



IMPROVED DROUGHT EARLY WARNING AND FORECASTING TO STRENGTHEN
PREPAREDNESS AND ADAPTATION TO DROUGHTS IN AFRICA

DEWFORA

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Chart of institutional responsibilities and communication lines

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SUMMARY

This report provides a discussion of the institutional responsibilities and communication lines for drought early warning systems across Africa in the DEWFORA study. The study first presents a methodology for analysis and then the method is applied to the case studies. The institutional responsibilities and communication lines are presented and discussed following the common methodology. The analysis is based on the data provided by WP2 and WP6.

We propose that drought early warning systems should incorporate natural and social aspects of drought. The institutional responsibilities should therefore refer to these two aspects of drought. The study also highlights the relevance of the communication lines.

The results are discussed in terms of gaps and opportunities for development of drought early warning systems in each region. The evaluation focuses in the operational aspects of drought early warning systems, linking the hazard with the propagation of drought effects across water resources and society. It is advisable that drought monitoring is incorporated along all institutions involved in drought management in the time chain in order to anticipate drought impacts. For this reason—and as discussed in WP3—, diagnostic drought indicators based on precipitation should be widely used for drought monitoring. They take advantage of the delay of the socioeconomic response function to drought and allow for the adoption of timely measures early on. In the context of a drought early warning system, the focus on vulnerability may prove to be very effective since it includes the evaluation of the capacity to anticipate and compensate the adverse effects of drought. If a drought forecast is available, drought managers gain time and can come closer to drought impacts in their analysis. The focus on drought vulnerability requires the development of new drought indicators that are tailor made for a given drought impact. Dewfora already proposed and implemented a drought vulnerability analysis across Africa in WP3.

The framework for chart of organizational responsibilities for drought mitigation and communication lines will improve coordination and strengthen existing institutions. Overall, a science-based approach is a useful guideline, but a number of challenges are recognized. Some countries may not have the resources to have institutions focused on drought mitigation.



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1. OBJECTIVES AND GEOGRAPHICAL SCOPE

1.1 CONTEXT

The main aim of DEWFORA is to develop a framework for improving drought early warning, with more effective drought mitigation measures that strengthens preparedness, increasing resilience, and enhancing adaptation to drought in Africa.

In WP5 drought risk and vulnerability (WP3) and forecasting (WP4) are combined and extended into a warning system based on appropriate and predictable indicators, related warning thresholds, and typical responses within the existing socio-political context in Africa. WP5 leads to the primary deliverable of DEWFORA: A framework to support drought early warning in Africa, responding to the technical and organisational structure of science and society. This framework is meant to support existing drought monitoring and warning institutions and agencies in the operation of drought early warning systems (DEWS).

D5.1 is a concept report outlining the framework for improved drought warning and mitigation in Africa. It outlines the main elements to be considered to get to a situation with improved drought warning and mitigation. D5.2 provides an organizational chart and describes the institutional responsibilities, and communication lines for drought responses from national to local levels, derived from WP2 and refined through case study experiences. D5.3 presents a consolidated framework for drought forecasting, warning and mitigation from national to local scale as a guideline document. It covers both the forecasting framework and the institutional framework. D5.4 presents recommendations for enhancing drought preparedness at the local, national and trans-boundary basin scales to cope with drought under a changing climate.

This document makes up deliverable D5.2. It provides an organizational chart for drought response and describes the institutional responsibilities, and communication lines from national to local scale.

1.2 OBJECTIVES

Ensuring water availability and protecting the environment are the main focus for coming years in order to address questions on drought management. Few countries have realistic policies, operational strategies or plans for integrating drought management plans into water policy, particularly in the southern African Countries. In fact most of the strategies for drought management are typically based on ex-post approaches and address only part of the issue of social and environmental sustainability. Examining the experiences of a wide range of



African countries with the same methodology makes possible to define strategies that have proved environmentally and financially sustainable, with possibilities to be used in other areas.

Starting from Institutional setting of each country it is possible to define the characteristics of the particular policies that need to be modified in order to promote sustainable drought management plans. During the next years water management and spatial planning in European countries will be focused on the implementation of EU water framework directive in the EU member countries with potential impact also in candidate countries as well as in other African Area countries. The resulting new responsibilities in spatial planning and water management have to be clarified at the administrative level. Additionally, this requires a contribution of environmental sciences as "trans-border" water bodies (as African Sea) will require integrated and coordinated tools and efforts for proper water management.

