A NATURAL HAZARDS APPROACH TO DROUGHT ASSESSMENT AND PLANNING IN THE CHATTAHOOCHEE RIVER BASIN

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INTRODUCTION

One effect the experience of the numerous drought events from 1980 to 1990 has had on the area of the Chattahoochee River Basin is to create awareness among states in the southeast for the need to develop strategies and planning to prepare for future climate variability. This paper outlines a natural hazards approach for analysis of climate change impacts and adjustments in order to improve the efforts in Alabama towards building a drought contingency planning process. Ideally, facilitating drought management efforts will also serve the broader agenda of the three states - Alabama, Georgia and Florida - to develop a comprehensive planning and management system for the Apalachicola, Chattahoochee and Flint (ACF) River Basin.

BACKGROUND

Prior to the series of drought events during the 1980s, there was no pressure on Alabama's state planners to develop policies and a state-wide water management system to deal with climate change and water resource variability. Adjustments to the ten years of drought have been undocumented and unavailable for federal, state and local water resource decision-makers involved in plan-making and management for climate change. State governments in the southeast with the guidance of The U.S. Army Corps of Engineers are just beginning to tackle the formidable planning process that would effectively provide for droughts as an important element of comprehensive water management in the future.

Most of the responses to date have suffered because of the lack of knowledge of how users and institutions are often affected differently, act in an uncoordinated fashion and sometimes are unable to adequately withstand the stresses brought on by repeated drought conditions. By the end of the decade and due to the experience of events in 1980, 1983, 1986 and 1988 some agencies were acutely aware that previously established operational procedures under the existing water management process for the southeast's Chattahoochee River Basin were inadequate to appropriately respond to severe drought conditions (U.S. Army Corps of Engineers, 1990 and Perritt, 1991).

The perceptions of officials during drought episodes in Alabama and Georgia have ranged from cornucopian optimism to emphasizing the social causes and blaming the droughts for the worst economic disaster in history especially for agriculture. The State of Alabama in preparing its first statewide environmental protection plan affirmed that "Alabama has been blessed with valuable water resources, both ground and surface" and although Alabama is considered a "water abundant" state there can be areas where heavy demands are posing serious problems (Alabama Environmental Planning Council, 1989). Some reports denied that the simple lack of "normal" rainfall could provoke serious disruptions in water dependent systems such as agriculture, drinking supplies, navigation, recreation, and environmental quality. Such disruptions and consequences for water users and resource operators were treated as inadequacies in the underlying social and institutional systems that failed to contend with such problems as part of the larger failed water resource management system itself. The Alabama Water Resources Study Commission reported in 1990 that "the droughts of 1986 and 1988 focused attention on the lack of water....however, the problems experienced were basic problems that were merely accentuated by the droughts."

In 1980, Georgia's Senator Talmadge acted out of concern over the federal government's gross underestimation of the effects on Georgia's agricultural economy. He arranged for a U.S. Senate hearing the same year- "to let the nation know that Georgia farmers face the worst economic times since the Great Depression. While skyrocketing costs of production are a factor, the current drought is the primary reason for this current depressed and critical situation" (U.S. Government Printing Office, 1980). Not satisfied with the then U.S. Secretary of Agriculture's appraisal that the 1980 drought impact from a national perspective was relatively modest, Senator Talmadge began to push for major legislative changes in 1981 to aid drought-stricken farmers in the southeast including a comprehensive crop insurance bill.

The end of the period 1988-1990 marked not quite the worst drought record for the United States (the period 1934-36 was drier), nor can the experience be classified as the classic natural disaster which provoked the emergency crisis legislation of Georgia and Senator Talmadge. Rather, in the

southeast and the rest of the United States, it was a mixture of cumulative and catastrophic events that interacted with social vulnerabilities, economic markets and coupled with the lack of drought planning caused loss and hardships across the U.S. including Alabama and Georgia.

There have been mixed results in the efforts by agencies to adopt permanent policies and implement drought contingency planning. Following the 1987-1989 drought, the awareness of the need for a drought planning process gathered force among federal, state, and municipal governments. Some states like Alabama reacted the strongest during the worst drought consequences occurring in 1986 and 1988. The State organized a task force committee structure to recommend actions during the same period but none of these efforts evolved into a permanent planning body or set of policies for drought management. Chatelain (1990) summarizes the experience on the whole for the southeast indicating that there has been little or no institutional change, anticipatory planning and development of water control devices as a result of the peak crisis years of the 1980s.

A NATURAL HAZARDS APPROACH

Social science studies of drought and assessments of drought impacts have their origins in research efforts dealing with natural hazards (Burton, Kates, and White 1978). Natural hazards may be broadly defined as a threat to humans and what they value - life, well-being, material goods, and environment, (Hohenemser, Kasperson, and Kates 1985).

