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**Science Document: Best Practices on National Drought Management Policy**

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## Science Document: Best Practices on National Drought Management Policy

### Introduction

As a beginning point in the discussion of drought management policy, it is important to identify the various types of drought policies that are available and have been utilized for drought management. The most common approach, and the one most often followed by both developing and developed nations, is post-impact government (or nongovernment) interventions. These interventions are normally relief measures in the form of emergency assistance programs aimed at providing money or other specific types of assistance (e.g., livestock feed, water, food) to the victims (or those experiencing the most severe impacts) of the drought. This reactive approach is seriously flawed from the perspective of vulnerability reduction since the recipients of this assistance are not expected to change behaviors or resource management practices as a condition of the assistance. For example, livestock producers that do not maintain adequate on-farm storage of feed for livestock as a drought management strategy will be those that first experience the impacts of extended precipitation shortfalls. These producers will be the first that turn to the government or other organizations for assistance in order to maintain herds until the drought is over and feedstocks return to adequate levels. This reliance on the government for relief is contrary to the philosophy of encouraging self-reliance through investments in creating improved coping capacity. Government assistance or incentives that encourage these investments would be a philosophical change in how governments respond and would promote a change in the expectations of livestock producers as to the role of government in these response efforts. The more traditional approach of providing relief is also flawed in terms of the timing of assistance being provided. It often takes weeks or months for assistance to be received, at times well beyond the window of when the relief would be of greatest value in addressing the impacts of drought.

A second type of drought policy approach is the development of pre-impact government programs that are intended to reduce vulnerability and impacts. In the natural hazards field, these types of programs or measures are commonly referred to as mitigation measures. Mitigation in the context of natural hazards is different from mitigation in the context of climate change, where the focus is on reducing greenhouse gas (GHG) emissions. These types of measures are numerous but appear to be less obvious to many when associated with drought since impacts are generally non-structural. These measures would include establishing comprehensive early warning systems; improving seasonal forecasts; increasing emphasis on water conservation (demand reduction); increasing or augmenting water supplies through measures such as the greater utilization of ground water resources, constructing reservoirs, interconnecting water supplies between neighboring communities; drought planning; and awareness building; and education. Insurance programs, currently available in many countries, would also fall into this category of policy types.

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

What is proposed as part of a national drought management policy is to emphasize the development and implementation of pre-impact government programs and preparedness plans and policies that are directed towards drought risk reduction. The lists of best practices that follow are examples of measures that should be considered as part of framing a national drought policy for each drought-prone nation.

## **A Compendium of Best Practices for National Drought Management Policy**

The key elements in a national drought management policy fall under the following areas:

- a) Promoting standard approaches to vulnerability and impact assessment
- b) Implementing effective drought monitoring and early warning systems
- c) Enhancing preparedness and mitigation actions
- d) Implementing emergency response and recovery measures that reinforce national drought management policy goals
- e) Understanding the cost of inaction

Following are the proposed elements in each of the five areas:

### **Promoting standard approaches to Vulnerability and Impact Assessment**

- 1) Understand the natural processes and human activities that contribute to vulnerability and community resilience and how these will be integrated to inform risk reduction and management.
  - a) Address the gaps in knowledge, methodologies and types of information that are preventing the effective application of these methodologies. A key goal is the enablement of affected populations.
  - b) Work with communities (broadly defined) facing hazards to manage their own environments more responsibly and equitably over the long term by joining in a global structure that supports informed, responsible, systematic actions to improve local conditions in vulnerable regions.
  - c) Encourage governments, departments and institutions, both public and private, to support, provide incentives, coordinate data collection and dissemination, provide decision support, and legitimize successful approaches to increasing capacity and action
- 2) Characterize and integrate drought-related impacts, vulnerability and risk information for the purpose of identifying proactive mitigation actions and measures.
- 3) Record drought impacts on and conduct risk assessments for vulnerable economic sectors, including but not limited to:
  - a) Rain-fed agricultural production
    - i. *Impact(s)*: Reduced or no yields; increases in extreme events and accelerating trends on the productivity of rainfed agriculture
    - ii. *Potential mitigations*: Imports (short term); choosing to sow different crops or do not sow at all (short term); application of improved agronomic practices (i.e. no tillage)
  - b) Irrigated agricultural production
    - i. *Impact(s)*: Reduced yields; vulnerability of water resources; reduced water quantity; water quality
    - ii. *Potential mitigations*: Water rationing; water allocation review; sowing dryland crops; introduction of water banks for temporary transfer of water rights
  - c) Livestock production
    - i. *Impacts*: Weight loss; mortality; destocking; increase in incidence of diseases; lower fertility and reproduction rates
    - ii. *Potential mitigations*: Destocking; feed distribution; cattle parking/relocation of herds; nomadic migration; use of special reserved areas (stockroutes and stock reserves)