Communities must often give priority to water either for agriculture, industry, tourism or other users. Therefore there is the need to define a careful strategy for sustainable use of water resources, based on the principle that water is not a "worldwide good" but a "worldwide need". As a consequence, the only policy will have to apply correctly the "integrated water management", that is the management of water cycle according to technical – economical logics. Current drought management plans are not always effective because they rely too much on decision processes under stress situations.

The relations among organizations and Institutions are base for understanding current drought management plans and for improving future actions that mitigate the effect of drought on agriculture, water supply systems and economy. To understand the national institutional regime is a key factor for establishing effective and integrated drought management plans that incorporate monitoring, public participation, and contingency planning (Iglesias and Moneo, 2005; Iglesias et al., 2009). The risk of damage caused by drought is viewed in most societies as a public good that justifies government action. Therefore societies develop policies to respond to drought.



1.3 GEOGRAPHICAL SCOPE

Table 1 summarises the geographical scope of the study.

Table 1 African regions and countries included in the analysis

African Region	Country (abbreviation used in tables)	DEWFORA case study
East Africa- Nile Basin	Egypt (EG)	Yes
	Sudan (SU)	
Ethiopian Plateau	Ethiopia (ET)	
East Africa- Equatorial Lakes Region	Kenya (KY)	
	Tanzania (TZ)	
	Rwanda and Burundi (RB)	
Southern Africa -Limpopo Basin	Botswana (BW)	
	Mozambique (MZ)	
	South Africa (SA)	Yes
	Zimbabwe (ZW)	
North Africa - Maghreb Region	Tunisia (TN)	Yes
	Algeria (AL)	
	Morocco (MO)	Yes
West Africa - Niger Basin	Nigeria (NG)	Yes

1.4 GLOSSARY OF COMMON TERMS

Here we summarise the main concepts that are used in this document with the aim of establishing a common language across the case studies (Table 2).

Table 2 A short glossary of terms used in the DEWFORA study

Concept	Definition
Forecast	Forecast is the statistical estimate of the definite statement of the occurrence of a future event.
Early warning	Early warning is the provision of timely and effective information, through identified institutions, that allows individuals at risk of a disaster, to take action to avoid or reduce their risk and prepare for effective response.
Preparedness	Preparedness refers to the activities and measures taken in advance to ensure effective response to a potential impact of hazards.
Mitigation	Mitigation is the set of structural and non-structural measures undertaken to limit the adverse impact of hazards
Organisation	A group of persons formally joined together for some common interest.
Institution	A public organization with a particular purpose or function in relation to law, policy, and administration and that establishes rules for its operation.
Network	Network is a group that interacts or engages in informal communication for mutual assistance or support.
Stakeholder	Stakeholders are those actors who are directly or indirectly affected by an issue and who could affect the outcome of a decision making process regarding that issue or are affected by it.



2. METHODOLOGY FOR INSTITUTIONAL ANALYSIS

This section describes a common methodology used to define the decision process. This includes chart the institutional responsibilities and communication lines relevant to drought preparedness, mitigation, management, and early warning systems. The common methodology is necessary in order to provide information that will contribute to compare among and across countries and to promote the cooperation with the existing institutions, organizations, networks, and other stakeholders in the Africa. The methodology proposed and described in this deliverable is supported by previous leading experiences synthesised by Iglesias et al (2007), Iglesias et al (2009), Wilhite et al (2000), Rossi et al. (2003) and Vogt et al. (2000).

2.1 IDENTIFICATION OF PARTICIPANTS IN EARLY WARNING SYSTEMS

The participants in the Early Warning System are the providers and users of the information. This could include individuals, organisations, institutions, decision-makers, or policy-makers, who determine or are affected by drought and water scarcity. Each group of participants could be defined as stakeholders. The stakeholders could act as institutions, since they have sets of rules, norms, shared strategies, and they are constrained by them in their responses to drought early warning systems.

Therefore a purposeful description of the map of legitimate actors, as well as an analysis of their interests, values and approaches to risk is a pre-requisite for the understanding of their link with institutional drought policy. The participation of the stakeholders serves two purposes: the validation of the mental model and the raise of awareness of the need to change drought management policies. Recognizing the importance that representative stakeholders are formally incorporated within the structure of the Protocol, the stakeholders are interviewed and further engaged in model validation. As result, the models described in each country have been accepted by the stakeholders. This will contribute to the acceptance and trust of the science that feeds into the Protocol for drought early warning systems.

