, and ground water levels; stream flow; and snowpack), and its impacts generally lag the occurrence of meteorological and agricultural drought. These types of drought may coexist or may occur separately.

An expert group meeting on early warning systems for drought preparedness, sponsored by the World Meteorological Organisation and others, recently examined the status, shortcomings, and needs of drought early warning systems, and made recommendations on how these systems can help in achieving a greater level of drought preparedness (Wilhite, Sivakumar *et al* 2000, p177). This meeting was organised as part of the World Meteorological Organisation's contribution to the UNCCD meeting in Bonn, Germany, in December 2000. The proceedings of this meeting documented recent efforts in drought early warning systems in countries such as Brazil, China, Hungary, India, Nigeria, South Africa, and the United States, but also noted the activities of regional drought monitoring centres in eastern and southern Africa and efforts in West Asia and North Africa. Shortcomings of current drought early warning systems were noted in the following areas:

- *Data networks*—inadequate density and data quality of meteorological and hydrological networks and lack of data networks on all major climate and water supply parameters;
- *Data sharing*—inadequate data sharing between government agencies and the high cost of data limit the application of data in drought preparedness, mitigation, and response;
- *Early warning system products*—data and information products are often not user friendly and users are often not trained in the application of this information to decision making;
- *Drought forecasts*—unreliable seasonal forecasts and the lack of specificity of information provided by forecasts limit the use of this information by farmers and others;
- *Drought monitoring tools*—inadequate indices for detecting the early onset and end of drought, although the Standardised Precipitation Index was cited as an important new monitoring tool to detect the early emergence of drought;
- *Integrated drought/climate monitoring*—drought monitoring systems should be integrated and based on multiple indicators to fully understand drought magnitude, spatial extent, and impacts;
- *Impact assessment methodology*—lack of impact assessment methodology hinders impact estimates and the activation of mitigation and response programs;
- *Delivery systems*—data and information on emerging drought conditions, seasonal forecasts, and other products are often not delivered to users in a timely manner;
- *Global early warning system*—no historical drought database exists and there is no global drought assessment product that is based on one or two key indicators, which could be helpful to international organisations, non-governmental organisations, and others.

Participants of the expert group meeting on drought early warning systems made several recommendations. First, early warning systems should be considered an integral part of drought preparedness and mitigation plans. Second, priority should be given to improving existing observation networks and establishing new meteorological, agricultural, and hydrological networks in support of drought monitoring efforts.

A trend toward establishment of national and regional drought monitoring centres is apparent. For example, the regional drought monitoring centres in eastern and southern Africa have had a significant impact on the collection and dissemination of drought forecasts/outlooks and early warning information to diverse users throughout these regions since their formation a decade ago (Ambenje 2000, p131). The seasonal precipitation outlooks provide users with broad regional patterns several months in advance. During periods with a strong El Niño signal (that is, higher probability of drought conditions in eastern Australia and southern Africa), the value of this information increases significantly for agriculture and other weather-sensitive sectors. Discussions regarding the establishment of other regional drought centres in other regions are ongoing. For example, UNESCO, following an international drought conference in South Africa in September 1999, proposed a regional drought centre with a broader mission. The challenge is to link these activities closely with national drought policy and preparedness efforts in these regions.

#### 4. Risk and impact assessment

Drought impacts cut across many sectors and across normal divisions of responsibility of local, state/provincial, and federal agencies. Wilhite and Vanyarkho have classified these impacts (Wilhite and Vanyarkho 2000, p248). 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, p9). Information on drought impacts and their causes is crucial for reducing risk before drought occurs and for appropriate responses during drought. As part of a drought planning process, technical specialists and members of stakeholder groups that understand those economic sectors, social groups, and ecosystems most at risk from drought should undertake risk assessment.

An approach in accomplishing this risk assessment that has been effective in the United States is to create a series of working groups as a part of the drought planning process (Wilhite, Hayes *et al* 2000, p697). These working groups will assess sectors, population groups, regions, and ecosystems most at risk and identify appropriate and reasonable mitigation measures to address these risks. The number of working groups established varies considerably between states. This process has been widely used in the United States. This process is applied through a methodology for assessing and reducing the risks associated with drought. This methodology was completed recently through collaboration between the NDMC and the Western Drought Coordination Council's Mitigation and Response Working Group (Knutson *et al* 1998, p1) and is available on the NDMC's web site at <http://drought.unl.edu>. This guide focuses on identifying and ranking drought impacts, determining their underlying causes, and choosing actions to address the underlying causes. This methodology can be employed by each of the working groups.