- d) Water
  - i. Impacts:* degraded water quality (salinity, BOD/COD); surface water shortages; overdrawing and depletion of groundwater; increased competition and conflict over water
  - ii. Potential mitigations:* *Ex ante* identification of supplemental and alternative sources of water; use of reserve sources of groundwater; technical optimization of water resources; water laws and rules for special circumstances dry-year options (sale, expropriation, restrictions) using critical drought thresholds; development of critical thresholds; prediction of future water use to determine zoning, realization of water reservoirs or farm ponds; interconnection of urban or rural water supply systems; establish a water security plan for all rural and urban areas with respect to climate change
- e) Environment
  - i. Impacts:* Ecosystem degradation; loss of biodiversity; species migration and extinction; landscape change and wind erosion; increased risk of wildfires; fisheries impacts
  - ii. Potential mitigations:* maintenance of environmental flows
- f) Transportation
  - i. Impacts:* Reduced transportation and navigation on rivers and lakes
  - ii. Potential mitigations:* Preparation of alternate transportation plans using rail and road ways
- g) Health
  - i. Impacts:* Morbidity and mortality increases; increased incidence of suicides; incidence of wind-, dust- and vector-borne diseases and respiratory illnesses; degradation of sanitation; decreasing levels of nutrition, depression, trauma and suicide; increased use and dependence on drugs and alcohol
  - ii. Potential mitigations:* Food supplements; stockpiling food; more robust social safety nets; improved access to mental and physical health care; access to counseling services
- h) Tourism and recreation
  - i. Impact(s):* Loss of recreation areas, decline of tourism revenue; reduction in taxes collected
  - ii. Potential mitigations:* Improved management of water reservoirs; reallocation of water supplies between user sectors
- i) Energy
  - i. Impacts:* Decreased hydropower production; brownouts and blackouts; increased demand; destruction of transmission lines
  - ii. Potential mitigations:* Energy restrictions; improvements in efficiency; alternative energy supplies; diversification of energy sources
- j) Society
  - i. Impacts:* Migration and loss of community; decreased marriage rates; increased divorce rates; increased incidence of suicides; increased conflicts; loss of assets and reduced property values; increased theft and crime; impacts on traditional cultures and practices; gender inequality; migration of population of farm/rural areas to urban areas
  - ii. Potential mitigations:* Social protection and cash-transfer programmes; diversification of rural livelihoods; employment programmes and schemes; provision of counseling services
- k) Education
  - i. Impacts:* School dropout rates (short-term); lower school enrollment (longer term)
  - ii. Potential mitigations:* Targeted social protection (e.g., Bolsa Familiar); mid-day meal schemes to prevent school dropouts
- l) Cost of emergency response programs