The stakeholders considered are those actors who are directly or indirectly affected by drought and water scarcity and who could affect the outcome of a decision making process regarding that issue or are affected by it. Table 3 outlines the stakeholders considered and included. The stakeholder analysis is conducted by mean of interviews. The objectives of the interviews are to: confirm that the mental models described above provide an accurate representation about drought preparedness and management plans; complete the findings



and fill the gaps that may exist in the mental models; and collect personal and subjective views of the country's level of preparedness and capacity for developing and carrying out management plans. The target individuals for the interviews are: policy makers/practitioners at the highest technical level and leading researchers with experience in drought's analyses and characterisation.

Table 3 Stakeholder participants in early warning systems and interest in early warning systems

Stakeholder	Characteristics and Structure	Interests and Expectations	Potential and Deficiencies	Involvement and participation
1. African rainfed farmers	Sometimes in collective organizations or Unions. Very interested in early warning systems	Plan and adopt practices adapted to drought. Anticipate drought effects on livestock. Avoid decreasing livestock capitals	Some with low financial margin to invest in new technologies. Some with insurance coverage. Increasing experience in alternative sources of livestock feeding	Benefit from new insurance products. R&D for insurance activities Alert in case of drought
2. African irrigated area farmers	Frequently, in Irrigators Associations. Interested and positively involved	Same as above	Same as above	RB plan design and functioning. (Represented by Irrigation Communities.) R&D Insurance. Alert in case of drought.
3. Urban water consumers and water utilities	Directly affected by water shortages. Sometimes represented by consumers associations. Aware of need to save water	To avoid water shortages, increase supply guarantee levels and water standards' reduction	High potential of saving water	RB plan design and functioning (Represented in Assembly of Users)
4. Tourism companies	Directly affected by water shortages Represented by Tourist Company Associations	To avoid water shortages and bad quality that limits sector development	Very influential in economic policies Sometimes the tourism model is water-wasting	RB plan design and functioning (Represented in Assembly of Users)
5. Industrial companies	Directly affected by water shortages. Represented by Employers' Organizations	To avoid water shortages and bad quality that limits sector development	Very influential in economic policies Sometimes the industry development model is not water-sustainable	RB plan design and functioning (Represented in Assembly of Users)
6. Water Basin Authorities	Depend on the State Government. In charge of administration and distribution of water	Directly affected by water shortages. Need to develop water policies based on risk analysis	Main actors in drought guidelines Need to take into account different and opposed interests	Pro-active: Design, management, decision-making, and implementation of RB plans. Reactive: Permanent Committee, emergency works strategies.
7. Local Water Authorities & Water Suppliers	Depend on the local authorities. Also private companies in some	Directly affected by water shortages. Need to develop water policies based	Main actors in drought guidelines	RB plan design and functioning. Priority in water allocation. (Represented in



Stakeholder	Characteristics and Structure	Interests and Expectations	Potential and Deficiencies	Involvement and participation
	cases	on risk analysis		Assembly of Users)
8. Meteorological and Hydrographical Institutions	Depend on national and / or regional governments	Interested in the use of their data in risk analysis	Main actors in drought guidelines. In some countries, difficulties to provide data	Provide information for plan designing and monitoring.
9. Ministries of Agriculture, Environment, Water, Tourism, Industry	Depend on national and / or regional governments	Directly concerned by water shortages. In charge of the implementation of mitigation policies	Key actors In some countries, coordination between them is to be improved	Approval of Basin Plans. Funding of Insurance Premia. Funding for subsidies, tax abatement. Create Permanent Office for Drought.
10. Insurance companies	Depend on national and / or regional governments	Directly concerned with the reduction in agricultural production due to drought periods	Key source of data for risk analysis in some countries Main actors in drought preparedness guidelines	R&D New insurance products. Approval of products
11. Agricultural banks and rural lending institutions	Depend on national and / or regional governments Private	Directly concerned with the need of extraordinary financial resources due to drought periods	Key source of data for risk analysis in some countries Main actors in drought guidelines	Credits to farmers.
12. Research, Training and Development Institutions	Depend on national and / or regional governments Private	In charge of development, adaptation and adoption of technologies for efficient water use	Key human capital in some disciplines but limited financial resources	New insurance products. Water planning Transfer of technology and knowledge.
13. International Cooperation Organizations	Intergovernmental	Drought and water are key issues. Key actors in technology transfer and knowledge	Good network of contacts and human resources Limitation of financial resources	Networking. Facilitate International agreements. Use common tools for water management. Capacity building.
14. NGO's	Non-profit, non-governmental	Environmental and social improvements.	Very active and sharp users of scientific results. Limitations resulting from their clear political standpoints.	Indirect participation in RB plans. Link between society and institution. Press governments to include environmental topics in political agenda. Information.