The steps included in this methodology include:

1. Assemble the team. Select stakeholders, government planners, and others with a working knowledge of drought's effects on primary sectors, regions, and people.
2. Evaluate the effects of past droughts. Identify how drought has affected the region, group, or ecosystem. Consult climatological records to determine the 'drought of record,' the worst drought in recorded history, and project what would happen if a similar drought occurred this year or in the future, considering changes in land use, population growth, and development that has taken place since the last drought. The worst single-year drought or the worst sequence of drought years, or both, could define the drought of record.
3. Rank impacts. Determine which of drought's effects are most urgently in need of attention. Various considerations in prioritising these effects include cost, areal extent, trends over time, public opinion, social equity, and the ability of the affected area to recover.
4. Identify underlying causes. Determine those factors that are causing the highest levels of risk for various sectors, regions, and population groups. For example, an unreliable source of water for municipalities in a particular region may explain the impacts that have resulted from recent droughts in that area. To reduce the potential for drought

impacts in the future, it is necessary to understand the underlying environmental, economic, and social causes of these impacts. To do this, drought impacts must be identified and the reason for their occurrence determined.

5. Identify ways to reduce risk. Identify actions that can be taken before drought that will reduce risk. In the example above, taking steps to identify new or alternative sources of water or implementation of a water conservation plan by a municipality at risk could increase resiliency to subsequent episodes of drought.
6. Write a 'to do' list. Choose actions that are likely to be the most feasible, cost-effective, and socially equitable. Implement steps to address these actions through existing government programs or the legislative process.

The choice of specific actions to deal with the underlying causes of drought impacts will depend on the economic resources available and related social values. Typical concerns are associated with cost and technical feasibility, effectiveness, equity, and cultural perspectives. This process has the potential to lead to the identification of effective and appropriate drought risk reduction activities that will reduce long-term drought impacts, rather than *ad hoc* responses or untested mitigation actions that may not effectively reduce the impact of future droughts.

## 5. Mitigation and response

Mitigation is defined in several ways in the natural hazards literature. Hy and Waugh (1990, p19) referred to mitigation as activities that reduce the degree of long-term risk to human life and property. These actions normally include insurance strategies, the adoption of building codes, land-use management, risk mapping, tax incentives and disincentives, and diversification. Drought is not often directly responsible for loss of life and its impacts are largely non-structural. Therefore, this definition is not appropriate in this case. The previously stated definition for mitigation in this chapter is short- and long-term actions, programs, or policies implemented during and in advance of drought that reduce the degree of risk to human life, property, and productive capacity.

Mitigation needs to focus on a range of levels from micro to macro. Davies (2000, p10) has classified these levels as national, local government, community, and household. Wilhite (1997, p961) has documented mitigation actions employed by states in the United States through a survey conducted in the early 1990s. Certainly, the range of alternatives would be greater if this survey were duplicated today since much of the country has been in severe to extreme drought conditions since 1996. The activities identified were diverse, reflecting regional differences in impacts, legal and institutional constraints, and institutional arrangements associated with drought plans. These actions represent a full range of possible mitigative actions, from monitoring and assessment programs to the development of drought contingency plans. Some of the actions included were adopted by many states, while others may have been adopted only in a single case.

Many of the mitigative programs implemented by states in the US during recent droughts can be characterised as emergency or short-term actions taken to alleviate the crisis at hand, although these actions can be successful, especially if they are part of a preparedness or mitigation plan. Other activities, such as legislative actions, drought plan development, and the development of water conservation and other public awareness programs, are considered actions with a longer-term vision. As states gain more experience assessing and responding to drought, future actions will undoubtedly become more timely and effective and less reactive. Viewed collectively, the mitigative actions of states in response to recent drought conditions are numerous, but most individual state actions were quite narrow. In the future, state drought plans need to address a broader range of mitigative actions, including provisions for expanding the level of intergovernmental coordination. Table 1 is illustrative of the arsenal of mitigation programs and actions available to states.