In order to aid policy makers, the hazards approach has developed classification schemes of responses. Typically, such classifications describe the management aspects attributed to different forms of adjustments and suggest ways they can fit into drought contingency plans.

Anticipatory.

Managers and planners often conceive of anticipating critical changes to the system by making adjustments in advance of likely impacts, presumably because they are convinced that the potential of change could threaten the future integrity of the system. A common anticipatory adjustment is over-sizing in anticipation of increased future demand of water resources. Riebsame (1991) points out that apparent precautions taken in advance of climatic changes can sometimes be only a form of "stability bias" based on the perception planners can have of overestimating the past regularity or continuity of ecosystems including water. If this bias towards designing for stability permeates, it can be less than adequate for the basis of sound anticipatory drought planning. Some types of adjustments must be made in advance, while others might be "on call."

Reactive.

After impacts, shortages, or failures occur, decision makers assess the situation and may act accordingly. Some adjustments, such as maintaining reservoirs at lower or higher levels during floods or droughts are relatively quick measures to enact.

Incremental.

These are often considered as the minor adjustments that can be made in anticipation or response, but involve little investment of system change. Changing the elevation of water in-takes might be considered incremental adjustments.

Drought related.

In order to refine general forms of adjustments for purposes of drought and water resource management, further description is required relating anticipatory, reactive, and incremental to drought management. Grigg and Vlachos (1990) developed a management response framework that captures many types of responses evolving out of the drought experience in the United States in the 1980s. The system categorized these responses according to their overall goal: supply augmentation, demand reduction, and impact minimization. For example, under the category of impact minimization they identify such strategies as: crop insurance; spread of risk; minimization of risk through irrigation technology; compensation for damages; application of disaster relief; changes in water uses; initiating interstate drought contingency actions; and conflict management.

Preliminary findings of an Auburn University project initiated in 1993 to assess adjustments by farm and other water managers indicates that many of these same responses have been applied in the Chattahoochee Basin, especially the spread of crop insurance, reliance on disaster relief measures, the growth of irrigation use in the southeast, and the likely development of interstate action to coordinate drought contingency planning.

Theoretical contributions.

One of the key issues of assessing hazards is to determine the sensitivity of institutions and resource users to climate stress. Do they only endure or can experiencing extreme periods of climate change create useful adaptations on the part of managers? Following the hazard research paradigm, people's perceptions, choice of actions and final adjustments to public policy making can be linked.

Gilbert White's flood hazard research offers a useful model for linking information on people's perceptions, choice of actions and final adjustments to public policy-making. His principal finding in a series of research reports examining flood hazard adjustments at a number of sites across the United States created wide interest and unexpected results for public officials and water planners. Basically, after government programs had invested more than $5 billion dollars in flood control projects, White found that damages to people and property had been steadily increasing. He posed a series of questions based on this research which were later developed into a general model for hazards research (Burton,

Kates, and White, 1978). White was critical of water policies and development that narrowed the range of choices considered, often ignoring the very adjustments of on-the-ground users which he argued are a source of preventive or adaptive responses to extreme events. He asked what are the broad range of responses to be considered as alternative measures for drought and economic impact? What would be the efficiency and equity of different approaches at national, regional and local scales? His model (Burton, Kates, and White, 1978) identified five basic objectives for hazards planning: 1. Characterize the nature and extent of human activities in areas subject to extreme events in nature; 2. Determine the range of possible adjustments by people and institutions to these events; 3. Examine how different groups perceive the extreme events and react to hazardous conditions; 4. Examine the process of choice and identify damage-reducing adjustments, include both individual and structural factors influencing choices and meaningful adjustments; 5. Estimate what would be the effects of varying public policy upon that set of responses.

Following this paradigm, the tendency has been to develop a social adjustments - drought impacts assessment process to begin to identify crucial linkages between key activities, for instance agriculture, where and when these activities are affected by changes in climate and finally assess the likely impacts on agricultural activities that occur as a result of certain climatic fluctuations. One approach is to examine a base-line or real scenario under the conditions of a simulated climate change in order to analyze how current water resource practices might be altered under various conditions of climate variability. Rosenburg and Crosson (1991) selected a scenario of climate change drawing on the decade of the 1930s to project how drought conditions impact might impact on existing agricultural practices and plans for regional development in the central US MINK region of Missouri, Iowa, Nebraska, and Kansas. Parry (1988) calls predicting the areas and types of impacts (usually first order impacts) on the basis of an understanding of the interactions between agriculture and weather, and then proceed to test these predictions against historic reality.