2.2 MAPPING ORGANISATIONS

The first step includes the identification and mapping of national, regional and local organisations and institutions in the DEWFORA countries as well international organizations, institutes and NGOs at the African and global level that work on the collection, processing, storing and disposing of data relevant to drought monitoring forecasting, early warning systems, drought mitigation, drought response, and drought management.



The second step includes a description of the current drought management plans and the explicit linkages and hierarchical relations among the institutions involved. The importance of identifying such relations among Institutions lies on the need to design coherent drought management plans that mitigate the effects of such hazard on water resources, agriculture, ecosystems and the economy.

The methodology includes:

- 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 analysis aims to provide insights to the following key questions:

- Are the set of organisations and institutions that interact within a formal or an informal network?
- Are there networks to provide communication and hierarchical flows of command?
- Are the stakeholders included into the network?
- What is the degree of influence and dependence of the stakeholders' decisions on the institutions' core themes?

The analysis takes into account drought and water scarcity. The underlying rationale of this separation is based on facts. First, because artificial and natural reservoirs eliminate, alleviate and delay the effects of abnormally low precipitation and run-offs. Second, because the conditions and the processes of drought (meteorological) evolve along temporal and spatial scales with little bearing on the processes that characterize water scarcity



(hydrological droughts) situations. Resulting from this desegregation, the Chapter analyzes two institutional mappings pertaining to drought and water scarcity contexts. The analysis includes the stakeholders that ultimately benefit from drought preparedness and management (primary stakeholders) and the stakeholders that are intermediary in delivering aid to the first group (secondary stakeholders) and describes the participation of the stakeholders in the processes. The Chapter attempts to provide a dynamic analysis of the institutional frameworks of different African countries with regards to drought risks and planning.

The methodology developed comprises five main tasks:

- Elaborate a mental model of organisations and institutions in each country and describe the institutional and legal frameworks.
- Collect additional information by interviews and / or other dialog methods. The interview should include “problem analysis” (i.e., what actions did your institution take during a historical drought in a specific year?) and identification of the stakeholders affected by the decisions of each institution.
- Validate the model structure. Communicate back to the organizations and institutions the results of the previous two tasks and complete the analysis
- Analysis of the strengths and weaknesses of the system organizational processes to take decision within the institution and within the hierarchical structure in each country.
- Discussion of the challenges and opportunities to improve drought management.

2.3 LINKAGES BETWEEN INSTITUTIONS AND STAKEHOLDERS

The objective of the research is to co-ordinate the knowledge and experiences of the Northern and Southern African Countries in order to implement and apply an innovative management for droughts and water scarcity aiming to operate into the framework of integrated management of the water sources and provide instruments to manage droughts in a more effective way.

This mental model is applicable to basins. It is the result of the exchange of knowledge and experiences among African Countries on policies and implemented proactive and reactive action plans. The results are analysed to assess the contribution to the sustainable management of water resources.



The mental model complies with the principles introduced by the EU Water Directive and it aims at contributing to achieve the objectives of protection, enhance and restore all bodies of surface waters and groundwater, ensure a balance between suction and recharge of groundwater. It can be useful to target those cases where it may be feasible or reasonable to achieve effective drought management plans.

The mental model is developed on the basis of the assumption that in each basin a proper policy of drought management can be carried out when the privileged target is the safeguarding of stakeholders rights belonging to the same area. Applying this mental model to basins in the Northern and Southern African Countries, assuming as the target is the minimisation of social risks derived from drought, it should be possible:

To examine specific features of each country. The institutional profile, to evaluate the status of water management, the effectiveness of those plans in historical situations, and assess the level of improvement of drought management plans.

To define both the characteristics and the institutional changes necessary to improve current drought management plans.

