GUIDELINES FOR DROUGHT MANAGEMENT

DIRECTIVES POUR LA GESTION DE LA SÉCHERESSE

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Abstract: The experiences in the development and implementation of drought and water scarcity management plans highlight the success and challenges of coping with drought for societies with different vulnerabilities and emphasize risk-based drought management as a critical approach to mitigate the impacts associated to drought-induced water shortages. Based on these experiences and the current legislation, management, technology and methods for evaluating risk, the Guidelines synthesise drought management operational actions that link science and policy and that can be applied to other regions. The Guidelines respond to the growing issue of drought preparedness planning, monitoring, and mitigation which has worldwide application. The methodologies and lessons learned are focused on a specific, drought-prone region so the applications have more significance. The Mediterranean region exemplifies many other drought-prone regions with rapidly expanding populations that are placing increased pressure on already limited water supplies.

The Mediterranean region is one that has been identified as experiences significant changes in climate as a result of climate change. Preparing for climatic extremes (i.e., managing climate variability) is an important first step in preparing for climate change.

The Guidelines are the result of the research carried out within the framework of the MEDA-Water project MEDROPLAN that analyses drought and water scarcity management in Mediterranean countries promoting a risk based preparedness and mitigation approach. The purpose of the Guidelines is to provide countries with a framework for effective and systematic approach to prevent and/or minimize the impacts of drought on people.

Key words : Drought, water scarcity, Mediterranean region, water use, irrigation, management actions

Résumé : Les expériences de réalisation et d'implémentation de plans de gestion de la sécheresse et de la pénurie d'eau soulignent les réussites et les défis face à la sécheresse de différentes sociétés dont les vulnérabilités sont différentes et montrent que la gestion du risque de sécheresse est fondamentale pour atténuer les effets des pénuries d'eau provoquées par la sécheresse. Sur la base de ces expériences et dans le cadre des législations, gestions, technologies et méthodes d'évaluation du risque existantes, les directives synthétisent les actions opérationnelles de gestion de sécheresse qui lient la science et la politique et qui peuvent être appliquées à différentes régions. Les directives répondent au problème qui se pose avec de plus en plus de force de la planification des actions de préparation à la sécheresse, de son suivi et de l'atténuation de ses effets, problème qui se pose partout dans le Monde. Les méthodologies et les enseignements tirés sont appliqués à une région particulière sujette à la sécheresse , ce qui donne plus de poids à leur application. La région méditerranéenne peut servir d'exemple à beaucoup d'autres régions sujettes à la sécheresse avec une démographie qui accroît la pression sur des ressources en eau déjà limitées. La région méditerranéenne est l'une de celles pour lesquelles des modifications significatives du climat ont été mises en évidence. La préparation aux extrêmes climatiques (par exemple la sécheresse) est une première étape importante dans la préparation au changement climatique. Les directives résultent des recherches menées dans le cadre du projet MEDA-Water MEDROPLAN qui analyse la gestion de la sécheresse et de la pénurie d'eau dans les pays méditerranéens et promeut des approches de préparation et d'atténuation basées sur l'analyse du risque. L'objet des directives est de fournir aux pays un cadre permettant une approche systématique et efficace pour prévenir et/ou minimiser les impacts de la sécheresse sur les populations.

Mots clés : Sécheresse, pénurie de l'eau, région Méditerranéenne, utilisation de l'eau, irrigation, actions de gestion

RESPONDING TO DROUGHT MANAGEMENT CHALLENGES

The Guidelines respond to the growing issue of drought preparedness planning, monitoring, and mitigation which has worldwide application. The methodologies and lessons learned are focused on the Mediterranean that is a specific, drought-prone region so the applications have more significance. The Mediterranean region exemplifies many other drought-prone regions with rapidly expanding populations that are placing increased pressure on already limited water supplies.

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There are significant challenges for developing drought management guidelines since every drought has unique problems and impacts therefore it is difficult to present a plan that details and addresses all of them. Furthermore, the social and economic structure of every basin or water unit is different. There is existing valuable information and knowledge related to water supply management under scarcity and development of drought response procedures. Therefore, the Guidelines are not prescriptive, rather a range of options that enhance the current knowledge in each location and system.

This paper summarises the Guidelines developed as the result of the research carried out within the framework of the MEDA-Water project MEDROPLAN and are fully documented in several publications (Iglesias and Moneo, 2005; Iglesias et al., 2006a,b; Garrote et al., 2006) that include numerous references to scientific work in the various aspects of drought characterization and risk management.

PURPOSE OF THE DROUGHT MANAGEMENT GUIDELINES

The purpose of the MEDROPLAN Guidelines is to provide Mediterranean countries with a framework for effective and systematic approach to prevent and/or minimize the impacts of drought on people. The Guidelines are intended to complement the ongoing regional and country water basin planning efforts and the ongoing agricultural policy initiatives. The Guidelines outline both long term and short term measures that are to be used to prevent and mitigate the effects of drought.