A second strategy examines how key user groups actually responded to the drought, and how the existence or the lack of technologies, political institutions and economic mechanisms enhanced or constrained the efficacy of drought management reactions. Many drought researchers stress the importance of conducting real case assessments of historic drought events, impacts and adjustments in order to build reliable policy responses. Easterling and Riebsame (1987) emphasize that the lessons from our recent past dealing with drought will give the most insight into how to prepare for managing the impacts of current and near-future drought.

Identifying impacts and linkages to drought adjustments requires a comprehensive approach of assessing different scales and organization of management units that are affected by climate variability. For instance, this approach requires analysis of responses by local farm water resource managers on up to higher scales of the institutional ladder including an analysis of state, regional, and national water and other resource programs, plans and policies. Parry (1988) points out the need to consider similar impacts that may occur as a result of quite different factors. For example, adjustments in agriculture may occur from changes in farming objectives (such as levels of expectation or tolerance to absorb loss), changes in the external economic market and political environment supporting agriculture and changes in the natural resource base (such as climatic change or soil erosion). These three groups of factors are interconnected and vary across agricultural regions and display differences in light of state or local politics. The objective of drought adjustments research is to disentangle them and identify the multiple human agents and institutional factors involved, clarify their influence and specify with some confidence, the effects of climatic change and variability on water resource and drought contingency planning.

Agricultural drought adjustments in southeast Alabama.

At the beginning of 1993, a group of geographers and agricultural economists at Auburn University began implementation of a drought assessment research project combining a hazards approach with a more conventional benefits/costs method to evaluate drought impacts and adjustments over the last decade in the Chattahoochee and Choctawahatchee Basins of Alabama. In order to assess adjustments and examine the " lessening Hypothesis" within the context of the record of drought adjustments in Alabama, the project applies a variety of methods including: surveys of users and key management institutions, interviews with policy makers, analysis of climate and other secondary data, use of GIS generated data banks and computerized mapping techniques.

The basic objectives of the project are: a) identify the water resource management system and drought impacts on the local agricultural system in the Chattahoochee - Choctawhatchee (Pea) River Basins of Alabama and create a geographic data base; b) identify and analyze responses by agricultural water managers, especially irrigation practices, and determine which adjustments were effective in ameliorating the impacts of drought and; c) recommend more efficient water management strategies and structures for Alabama to improve farmer and non-farmer capabilities to withstand drought and to increase benefits received from the use of water.

In a fashion similar to the hazards research paradigm first developed by geographers (Burton, Kates, White 1978), the project seeks to answer basic questions pertaining to drought in Alabama and the Chattahoochee Basin: "What negative impacts did the drought cause; which sectors or activities accrued losses and hardships; how did they respond and; how did these responses attenuate impacts in ways that

aid in planning for future events?" The results of the study will act as a guide to public systems for developing more effective water resource management while focusing specifically on ways to improve drought contingency planning.

SUMMARY

The past decade of drought events occurring in many parts of the United States provoked substantial impacts in virtually all sectors of the government and among private water resource users. Agricultural losses in the Southeast alone were estimated to be 2.5 billion dollars (Chatelain 1990). Despite concerted efforts and significant accomplishments in water resource development, crop breeding, and other improvements in climate sensitive technologies, recent droughts demonstrated that the simple lack of "normal" rainfall still provokes serious disruptions in agriculture, water supply, transportation,environmental quality and other areas.

Several important aspects emerge from the national experience which pertain to the events in the Southeast regarding the initial reactions to the droughts during the 1980s. Weather forecasting officials and natural resource and agricultural managers were slow to recognize the cumulative effects of events. Information on the drought's development and likely impacts was not disseminated and inserted into decision-making in a timely fashion. Managers often did not know how vulnerable their systems were to drought, where the critical impact areas were located, what kind of impacts to expect, or the full range of options available for adjusting their activities. The drought did evoke some successful responses, and experience from the past was effectively applied in some cases.

Indeed, one of the objectives of the Auburn University drought assessment will be to identify effective adjustments in the Chattahoochee region of Alabama during the past decade which will pave the way towards improved drought management in the future and reduction of overall climate vulnerability. Consideration of the "lessening hypothesis" in the case of Alabama's experience poses a difficult question. Responses on the state level have been piecemeal and largely uncoordinated and subject to a cycle of " go and then come to grinding halt" regarding the interests and actions of the state political process. Most of the adjustments surveyed so far reveal much adaptation at the local level to cope with climatic and water availability which has been maintained primarily by creatively tapping into federal programs such as crop insurance as a means of reducing the impacts experienced during the decade of droughts.

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