- i. Impacts:* Amount spent on relief and response
  - ii. Potential mitigations:* Insurance schemes, better targeting of response programs; improved monitoring of impact sectors to identify when measures should be implemented to mitigate impacts
- m) Secondary and tertiary impacts on economic productivity
  - i. Impacts:* Loss of income and productivity; opportunity costs; higher personal debt levels
  - ii. Potential Mitigation:* Employment guarantee schemes and loan waivers
- 4) Elicit key stakeholders for information on the key issues and their needs for seasonal and longer climate information.
- 5) Assess socio-economic and management characteristics, capacity-mapping and trends in the countries/communities of concern, and include standards for data collection.
- 6) Develop risk assessments and profiles showing physical, social, economic and environmental pressures on a community from global, regional, and local scales, i.e., to determine who and what is at risk and why.
- 7) Understand effective decision-making in the context of drought risk management – what it is and how it can be improved.
  - a) Conduct research on decision making and risk perceptions and on implementation of risk management and mitigation programs;
  - b) Include critical actors at each jurisdictional level; the actors' risk assumptions; their needs for different types of information; and the design of an information infrastructure that would support their decisions at critical entry points.
- 8) Conduct risk profiles prior to the onset of droughts, and capture drought impacts on vulnerable populations. Risk profiles should consider vulnerable groups, including but not limited to:
  - a) women;
  - b) children;
  - c) the elderly;
  - d) invalid, infirm and sick;
  - e) the landless;
  - f) farmers;
  - g) pastoralists;
  - h) marginalized communities; and
  - i) indigenous communities and populations
- 9) Develop, test and improve methodologies and measure progress in reducing vulnerability and enhancing community capacity, e.g., drought risk management, cost-effectiveness of methodologies and analyses, and societal impacts of catastrophic events.
- 10) Strengthen cross-sectorial coordination of the assessment of drought vulnerability and impacts and partnerships among state, academia and the private sector for conducting impacts assessments.
  - a) Assess impediments and opportunities to the flow of information including issues of credibility, legitimacy, compatibility (appropriate scale, content, match with existing practice) and acceptability.
  - b) Develop and test common drought risk reduction practices, coordinating information flow from different organizations into easily understandable language for all affected communities in countries and communities at risk.

- 11) Develop and mainstream effectiveness of impact assessments on Early Warning Information Systems that include warning of potential impacts on livelihoods.
- 12) Enable affected populations through support from governments and institutions, provision of incentives, and legitimization of successful approaches to increasing capacity and action at the local level.
- 13) Identify and assess vulnerable people and communities. Factors to consider, but are not limited to:
  - a) Gender
  - b) Age
  - c) Ethnicity
  - d) Political status
  - e) Dependency on agriculture
  - f) Level of wealth/poverty and human development
  - g) Status of education
  - h) Access to natural assets
  - i) Access to alternative supplies of water and fodder
  - j) Access to markets
  - k) Baseline health
  - l) Livelihood and employment options, and access to alternative or supplemental employment
  - m) Social networks and level of isolation
  - n) Access to infrastructure
  - o) Underlying climate variability
  - p) Exposure to previous droughts, floods and other hazards
- 14) Develop criteria to weigh the importance drought impacts and vulnerability factors, and to identify high-leverage mitigation actions.
- 15) Develop mitigation actions at multiple time scales to enable the implementation of appropriate mitigation actions during drought onset and termination.
  - a) Use drought impact records to develop probabilistic drought-risk assessments and facilitate proactive planning and drought risk management;
  - b) Consider the ability of farmers to receive and use information.
- 16) Systematically monitor and record local drought impacts in real time in association with drought early warning systems and this information is available in a timely fashion to local communities.
- 17) Develop common methodologies and terminology to assess drought vulnerability to facilitate the assessment of drought risk at multiple spatial scales and across political borders.

### **Implementing Effective Drought Monitoring and Early Warning Systems**

- 18) Identify and evaluate existing comprehensive, integrated drought monitoring systems which couple multiple climate, water, soil and crop parameters, socio-economic and environmental indicators and indices to fully characterize the magnitude, spatial extent, trends, duration, and potential impacts of droughts.