The Guidelines are the result of the research carried out within the framework of the MEDA-Water project MEDROPLAN, and will be published in six languages and a tutorial to be used in print and on-line. The Guidelines give the tools to analyse drought management in selected Mediterranean countries promoting a risk based preparedness and mitigation approach.

Drought, aridity, water shortage and desertification are common and overlapping processes in Mediterranean countries and often are misinterpreted and used. Starting with clear and agreed definitions and concepts contributes to the development of clear methods and the interpretation of the results for developing drought management plans.

- Drought: Natural temporary imbalance of water availability (persistent lower-than-average precipitation).
- Water shortage: Man-induced temporary water imbalance.
- Aridity: Natural permanent imbalance in the water availability (low average annual precipitation).
- Desertification: Man-induced permanent imbalance in the availability of water (inappropriate land use).

The process of creating the guidelines

The Guidelines are developed in the context of current drought vulnerability, legislation, management, and technologies. The design of the Guidelines intends to be broad enough to incorporate new criteria for establishing priorities as societies change or as scientific and technological aspects of drought management improve. Figure 1 summarises the process

Drought management plans are always in progress and all components need to be considered dynamic (Figure 1). As technologies

evolve, new programs are developed, and institutional responsibilities change, these plans have to be revised. However the proposed drought plan is the result of more than three years of research and it should be considered as an integrated drought plan, which takes into account almost every aspect of mitigating drought for the time being. It is true, though that from time to time it should be reviewed and probably edited and updated.

Fig. 1. Development and revision of the guidelines for drought management plans.

The intended user of the Guidelines

Drought management plans must make information available to the largest possible audience; therefore the goal of the MEDROPLAN Guidelines is to reach the full range of stakeholders related to drought in the Mediterranean, and especially oriented to the support of policy making. In order to achieve this goal, the Guidelines are written with the user in mind and try to avoid the use of very specific scientific or technical language that may be difficult to understand by a non-specialist. Finally, the Guidelines are produced in six languages to reach the largest possible number of stakeholders in the Mediterranean (Arabic, English, French, Greek, Italic, and Spanish).

The Guidelines are designed to appeal to a broad audience. Each component of the Guidelines includes information that can be understood by a non-technical user. The methodological component also includes more in-depth scientific information and developments in drought characterization and risk analysis. The Guidelines link academic and technical issues with operational aspects therefore linking scientific and policy communities.

COMPONENTS OF THE GUIDELINES

The MEDROPLAN Guidelines include the following components (Fig. 2):

- Executive summary
- The planning framework
- Organizational component
- Methodological component
- Operational component
- Examples of the application in Mediterranean Countries
- Tutorial

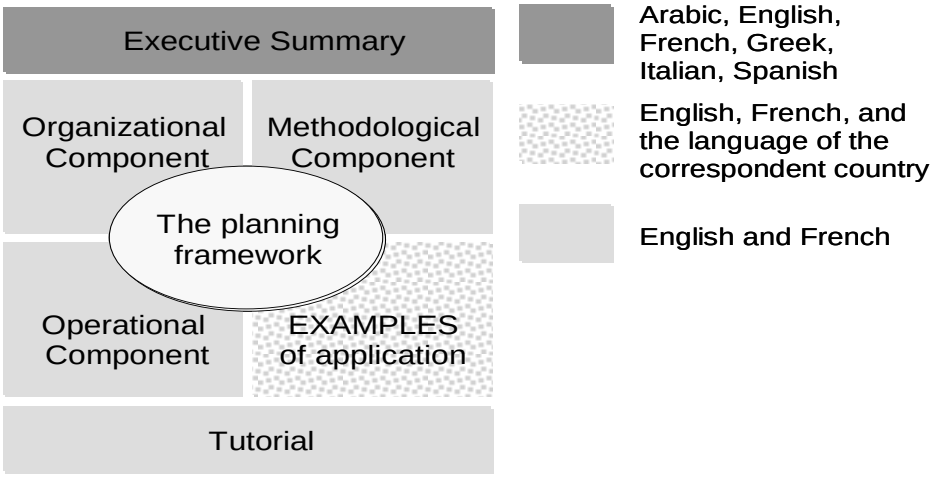

Fig. 2. Components of the Guidelines and languages of dissemination

The executive summary summarises the Guidelines in a language that may appeal to a broad audience and the non-technical users. The objective is to provide a methodological framework with examples that may be followed to develop drought management plans in a range of situations. The executive summary is an overview of the planning framework and the examples of application.