The use of such a mental model may have a crucial role in creating positive outcomes in those situations detectable according to different scenarios. As examples four typical scenarios can be individuated: Proactive and reactive meteorological and hydrological droughts. These four scenarios are quite widespread in all countries of the African basin. The proposed model promote an improvement of drought management plans oriented to increase of water availability in African countries, minimising the social risk of drought as well taking in account the socio-cultural differences of the African countries. The use of the proposed model to develop drought management plans can play a crucial role in contributing to ensure water supply in the area and socio/economic development. The mental model provides a methodology to analyse integrated drought management plans, to involve the stakeholders and users, and to define the possible incentives supporting proposed changes. As a result of this approach to drought management analysis, a better understanding of specific needs of different areas is promoted. The use of a common methodology for management evaluation promotes better trans-border integration and process learning.

An exact technical definition of the best solution for drought management for a certain area requires: rank the different possible alternatives, demonstrate actual needs for drought management improvement, and demonstrate that needs of extensive and expensive actions are based on rigorous analysis. The research contributes to define these elements by

evaluating recognized standards for drought management intended as a part of environmentally and socially sustainable growth.

Water and drought Institutional Framework are all organizations and institutions related with the management of water resources. The institutions are classified into policy-level institutions, executive-level institutions, user-level institutions and the NGO's institutions, at national, regional, district and local levels. A correct definition of the roles of the different levels of government in planning and co-ordination is a primary need in the preparedness and management processes. This component of the mental model includes a topology-type graph and a written description. The organizations and institutions to be included are those within the formal framework of the political and government structures in each country (i.e., Ministries, General Directorates, Commissions, etc.) and the Official Institutes and Offices with relevant roles in drought preparedness and management, including water management organisations (e.g. municipal supply agencies, irrigation district consortia), institutions responsible of disaster's defence and ad-hoc drought emergency Committees or Offices. Figure x provides an overview of the institutional framework within which meteorological and agricultural droughts may be faced, mitigated and alleviated. Figure 1 illustrates a general guide and road mapping that may be used as conceptual framework in the specific country analysis. In all cases, the analysis and evaluation of this institutional performance takes into account the reactive capacity, the scope, and the social learning process.

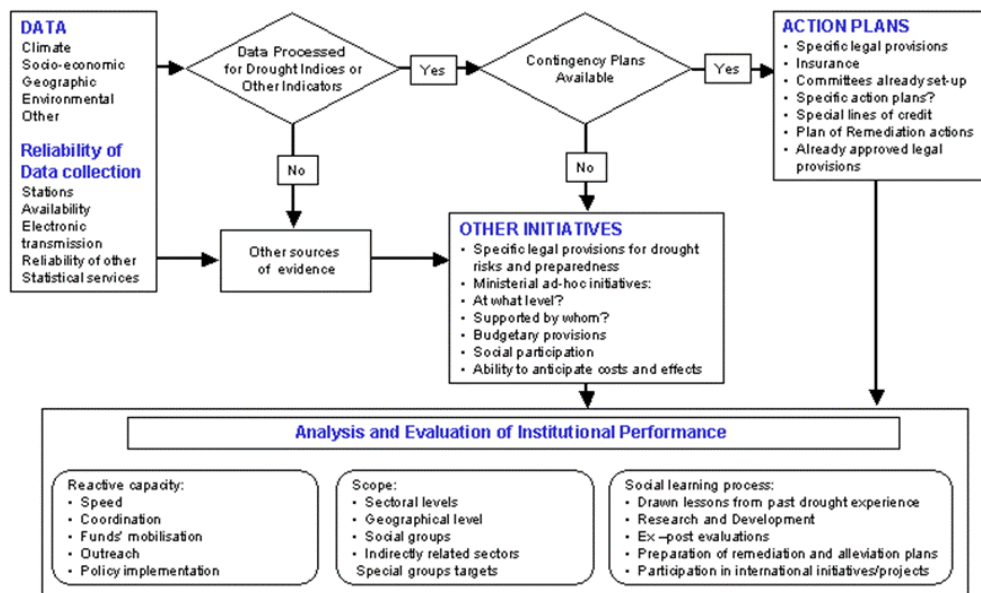


Figure 1 Overview of the institutional framework within which meteorological and agricultural droughts may be faced, mitigated and alleviated

Droughts provide a good opportunity to implement water policy. Society claims that something should be done. Additional funds are made available. In political terms, we are “solving a problem created by others” (Figure 2).