- a) Establish and support a comprehensive and effective integrated drought monitoring system at the national level;
  - b) Ensure that relevant parameters for climate, water, crop, and soil and the indicators and indices for socio-economic and environmental parameters are collected and made available through the system;
  - c) Place more emphasis on supporting research to characterize the magnitude, spatial extent and trends, duration and potential impact of droughts on social, environmental and economic aspects of the region/country;
  - d) Use an appropriate classification system on different types of droughts, i.e., meteorological, agricultural, hydrological, and socio-economic droughts, while communicating information on droughts on a routine basis;
  - e) Develop effective delivery systems for the dissemination of information to the user community for improved decision making.
- 19) Assess the adequacy of networks, in particular, meteorological, hydrological and ecological networks for drought monitoring and data quality.
- a) Ensure that an adequate and coordinated network of meteorological, hydrological and ecological stations is established in the country to provide good spatial characterization of droughts;
  - b) Ensure that the meteorological, hydrological and ecological stations have the necessary instruments in good working condition to provide relevant data.
  - c) Take full advantage of the advances in instrumentation technology such as Data Collection Platforms (DCPs), automatic weather stations, telemetry, hydroprobes in automating the data collection;
  - d) Use gridded products to compensate for gaps in station networks in order to create time series of climate monitoring products;
  - e) Encourage the wider availability and use of remote sensing data and products and provide training on the proper interpretation of these products for natural resource managers and policy makers;
  - f) Implement effective data management and data quality control systems including proxy data consistent with WMO quality control procedures;
  - g) Ensure the long-term sustainability of meteorological, hydrological and ecological networks in order to provide the user community relevant information on a regular basis.
  - h) Assess the needs of the user community in terms of specific information needs for time sensitive decisions.
- 20) Examine current arrangements and procedures for coordinating the collection and analysis of meteorological, hydrological, and ecological data and eliminate fragmentation between many agencies and ministries at the different administrative levels.
- a) Encourage close collaboration among meteorological, hydrological, ecological and other relevant agencies in the collection of comprehensive drought data;
  - b) Develop standard protocols for data collection and analysis;
  - c) Establish a centralized authority for the analysis and quality control of meteorological, hydrological and ecological data to generate integrated products related to droughts;
  - d) Determine the most user-friendly format of the integrated data for easier access and use by both researchers and practitioners.
- 21) Evaluate existing procedures for data sharing and their applications of drought monitoring, preparedness, mitigation and response.
- a) Review existing data sharing practices and procedures;

- b) Encourage regular interaction between all relevant agencies and institutions at the local, national, and regional levels in developing appropriate specific drought products for application in all sectors affected by droughts.
  - c) Adopt agreed upon standards for sharing of data and products with all sectors concerned with the impacts of droughts;
  - d) Promote a policy of free, open and unrestricted exchange of data, information and products with all interested agencies and institutions in the public and private sectors;
  - e) Establish a rigorous monitoring system to ensure that data, information and products are shared freely between institutions and agencies in a timely manner.
- 22) Assess the availability of early warning and decision-support tools and methodologies in support of drought preparedness planning and policy development.
- a) Undertake a comprehensive assessment of drought risks; identify potential threats and establish the degree of vulnerability of local populations and economic sectors to droughts and how these vulnerabilities vary by region within a country;
  - b) Evaluate the existing capabilities in the country for early warning of droughts, identify the gaps and take appropriate steps to develop and strengthen the national capabilities to provide effective drought early warnings;
  - c) Evaluate existing decision-support tools in close collaboration with the user community in different sectors which are impacted by droughts and improve these tools by taking advantage of current advances to provide better and more timely information for decision making;
  - d) Promote multidisciplinary collaboration among meteorologists, hydrologists, soil scientists, ecologists, agronomists, the social/behavioral sciences, health care system and others in the collection of data including meta-data and generation of drought products for the user community.
  - e) Consider the capability of the users and policy makers to disseminate the drought indices used and their applicability;
- 23) Assess the current capabilities of regional outlooks and forecasts for the duration and severity of drought, improve the skill of these forecasts and enhance communication to users.
- a) Encourage investments to strengthen research capacity at the national, regional and local levels into the causes and effects of climate variations and long-term climate prediction to provide drought early warnings;
  - b) Collaborate with the Global Producing Centres for Long-range Forecasts (GPCs) and the Regional Climate Centres (RCCs) to augment the ability in the country to provide seasonal, intraseasonal and inter-annual forecasts and skill indicators for the drought outlook and decision making;
  - c) Assess past and current droughts in the context of trends and extreme events that affect the duration and severity of droughts;
  - d) Improve the capability to forecast and develop future drought predictions
- 24) Evaluate the four phases in drought risk management: vulnerability and risk assessment; monitoring and early warning systems; preparedness and mitigation; and emergency response and recovery.
- a) Establish an evaluation procedure for each of the four phases;
  - b) Implement a feedback process in the drought life cycle to learn from past practices in the mitigation or prevention, preparedness, response and recovery strategies;
  - c) Ensure that the early warnings are delivered to the decision makers in a timely fashion and in appropriate formats and that preparedness, response and recovery plans are in place;