Table1. Drought-related mitigative actions of state government in response to recent episodes of drought

<i>Category</i>	<i>Specific Action</i>
Assessment programs	<ul style="list-style-type: none"> <li>Developed criteria or triggers for drought-related actions</li> <li>Developed early warning system, monitoring program</li> <li>Conducted inventories of data availability</li> <li>Established new data collection networks</li> <li>Monitored vulnerable public water suppliers</li> </ul>
Legislation/public policy	<ul style="list-style-type: none"> <li>Prepared position papers for legislature on public policy issues</li> <li>Examined statutes governing water rights for possible modification during water shortages</li> <li>Passed legislation to protect instream flows</li> <li>Passed legislation providing guaranteed low-interest loans to farmers</li> <li>Imposed limits on urban development</li> </ul>
Water supply augmentation/development of new supplies	<ul style="list-style-type: none"> <li>Issued emergency permits for water use</li> <li>Provided pumps and pipes for distribution</li> <li>Proposed and implemented program to rehabilitate reservoirs to operate at design capacity</li> <li>Undertook water supply vulnerability assessments</li> <li>Inventoried self-supplied industrial water users for possible use of their supplies for emergency public water supplies</li> <li>Inventoried and reviewed reservoir operation plans</li> </ul>
Public awareness/education program	<ul style="list-style-type: none"> <li>Organised drought information meetings for the public and the media</li> <li>Implemented water conservation awareness programs</li> <li>Published and distributed pamphlets to individuals, businesses, and municipalities on water conservation techniques and agricultural drought management strategies</li> <li>Organised workshops on special drought-related topics</li> </ul>



<i>Category</i>	<i>Specific Action</i>
	<p>Prepared sample ordinances on water conservation for municipalities and domestic rural supplies</p> <p>Established drought information centre as a focal point for activities, information, and assistance</p>
Technical assistance on water conservation and other water-related activities	<p>Provided advice on potential new sources of water</p> <p>Evaluated water quantity and quality from new sources</p> <p>Advised water suppliers on assessing vulnerability of existing supply system</p> <p>Recommended that suppliers adopt water conservation measures</p>
Demand reduction/water conservation programs	<p>Established stronger economic incentives for private investment in water conservation</p> <p>Encouraged voluntary water conservation</p> <p>Improved water use and conveyance efficiencies</p> <p>Implemented water metering and leak detection programs</p>
Emergency response programs	<p>Established alert procedures for water quality problems</p> <p>Stockpiled supplies of pumps, pipes, water filters, and other equipment</p> <p>Established water hauling programs for livestock from reservoirs and other sources</p> <p>Compiled list of locations for livestock watering</p> <p>Established hay hotline</p> <p>Provided funds for improving water systems, developing new systems, and digging wells</p> <p>Provided funds for recovery programs for drought and other natural disasters</p> <p>Lowered well intakes on reservoirs for rural water supplies</p> <p>Extended boat ramps and docks in recreational areas</p> <p>Issued emergency surface water irrigation permits from state waters</p> <p>Created low-interest loan and aid program for agricultural sector</p> <p>Created a drought property tax credit program for farmers</p> <p>Established a tuition assistance program to enable farmers to enrol in farm management programs</p>
Water use conflict resolution	<p>Acted to resolve emerging water use conflicts</p> <p>Negotiated with irrigators to gain voluntary restrictions on irrigation in areas where domestic wells were likely to be affected</p> <p>Established a water banking program</p> <p>Clarified state law regarding sale of water</p> <p>Clarified state law on changes in water rights</p> <p>Suspended water use permits in watersheds with low water levels</p> <p>Investigated complaints of irrigation wells interfering with</p>

<i>Category</i>	<i>Specific Action</i>
	domestic wells
Drought contingency plans	Established state-wide contingency plans Recommended to water suppliers the development of drought plans Evaluated worst-case drought scenarios for possible further actions Established natural hazard mitigation council

## 6. Examples of international experience with drought policy and preparedness

### 6.1 THE UNITED STATES

In 1995 the Federal Emergency Management Agency estimated average annual losses because of drought in the United States to be US\$6-8 billion, more than for any other natural hazard (Federal Emergency Management Agency 1995, p2). Yet the United States has typically been ill-prepared to effectively deal with the consequences of drought. Historically, the approach to drought management has been to react to the impacts of drought by offering relief to affected areas. These emergency response programs can best be characterised as too little and too late. More importantly, drought relief does little if anything to reduce the vulnerability of the affected area to future drought events. Improving drought management will require a new paradigm, one that encourages preparedness and mitigation through the application of the principles of risk management.