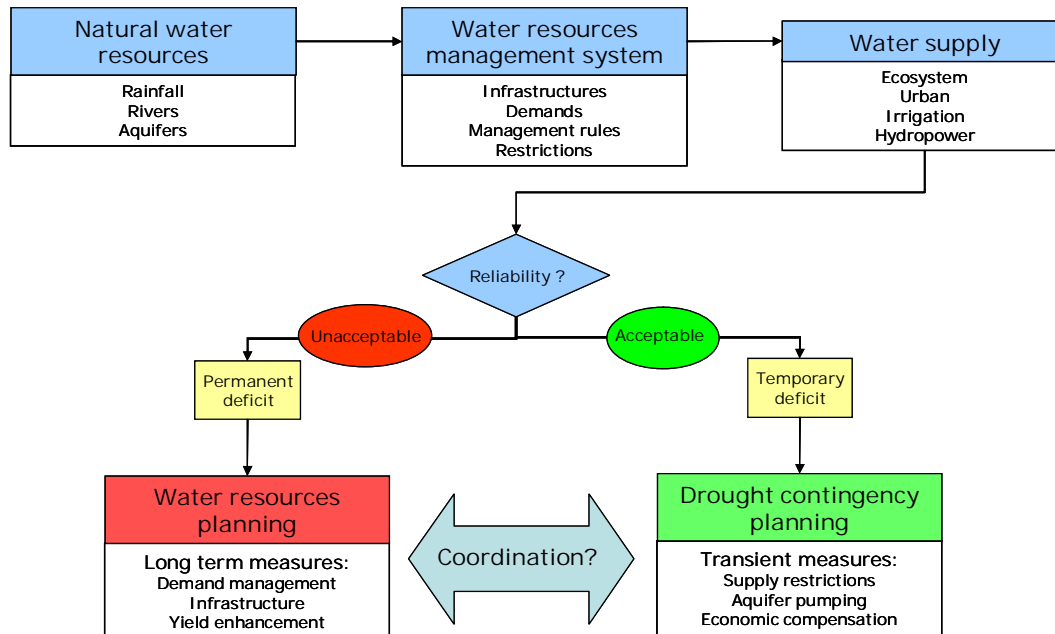


Figure 2 Overview of the coordination between basin and drought policy to derive legislation

2.4 ROLES OF INSTITUTIONS AND ORGANIZATIONS

A complete detailed description of each of the following points:

- Description of the organizations and institutions included in the flow-chart.
- Description of the formal and informal means of communication and hierarchical command among the organisations and institutions described above. This should include both regular, and ad-hoc modes of interaction, both at the pre-active and pro-active levels.



- Description of the various governing boards, commissions and groups' actions that have direct responsibility in drought preparedness, planning, management and mitigation. Under pre-crisis and crisis situations, a very detailed description of these should be provided
- List, description and location of each stakeholder that either influences drought preparedness and management or is directly affected by it. Description of the means of communication, interaction and dependency with the map of organisations and institutions.
- At the local and stakeholders level, it would be of special interest reporting on the customary rules and actions, and their dependence from upper organisations.

In the context of DEWFORA we define Organization as a group of people who work together in a systematic way arranged in a structure. An Institution is an entity defined interactively by birth in a formal and informal way, as well as at the macro and micro level, that establish sets of rules, norms, and shared strategies for their operation in relation to law, policy, and administration. Network is a group that interacts or engages in informal communication for mutual assistance or support. The institutions relevant to drought management are those that are concerned with water law, water policy, and water administration in relation to water shortages, risks, and impacts. Institutions are NOT simply organisations and they transcend organizations. This complex broad definition implies the following ideas about institutions have regularised patterns of behaviour, informal and formal rules, explicit and implicit rules, kinds or/and levels of rules' and laws' enforcement, and formal and informal sanctioning rules.

2.5 PROACTIVE AND REACTIVE PLANS AND ACTIONS

This component of the mental model includes a description of the proactive and reactive drought preparedness and management plans that have been developed or are already developed and put in action in the past or are applied in the present, detailing the responsible organisation, and sources of funding for the plan or its actions. If no drought preparedness or management plan has been applied to the present time, focus on plans that are currently being developed. The analysis should be done at the country level and examples should be provided.