The Guidelines includes examples of the application of the planning framework to specific situations in order to show how the various components and methodologies can be developed and applied to develop drought management plans.

The tutorial guides the web-user to find and select the relevant information in the different aspects of developing a drought management plan, and provides examples of use of the methods and models available and applied in the examples of application.

The planning framework

The planning framework defines the local, regional and national purpose for developing drought planning and highlights the dynamic process that responds to changing pressures in the environment and society. The planning framework guides the user of the Guidelines to define the planning purpose and process, establish a

common language among stakeholders, and highlights the importance of using a common set of terms and concepts for developing a drought management plan that can be discussed among a full range of stakeholders.

The organizational component

The social and hydrological context of Mediterranean have resulted in the complex institutional framework, and highlighted the importance of stakeholder involvement and awareness building for successful drought management. Designing effective risk based strategies that mitigate the effects of drought in agriculture and water supply systems, ultimately depends on the role of organizations, institutions, and civil stakeholders involved in drought in each case.

The organizational component assists the user of the Guidelines to:

- Compile and provide the most comprehensive information about how society responds to drought and establish the linkages among the stakeholders
- Coordinate with the various institutions to avoid conflict, duplication, and expedite the administrative and legal process
- Provide responsible and timely public information
- Encourage water and energy conservation
- "Declare drought"

Figure 3 summarises the framework to analyse the institutions and organizations in each case study. This includes the following steps:

- Explicit description of institutions and organizations with competence in water policy and administration, in planning, decision making, operation of water supply systems and in drought preparedness, and emergency action with particular emphasis in municipal and irrigation water supply.
- Explicit description of the linkages and hierarchical relations among the organizations and institutions.
- Information on existing drought preparedness and management plans.
- Document the institutional experience on the application of the existing drought preparedness and management plans.
- Description of the data collection system in the country, specifying the institutions responsible, the type of reporting and accessibility, and the primary uses of the data.

The methodological component

The methodological component presents the scientific approach to risk evaluation, including characterization of drought episodes, development of indicators of risk in hydrological and agricultural systems, and analysis of the role of economic instruments and groundwater for risk mitigation. This component also includes the description of an integrated method for evaluating social vulnerability based on indicators that include the capacity to anticipate, cope, and respond to drought.

Drought is characterisation and risk and vulnerability analysis are complex and there are a wide range of methods applied. Each method has its own merit and they are usually supportive of each other. A combination of methods is usually most rewarding.

The methodological component provides a framework to:

- Compile and provide the most comprehensive technical and scientific approaches to drought characterization, development of indicators of risk in hydrological and agricultural systems
- Define the methods used for risk management in the context of Mediterranean climate and social characteristics: including economic instruments, application of technology, and groundwater use, etc.
- Define the academic methods for evaluating social vulnerability based on indicators that include the capacity to anticipate, cope, and respond to drought.
- Encourage technical studies to strengthen the use of indicators and the declaration of drought