- d) Ensure that drought early warning systems are always functional and incorporate a tiered approach based upon the severity of the event;
  - e) Develop long-term solutions in addressing recurrent/multi-year drought episodes;
  - f) Identify appropriate and sector-specific triggers for the timely implementation of mitigation actions.
- 25) Examine the need for the development of useful end products, information or decision-support tools for delivery to the end users.
- a) Ensure that the user community in different sectors impacted by droughts is involved from the outset in the development of useful end products, information and decision-support tools in order to ensure that the products and information meet their needs and expectations;
  - b) Develop appropriate decision support tools and climatological end products covering all aspects of drought to assist the users in their decision making in drought risk management;
  - c) Include extension service personnel and promote their capability to understand and use of drought indices to better disseminate information regarding the four phases of drought risk management.
- 26) Assess the capacity of delivery systems to disseminate data, information, products and services to users in a timely manner to enhance their usefulness for decision support.
- a) Undertake a review of past and present delivery systems for disseminating drought services to end users and use the review findings and recommendations as the basis for developing user friendly delivery systems;
  - b) Establish a procedure/survey to ensure that the needs of the decision makers are being adequately met by the delivery system and modify the system as required;
  - c) Design the presentation of data and products to meet the specific needs for different decision makers (do not make users search through all data but provide access to different products for different groups, e.g., agriculture, education, policy makers);
  - d) Use the most cost effective and modern methods for information delivery including Internet, social media (Facebook, Twitter, etc.), social gatherings, mobile phones, radio, TV, etc., which are appropriate to the local conditions;
  - e) Place emphasis on training of the user communities in the use of decision support tools and products.

### **Enhancing Preparedness and Mitigation Actions**

- 27) Develop drought response measures that reinforce the concept of risk management as a key element of a national drought management policy while promoting environmental stewardship.
- a) Emphasize fundamental need for integrated monitoring/observational and analysis system.
  - b) Establish drought triggers or thresholds for taking action;
  - c) Differentiate between normal seasonal dry periods and prolonged drought situation in the context of implementing emergency relief and response measures;
  - d) Continue assessment of socio-economic consequences/impacts of the specific drought event;
  - e) Identify emergency measures that will reduce the impact of current drought while reducing vulnerability to future occurrences (these measures should, at least, be neutral);
  - f) Establish an effective communications and awareness building strategy for public education.
  - g) Develop policy to ensure that the relief reaches affected communities/sectors in a timely fashion;
  - h) Provide a drought fund for relief and response as part of a National Drought Management Policy.

- 28) Promote training opportunities to enhance understanding of how seasonal forecasts and decision support tools can be applied by vulnerable groups and within vulnerable sectors to improve resilience/coping capacity and preparedness.
  - a) Develop a business (management) plan to implement training in different sectors;
  - b) Emphasize training of trainers (e.g., extension service personnel) to better communicate the policy instruments to user communities;
  - c) Stress the application of climate risk information for management and policy;
  - d) Understand user needs and involve users in the development of decision support tools from the beginning;
  - e) Employ the media to engage the public and policy makers and receive feedback on the effectiveness of emergency relief measures.
- 29) Identify incentives that could be provided to vulnerable sectors/groups to enhance the adoption of risk-based management measures in support of a national drought management policy.
  - a) Consider financial incentives (implementation of a government approved program to provide loans on a tax-free basis to stimulate the development of implementation of drought mitigation measures);
  - b) Link drought relief to establishment/implementation of drought plans at any level (local, state)
  - c) Institute a policy whereby a portion of funds provided for emergency drought relief payments must be directed towards mitigation measures to reduce the impacts of future droughts;
  - d) Evaluate existing drought insurance plans or schemes in terms of how effectively the plans promote rewarding wise stewardship of natural resources and sustainable development;
  - e) Use rewards for drought preparedness and effective response. Use matching funds to finance preparedness plans.
- 30) Identify and communicate successful examples of how inter-agency or inter-ministerial coordination has enhanced drought monitoring, mitigation, response, and planning (e.g., U.S. Drought Monitor, North American Drought Monitor, the Australian 'Monitor', State of Ceara in Northeast Brazil, drought and climate monitoring centres (ICPAC, SADC-CSC, DMCSEE).
- 31) Examine how drought drills or exercises could be effectively used to promote more effective institutional coordination for preparedness and response.
- 32) Collect local and traditional knowledge and incorporate into the decision making process
- 33) Ensure connections between science and policy aspects.