An example of a proactive plan may be an insurance policy for dry-land cereal and forage growers. An example of a reactive plan may be a list of water plants to be realized for increasing water resources (new wells, conduit for water transfer or desalination plants) or for



reducing water losses in conveyance and distribution network. An example of a reactive plan may be a programme of water use restrictions for cities (prohibition to water public parks or to clean streets).

Each plan should at least include: objectives, list target groups, logic and rationale, attempt to judge and determine its performance, either proved or potential, budget and funding sources, and bodies and offices that are responsible in design, development and application.

The revision of the plans will contribute to the interview process by identifying the potential candidates for the interview, and by outlining the main themes and questions that may be of interest to them.

2.6 MODEL VALIDATION

The mapping models presented above are validated with the participation of the Stakeholders interviewed. The process included four sequential steps. First, the theoretical involvement of the stakeholders was included in the mental model. Second, key stakeholders were interviewed to validate the model. Third, the participation of the stakeholders in the process was defined. Finally, the four mapping models were reviewed, identifying omissions, redundancies and other diverging elements. To do so, it is essential to follow the same structure developed to present the mappings.

The mental model structure validation includes the following steps:

- Final collection of information and data needed for the institutional analysis.
- Ensure that the mental model components provide a realistic representation of each country's drought preparedness and management plans as well as the country's capacity to implement them.
- Contrast the mental model with the interviews' insights and results.
- Set the framework of reference for the analysis of the strengths and weaknesses of the institutions and the Conclusions.

2.7 EVALUATION OF THE STRENGTHS AND WEAKNESSES OF THE INSTITUTIONS

This task should clearly identify the institutions strengths and weaknesses for implementing or developing drought preparedness and management plans. The analysis should consider



all aspects of the model. Table 4 outlines the major issues to be evaluated.

Table 4 Summary of the major issues to be evaluated in the analysis of the model structure

Topic	Relevant issues
Data and Information	Representation (spatial and temporal) Adequacy for risk analysis Appropriate for historical analysis Accuracy Handling Accessibility Legal data: Water right-holders records Updated registries Socio-economic data Water users Sectoral distribution Demographics Other
Institutional Organization	Organisational set-up Legal set-up Personnel capacity and training Coordination among institutions Information flows and utilisation Units in charge of drought preparedness actions Bodies in charge of developing proactive and reactive management plans NGOs and stakeholders participation
Institutional Performance	Based on the most recent drought episode Based on the present state of approved contingency plans Based on the strategies developed as a response to recent drought episodes Based on the capacity to conduct risk analysis Based on the capacity to pool risks and ensure compensation mechanisms at the lowest cost
Conflict Resolution	Levels at which conflicts are faced and solved Means to solve conflicting issues Stakeholders and users participation Groups left unattended or disenfranchised

The analysis may consider the following aspects:

- Synthetic and comprehensive view of the current state of institutions in each country in relation to all issues related to drought preparedness and management.
- Concise and specific conclusions about the institutions' performance (both based on past episodes and future contingencies) in relation to mitigation of drought impacts and anticipatory measures.
- Discussion the major strengths and challenges (impediments and weaknesses) that stand against drought preparedness and the capacity to develop and carry out management plans. Following the analysis, tentative recommendations as to what specific institutional changes would be needed to improve the current preparedness plans can be made. In some cases, specific identified changes may take place within the current political and administrative context in each country.



3. CHART OF INSTITUTIONAL RESPONSIBILITIES AND COMMUNICATION LINES IN THE CASE STUDIES

The source of information for this section is WP2.2.

3.1 MOROCCO

3.1.1 Organisations involved in drought management

The institutional responsibilities for drought mitigation from national to local level is presented in Table 5.