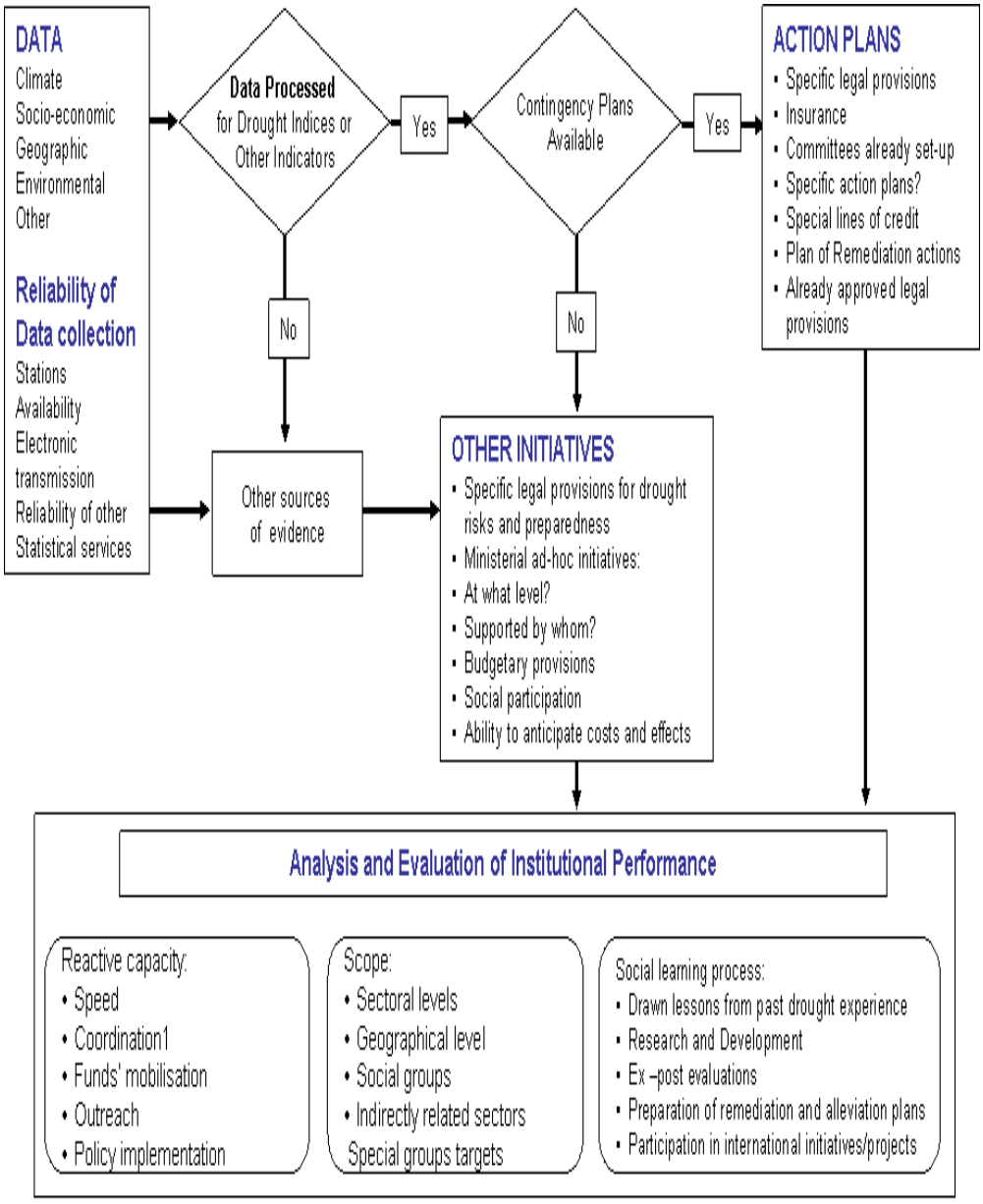

Fig. 3 Outline of the methodology applied for the analysis of organizations and institutions involved in drought planning

The methodological component includes the characterization of drought and the evaluation of drought risk and vulnerability in agricultural and hydrological systems.

Drought characterisation provides the methodology to be applied for the definition of meteorological and hydrological droughts and water scarcity.

Risk analysis provides the mean to quantify the probability of damage in each drought situation and validate the results with the observed impacts. The benefit from risk analysis is twofold:

- The quantification of what items and values are at jeopardy
- By estimating the magnitude of the drought to predict the anticipated damage and therefore act accordingly in time.

Vulnerability refers to the characteristics of a group in terms of its capacity to anticipate, cope with, resist and recover from the impact of drought. Vulnerability represents the internal component of risk and can be described by a combination of economic, environmental, and social factors.

The operational component

The operational component identifies both the long and short term activities and actions that can be implemented to prevent and mitigate drought impacts. The activities and actions are essential for the creation of specific drought planning and response efforts. The operational component includes five aspects:

- Preparedness and early warning (permanent measures)
- Establishing priorities to be respected during water scarcity situations
- Thresholds defined by drought indices and indicators (physical and social)
- Evaluating the process to implement the actions
- Defining the actions

Table 1. Summary of the types of actions that may be adequate for preparedness before drought and three levels of drought.

	Preparedness	Pre-alert	Alert	Emergency
Monitoring indicators	Indicators show a normal situation	Indicators show initial stage of danger; no observed impacts (meteorological drought)	Drought is occurring and impacts will occur if measures are not taken (meteorological and hydrological drought)	Drought is persistent and impacts have occurred; water supply is not guaranteed (socio-economic drought)
Objective of the plan in each stage	To ensure that a preparedness and early warning plan is in place	To ensure acceptance of measures to be taken in case of alarm or emergen by raising awareness of the danger of drought	To overcome the drought situation and to guarantee water supply while emergency measures can be put in place	To minimize damage, the priority is drinking water
Measures	Development of a management plan and strategy for revision and review Implementation of a monitoring and early warning system Integration with development and land use policies	Low cost, indirect, voluntary Non structural directed to influence water demand and avoid worse situations Focus on communication and awareness Intensification of monitoring and evaluation of worse case scenarios	Low cost, direct, coercive, direct impact on consumption costs Non structural directed to specific water use groups Water restrictions for uses that do not affect drinking water Changes in management Revision of tariffs Rights Exchanging Centres	High cost, direct, restrictive, approved as general interest actions Structural, new infrastructure, intra-basin, inter-basin and transboundary transfers Non structural, such as permission for new groundwater abstraction points Water restrictions for all users, including urban demand risk

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