There are several critical points to note about drought in the United States. First, drought occurs somewhere in the United States every year. On average, 14% of the nation is affected each year. Second, the percent area affected is highly variable from year to year, but drought years are often clustered, as in the 1930s, 1950s, late 1980s and early 1990s, and late 1990s and early 2000s. Third, the worst year on record in terms of percent area affected was 1934, when about 65% of the country was in severe to extreme drought. More recent severe drought episodes have generally been in the 40% range, as was the case in 2002. Finally, no trend in the area affected is noticeable. However, impacts associated with drought in the country have increased substantially in magnitude and complexity. The implication is that vulnerability to drought is increasing.

Since 1996 widespread and severe drought conditions have occurred throughout the United States and have raised serious concerns about continuing vulnerability to extended periods of drought-induced water shortages because of the complexity and magnitude of impacts. Many parts of the country have experienced several consecutive years of drought during this time period. At this writing, some western states (for example, Montana) are into their sixth consecutive year. Although it is not unusual for multiple drought years to occur in the drier western states, the occurrence of consecutive drought years in the east is unusual. For example, south-eastern states such

as Georgia, Florida, and South Carolina experienced from three to five consecutive drought years from the late 1990s to the early 2000s.

Most recently, drought conditions during the period 2000–03 affected large portions of the eastern and western states. Impacts on public water supplies, agriculture, forests, transportation, energy production, recreation and tourism, and the environment (for example, fisheries, soil erosion, incidence of forest and wild fires) have been substantial and have drawn considerable attention from elected officials and the media, providing additional fuel for the growing debate regarding the lack of a national drought policy and a co-ordinated response effort between federal, state, local, and tribal governments.

#### 6.1.1 *State-level Drought Planning*

There has been a remarkable increase in the number of states with drought plans during the past two decades. In 1982, only three states had drought plans in place. In early 2004, thirty-seven states had developed plans and four states were at various stages of plan development. The growth in the number of states with drought plans suggests an increased concern at that level about the potential impact of extended water shortages and an attempt to address those concerns through planning. The rapid adoption of drought plans by states is also a clear indication of their benefits.

Initially, drought plans largely focused on response efforts; today the trend in the United States is for states to place greater emphasis on mitigation as the fundamental element of a drought plan. An example of mitigation actions identified recently by the state of Georgia is shown in Table 2. Agriculture, municipal and industrial, and water quality, flora, and fauna sectors were used to classify these potential mitigation actions.

Initially, states were slow to develop drought plans because the planning process was unfamiliar. With the development of drought planning models (Wilhite 1991, p29; Wilhite, Hayes *et al* 2000, p697) and the availability of a greater number of drought plans for comparison, drought planning has become a less mysterious process for states. As states initiate the planning process, one of their first actions is to study the drought plans of other states to compare methodology and organisational structure.

Many US states have followed to a considerable degree the planning methodology outlined by Wilhite (1991, p29) and Wilhite, Hayes *et al* (2000, p697) in the development of a plan. Tribal and local governments have also used this methodology. At times, this methodology has been followed unknowingly as some states borrow the organisational structure from adjacent or other states that have employed this methodology.

With the tremendous advances in drought planning at the state level in recent years, it should come as no surprise that states have been extremely frustrated and dissatisfied with the lack of progress at the federal level. Early into the 1995–96 drought, the lack of leadership and coordination at the federal level quickly became obvious and continued with subsequent drought episodes. Recent initiatives toward development of a national drought policy are aimed at reducing or eliminating those frustrations.