**Implementing Emergency Response and Relief Measures  
that reinforce National Drought Management Policy Goals**

- 34) Develop adequate linkages between early warning and relief and response.
- 35) Carry-out rapid assessment of ongoing drought emergencies.
  - a) Prepare diagnostic tools for rapid assessments;
  - b) Establish and train inter-agency diagnostic teams (pre-emergency).
- 36) Conduct research that evaluates the effect of drought relief measures on societal vulnerability.

- a) Identify case studies at the local level as to how risk management can reduce vulnerability (i.e., reduce impacts and improve resilience);
- b) Diversify activities and portfolio of assets as a drought mitigation strategy (e.g. crop production);
- c) Assess the effectiveness of drought policies and look for areas of improvement and refinement;
- d) Use risk mapping to identify vulnerabilities in support of drought policies.

### **Understanding the cost of inaction**

- 37) Document the social, environmental, and economic impacts associated with past drought events and impact trends by sector to better understand the cost of inaction at all levels and for all sectors.
- 38) Understand the cost/benefit relationships between a reactive, post-drought impact and emergency relief government policy vs. a risk-based government policy directed towards investment in mitigation actions that reduce impacts and the need for government interventions.
- 39) Opportunity costs to be derived from translating science into policy action.

### **National Drought Management Policy: The Way Forward**

The challenge that nations face in the development of a risk-based, national drought management policy is complex and requires political will and a coordinated approach within and between levels of government and with the diversity of stakeholders that must be engaged in the policy development process. One tool that has been instrumental in providing guidance in the development of drought preparedness and mitigation plans in the United States is a 10-step planning process. This step-by-step approach has been modified and is provided below as one approach to assist nations with the national drought policy development process. The terminology from the original 10-step process has been modified slightly to reflect the goal of developing a national drought management policy vs. a preparedness or mitigation plan as it was originally intended.

- Step 1:**        *Appoint* a national drought management policy commission or task force
- Step 2:**        *State* or *define* the goals and objectives of a risk-based national drought management policy
- Step 3:**        *Seek* stakeholder participation; *define* and *resolve* conflicts between key water use sectors
- Step 4:**        *Inventory* data and financial resources available and *identify* groups at risk
- Step 5:**        *Prepare/write* the key tenets of a national management drought policy, including the following elements:
  - Monitoring, early warning and prediction
  - Risk and impact assessment
  - Mitigation and response
- Step 6:**        *Identify* research needs and *fill* institutional gaps

- Step 7:**        *Integrate* science and policy aspects of drought management
- Step 8:**        *Publicize* the national drought management policy and *build* public awareness
- Step 9:**        *Develop* educational programmes for all age groups and stakeholder groups
- Step 10:**      *Evaluate* and *revise* national drought management policy

The tenets of a national drought policy require periodic evaluation and revision in order to incorporate new technologies, lessons learned from recent drought events, changes in vulnerability, and so forth. Nations are advised to complete periodic assessments of their national drought policy, conduct drought exercises to ensure the highest level of coordination between government agencies or ministries and with levels of government and non-governmental organizations, and revise or update the policy accordingly.

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