Table2. Summary of selected pre-drought strategies included in the Georgia Drought Management Plan (Georgia Department of Natural Resources 2003, pp7-12)

<b>MUNICIPAL AND INDUSTRIAL</b>	<b>AGRICULTURE</b>	<b>WATER QUALITY, FLORA, AND FAUNA</b>
<i>State Actions</i>	<i>Farmer Irrigation Education</i>	<i>State Actions</i>
Formalise the Drought Response Committee as a means of expediting communications among state, local, and federal agencies and non-governmental entities	Recommend that farmers attend classes in best management practices (BMP) and conservation irrigation, before (i) receiving a permit, (ii) using a new irrigation system, or (iii) irrigating for a coming announced drought season	Encourage all responsible agencies to promote voluntary water conservation through a wide range of activities
Establish a drought communications system between the state and local governments and water systems	Provide continuing education opportunities for farmers	Monitor stream flow and precipitation at selected locations on critical streams
Review the local governments' and water supply providers' conservation and drought contingency plans	Develop electronic database for communicating with water use permit holders	Provide the stream flow and water-quality data in real time for use by drought managers and work with drought managers to optimise information delivery and use
Work with the golf course and turf industry to establish criteria for drought-tolerant golf courses	Encourage development and distribution of information on water efficient irrigation techniques	Evaluate the impact of water withdrawals on flow patterns, and the impact of wastewater discharges on water quality during drought
Encourage water re-use	<b><i>Field/Crop Type Management</i></b> Encourage the use of more drought resistant crops	Investigate indicators and develop tools to analyse drought impacts for waterways such as coastal ecosystems, thermal refuges such as the Flint River, and trout streams.
Provide water efficiency education for industry and business	Encourage the use of innovative cultivation techniques to reduce crop water use	Improve the agencies' capabilities and resources to monitor land-disturbing activities that might result in erosion and sedimentation

MUNICIPAL AND INDUSTRIAL	AGRICULTURE	WATER QUALITY, FLORA, AND FAUNA
		violations
Conduct voluntary water audits for businesses that use water for production of a product or service	Conduct crop irrigation efficiency studies	Identify funding mechanisms and develop rescue and reintroduction protocols for threatened and endangered species during extreme events
Identify vulnerable water dependent industries, fund research to help determine impacts and improve predictive capabilities	Provide farmers with normal year, real time irrigation, irrigation scheduling, and crop evaporation/transpiration information	Develop and execute an effort to identify pollutant load reduction opportunities by wastewater discharge permit holders
Develop criteria for a voluntary certification program for landscape professionals	Monitor soil moisture and provide real time data to farmers	Develop and execute an effort to identify opportunities for industry to decrease water use during drought periods
Develop and implement a state-wide water conservation program to encourage local and regional conservation measures	<b><i>Irrigation Equipment Management</i></b>	Evaluate the impact of water withdrawals on flow regimes and the impact of wastewater discharges on water quality during drought
	Encourage the installation of water efficient irrigation technology	
Develop and implement an incentive program to encourage more efficient use of existing water supplies	Retrofit older irrigation systems with newer and better irrigation technology. Update any system over 10 years old	Develop and promote implementation of sustainable lawn care programs based on selected BMPs and/or integrated pest management practices
<b><i>Local/Regional Actions</i></b> Develop and implement a drought management and conservation plan.	Encourage farmers to take advantage of available financial incentives for retrofitting and updating older or less efficient systems.	Encourage protection and restoration of vegetated stream buffers, including incentives for property owners to maintain buffers wider than the minimum required by state law.
Assess and classify drought vulnerability of individual water systems.	Recommend irrigation system efficiency audits every 5 to 7 years.	Provide for protection of recharge areas through measures including land purchase or acquisition of easements.
Define pre-determined	<b><i>Government Programs</i></b>	Encourage and explore

<b>MUNICIPAL AND INDUSTRIAL</b>	<b>AGRICULTURE</b>	<b>WATER QUALITY, FLORA, AND FAUNA</b>
drought responses, with outdoor watering restrictions being at least as restrictive as the state's minimum requirements.	Improve irrigation permit data to create a high degree of confidence in the information on ownership, location, system type, water source, pump capacity, and acres irrigated for all irrigation systems to determine which watersheds and aquifers will be strongly affected by agricultural water use, especially in droughts.	wild-land fire mitigation measures.
Establish a drought communications system from local governments and water supply systems to the public.	Improve on the agriculture irrigation water measurement and accounting state-wide.	Enhance programs to assist landowners and farmers with outdoor burning.
	Improve communications and cooperation among farmers and relevant state and federal agencies regarding available assistance during drought conditions.	
	Support legislation and efforts to enhance the ability of farmers to secure adequate water supplies during drought conditions.	
	Support legislation and efforts to enhance the ability of farmers to secure adequate water supplies during drought conditions.	

#### 6.1.2 National Drought Policy

Calls for action on drought policy and plan development in the United States date back to at least the late 1970s. The growing number of calls for action has resulted primarily from the inability of the federal government to adequately address the spiralling impacts associated with drought through the reactive, crisis management approach. This approach has relied on *ad hoc* interagency committees that are quickly disbanded following termination of the drought event. The lessons of these response efforts have quickly been forgotten and the failures of these efforts are subsequently repeated with the next event.

Several regional and national drought-related initiatives occurred as a result of widespread drought conditions in the United States during the period from 1996 to

1998. These initiatives led to the passing of the National Drought Policy Act of 1998, resulting in the formation of the National Drought Policy Commission (NDPC) to 'provide advice and recommendations on creation of an integrated, co-ordinated Federal policy designed to prepare for and respond to serious drought emergencies.' The NDPC's report, submitted to Congress and the president in May 2000, recommended that the United States establish a national drought policy emphasising preparedness (National Drought Policy Commission 2000, p6). The goals of this policy would be to:

1. Incorporate planning, implementation of plans and proactive mitigation measures, risk management, resource stewardship, environmental considerations, and public education as key elements of an effective national drought policy;
2. Improve collaboration among scientists and managers to enhance observation networks, monitoring, prediction, information delivery, and applied research and to foster public understanding of and preparedness for drought;
3. Develop and incorporate comprehensive insurance and financial strategies into drought preparedness plans;
4. Maintain a safety net of emergency relief that emphasises sound stewardship of natural resources and self-help; and
5. Co-ordinate drought programs and resources effectively, efficiently, and in a customer-oriented manner.

The legacy of the 1996 and subsequent droughts is not likely to be their impacts but rather the policy initiatives that occurred in the post-drought period (Wilhite 2001, p20). These initiatives appear to be changing the way droughts are viewed, and they may change the way droughts are managed in the United States. The real question at this point is whether these changes will result in permanent and substantive modifications in the way government entities deal with drought. The National Drought Preparedness Act of 2003 was introduced in the US Congress in July 2003. The goal of this bill is to develop a national drought policy that emphasises risk management through improved levels of monitoring, preparedness, and mitigation. This bill has strong support from the states and bipartisan support in Congress. Now, more than at any time in the history of drought management in the United States, the country is at a critical crossroads for drought policy. Will it continue down the road of crisis management or move toward risk management?

## 6.2 PROGRESS IN SUB-SAHARAN AFRICA

In sub-Saharan Africa, drought is a major threat to sustainable livelihoods, in particular in dryland areas of arid and semiarid regions (Glantz 1987, p43). Recent drought events have had serious economic, social, and environmental consequences and have resulted in land degradation, human migrations or relocations, famine, diseases, and loss of human life (UNDP/UNSO 2000, p3). In 1986, approximately 185 million people living in the dryland areas of Africa were at risk and 30 million were immediately threatened (Dinar and Keck 2000, p137). Drought has affected nearly all of the countries in western, eastern, and southern Africa in the past two decades, and in many cases on more than one occasion. These droughts have resulted in a recurring deficiency of food supplies and the need for interventions by governments and international donors to

alleviate food shortages to avert major losses of human life. For example, the 1991–92 drought in southern Africa resulted in a deficit of more than 6.7 million tonnes of cereal supplies, which affected more than 20 million people (Dinar and Keck 2000, p138). Past drought response programs have been reactive and have done little, if anything, to reduce the impacts of future droughts.

In 1997, a UNDP/UNSO project was initiated to assess the status of drought preparedness and mitigation activities in selected sub-Saharan African countries (UNDP/UNSO 2000, p3). Three main questions were addressed in this assessment. First, what is the status of drought preparedness (that is, institutional capacity) within each country? Second, what constraints exist with regard to policy and plan development? Third, what are the primary drought policy and planning needs? The conclusions summarised here are drawn from eleven of the most drought-prone southern African countries: Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe.

Common themes on the current status of drought preparedness and institutional capacity in sub-Saharan Africa included the following:

- There is no permanent government body to deal with drought issues;
- Drought response is often co-ordinated through natural disaster authorities;
- Drought relief is directed toward human relief, protection of key assets, and recovery;
- Post-drought evaluation of response is not usually undertaken;
- Formal drought plans are rare and mainly directed at response actions;
- Drought and famine early warning systems commonly co-exist;
- Vulnerability assessments often exist for sectors, groups, and areas at risk;
- Mitigation actions focus on economic diversification and poverty reduction;
- Drought management is increasingly viewed as part of the development process; and
- Drought policies are usually lacking.

Botswana and South Africa clearly stand apart from the other countries included in this assessment in terms of their experiences and current status of drought planning. Although Botswana does not have an identified drought policy and plan, it has had a long history with various types of drought programs. Drought preparedness planning is part of development planning and institutional structure is well defined, with local involvement at the district level. In South Africa, the National Consultative Drought Forum was established in 1992 and composed of representatives of government, church organisations, trade unions, and NGOs. The Forum led to a shift from an exclusive emphasis on commercial farmers to a more comprehensive program that includes rural farmers, rural poor, and farm workers. Policy changes included greater equity for recipients of assistance. Drought policies have increasingly focused on improving levels of self-reliance, reducing risk in the agricultural sector, and stabilising income. The National Drought Management Committee was established in 1995 with similar structures at the provincial and local levels of government. The primary objectives of this committee were to develop national disaster management policy, propose and



review new legislation, promote community participation in disaster management, promote the establishment of an integrated disaster information system, and ensure risk reduction at the national level. In 2002 the South African government was looking at additional drought policy revisions (Monnik 2000, p48).

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

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

- Poor quality of meteorological networks
- Minimal understanding of drought impacts
- Lack of institutional capacity
- Low level of involvement by NGOs in drought management
- Lack of understanding of household vulnerability
- Inadequate financial resources for drought management and human resources development
- Need for expanded extension services
- Inequitable access to land
- Limited coordination between government agencies
- Reduced response/mitigation capability due to lack of drought policy and plan

Future drought policy and planning needs were also identified in the country reports. Many of these needs are aimed at addressing the constraints referred to previously. In many countries it was reported that recommendations on drought policies and specific mitigation actions had been made in government reports or as a result of workshops focused on future drought planning and response needs. In many cases, however, these recommendations have not been implemented. For example, Namibia has developed a series of drought policy recommendations based on the elements of the ten-step drought planning process developed by Wilhite (Wilhite 1991, p29; Wilhite, Hayes *et al* 2000, p697). The goal of the Namibian policy is to develop an efficient, equitable, and sustainable approach to drought management that shifts responsibility from government to the farmer. The tenets of that policy are to (1) ensure household food security is not compromised by drought; (2) encourage and help farmers adopt a self-reliant approach to drought risk; (3) preserve reproductive capacity of the national livestock herd during

drought; (4) ensure a continuous supply of potable water to communities and livestock; (5) prevent degradation of the natural resource base; (6) enable rural inhabitants and the agricultural sector to recover quickly following drought; (7) ensure the health status of all Namibians; and (8) finance drought relief programs efficiently by establishing an independent and permanent national drought fund.

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

As expected, there is a wide range of institutional capacity to respond to drought emergencies in southern Africa. Although some countries have an organisational structure in place to co-ordinate the actions of government at various levels, as well as those of donors and nongovernmental organisations, most have not developed a permanent institutional capacity. One of the common problems with drought and other natural hazards is maintaining interest in planning beyond the relatively short window of opportunity that follows the event, given the on-again, off-again nature of drought. Interest in drought planning quickly wanes in the post-drought period when precipitation conditions have returned to normal or above-normal levels. The challenge is to break this cycle by developing and implementing comprehensive drought preparedness plans that emphasise risk management.

### 6.3 AUSTRALIA

As outlined in earlier chapters, Australia officially adopted a risk management approach to drought in 1992. This policy included many of the characteristics outlined above with its focus on increased research and development on climate patterns, an emphasis on self-reliance by agricultural producers and the intention to move away from *ad hoc* responses to drought. As illustrated elsewhere in this volume the implementation of the National Drought Policy has not always met its objectives; however, it is a step in the right direction. It also highlights the difficulties governments can face in implementing a preparedness approach to drought, even in comparatively wealthy countries in which drought is a recurring phenomenon.

## 7. Global drought preparedness network

Because of increasing concern over the escalating impacts of drought and society's inability to effectively respond to these events in the past, developing and developed countries are now placing greater emphasis on the development of national policies and plans that stress the principles of risk management. Global initiatives, such as the UN Convention to Combat Desertification (UNCCD), are emphasising the importance of

improving drought early warning systems and seasonal climate forecasts and developing drought preparedness plans.

The National Drought Mitigation Center at the University of Nebraska at Lincoln is working in partnership with the United Nations Secretariat of the International Strategy for Natural Disaster Reduction and other organisations to develop a network of regional networks on drought preparedness and then to link these networks into a Global Drought Preparedness Network (GPDN). Working in cooperation with the UN's Secretariat for the International Strategy for Disaster Reduction, the goal is to promote the concepts of drought preparedness and mitigation in order to build greater institutional capacity to cope with future episodes of drought (ISDR Drought Discussion Group 2003, pp10-12). The GPDN could provide the opportunity for nations and regions to share experiences and lessons learned (successes and failures) through a virtual network of regional networks—for example, information on drought policies, emergency response measures, mitigation actions, planning methodologies, stakeholder involvement, early warning systems, automated meteorological networks, the use of climate indices for assessment and triggers for mitigation and response, impact assessment methodologies, demand reduction/water supply augmentation programs and technologies, and procedures for addressing environmental conflicts.

## **8. Conclusion**

As this book has argued for Australia, there is a need internationally to build awareness of drought as a normal part of climate. It is often considered to be a rare and random event—thus the lack of emphasis on preparedness and mitigation. Improved understanding of the different types of drought and the need for multiple definitions and climatic/water supply indicators that are appropriate to various sectors, applications, and regions is a critical part of this awareness-building process.

A second challenge is to erase misunderstandings about drought and society's capacity to mitigate its effects. 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 originates from a deficiency of precipitation over an extended period of time. 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 risk to society. 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 resource management), technological changes, social behaviour, and trends in environmental awareness and concerns. It is obvious that well-conceived

policies, preparedness plans, and mitigation programs can greatly reduce societal vulnerability and therefore the risks associated with drought.

A fourth challenge is to convince policy and other decision makers that investments in mitigation are more cost effective than post-impact assistance or relief programs. Evidence from around the world, although sketchy, illustrates that there is an escalating trend of losses associated with drought in both developing and developed countries. Also, the complexity of impacts is increasing. It seems clear that investments in preparedness and mitigation will pay large dividends in reducing the impacts of drought. A growing number of countries are realising the potential advantages of drought planning. Governments are formulating policies and plans that address many of the deficiencies noted from previous response 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 cultures and reflected in our institutions. Movement from crisis to risk management will certainly require a paradigm shift. 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 unsustainable use of natural resources. Many governments have now come to realise that drought response in the form of emergency assistance programs only reinforces poor or unsustainable actions and decreases self-reliance.

Internationally, progress in drought preparedness is accelerating as knowledge of drought planning tools becomes more widely known and drought impacts increase in magnitude and complexity. Many regional efforts are underway to provide greater emphasis on drought policies and plans. Recent international and regional drought conferences and workshops are good examples of this growing momentum. As nations continue to build institutional capacity to cope with drought, it is imperative that these lessons learned are shared with others. Working individually, many nations and regions will be unable to improve drought coping capacity. Collectively, working through global and regional partnerships, we can achieve the goal of reducing the magnitude of economic, environmental, and social impacts associated with drought in the twenty-first century.