Table 5 Institutional responsibilities in Morocco

Institution	Responsibility	Level
Ministry of Agriculture and Maritime Fisheries		
Directorate of Plant Production (DPV)	Agricultural and Rural Development. Horizontal control, promotion, production and food processing, agricultural, industrial and other	National
Water and Ag-Engineering Administration (AGR)	Hydro-agricultural development. Administration: Agriculture and Agrarian Reform	National
National Institute Agronomic Research (INRA)	"INRA" mission is to undertake research for agricultural development.	National
Agronomic and Veterinary Institute Hassan II (IAV HII)	Higher Education, Research and Development	National
Regional Office of Agricultural Development		
Marrakech (ORMVAM), Tadla (ORMVAT), Gharb (ORMVAG), Doukkala (ORMVAD), Haouz (ORMVAH), Souss Massa (ORMVAS), Loukkos (ORMVAL) Moulouya (ORMVAM), Ouarzazate (ORMVAO)	The regional agricultural development (ORMVA), expected agricultural policy framework of the state, confined in the role of water vendors. Drowning in debt and a heavy payroll, they continue to gobble up huge budgets	Regional
National Drought Observatory (NDO)	Drought management	National
National School of Forest Engineers (ENFI)	Engineering education in State of Water and Forests.	National
Secretary of State to the Minister of Energy, Mines, Water and Environment		



Institution	Responsibility	Level
Superior Council for Water and Climate (SCWC)	The national strategy of knowledge of climate and its impact on water resources, * The national plan for water * Plans for integrated management of water resources with particular emphasis on the distribution of water between different users, transfers of water and provisions for the use and protection of water resources.	National
National Council for Environment (NCE)	Coordination and consultation, provides a forum for discussion and exchange on topics related to environment and sustainable development, and includes all departments, non-governmental organizations (NGOs), professional associations, scientific institutes and the private sector.	National
General Direction of Hydraulics , Oum Er Rbia Basin	Planning and management, integrated and collaborative water resources with a view to ensure sustainable development of the basin of the Oum Er Rbia through: harmonious management, planned, rational and sustainable water; decentralized management based on cooperation and partnership; solidarity among water users; A master of the resource and the recognition of its economic value.	Regional
Tensift basin	Coherent and coordinated planning across the river basin; Integrated, decentralized and coordinated water resource and public water; Protection and conservation quantity and quality of water resources; Optimum and rational utilization of water.	Regional
Bouregreg basin	Hydraulic Basin Agency Bouregreg and Chaouia is a public institution, endowed with legal personality and financial autonomy. Having a central role in the management and protection of public water, it initiates and implements the policy of water in its area of action.	Regional
Sebou basin	The Agency is governed by a Board chaired by the government authority responsible for water resources are represented and in which all actors in the field of water at the river basin.	Regional
lokkous basin	Assessment, planning, resource management, exploitation of hydraulic works, etc. ...	Regional
Moulouya basin	Assessment of water resources and their use of state Development of water resources of the basin Project preparation PDAIR Basin Moulouya	Regional
Massa Agadir basin	Overexploitation of groundwater increased, the increasing urbanization of the area regional emergence of new needs for water, and good governance in the management of water resources.	Regional
DPCC, Partnership and Communication Department.	Coordination of policies, plans and programs of regional planning, environment and water and Partnership Coordination of Environmental Action	Regional
Climate Change service	UNFCCC Focal Point	National
National Office for Drinking Water (ONEP)	Planning del'approvisionnement drinking water (EPA) across national -Production of drinking water -Distribution of drinking water for the local -Management of liquid waste disposal on behalf of CL - Monitoring water quality	Regional



Institution	Responsibility	Level
Directorate General of Hydraulics, (DGH)	The evaluation and monitoring of water resources; Planning their development; Management; The control and protection of their quality; The construction and maintenance works for mobilization and transfer of water.	Regional
Direction de la Recherche et de la Planification de l'Eau (DRPE)	Development and implementation of government policy planning, mobilization, management and conservation of water resources.	
Direction de la Météorologie (DMN)	Drought long term forecast and artificial rain program	Regional
High Commissariat of Water, Forests and Fight Against Desertification		Regional
HCEFLCD: High Commissariat of water, forests and fight against desertification	Coordination of the implementation of the LCD Preparation programs in watershed management and soil conservation Preparation of development plans of parks and wildlife reserves Defining strategies to protect forests, integrated development programs and ecotourism	Regional

3.1.2 Institutional responsibilities and communication lines

Overall coordination of drought management issues is the responsibility of the Permanent Inter-ministerial Council for Rural Development (PICRD), which is headed by the Prime Minister and has ability to officially declare the onset of drought. The technical secretariat of this Council is under Ministry of Agriculture and Rural Development which heads the weekly meetings of the Inter-ministerial Technical Commission once a drought episode is declared. Figure x present how institutions work together during meteorological, hydrological and agricultural droughts (Ouassou et al., 2007)

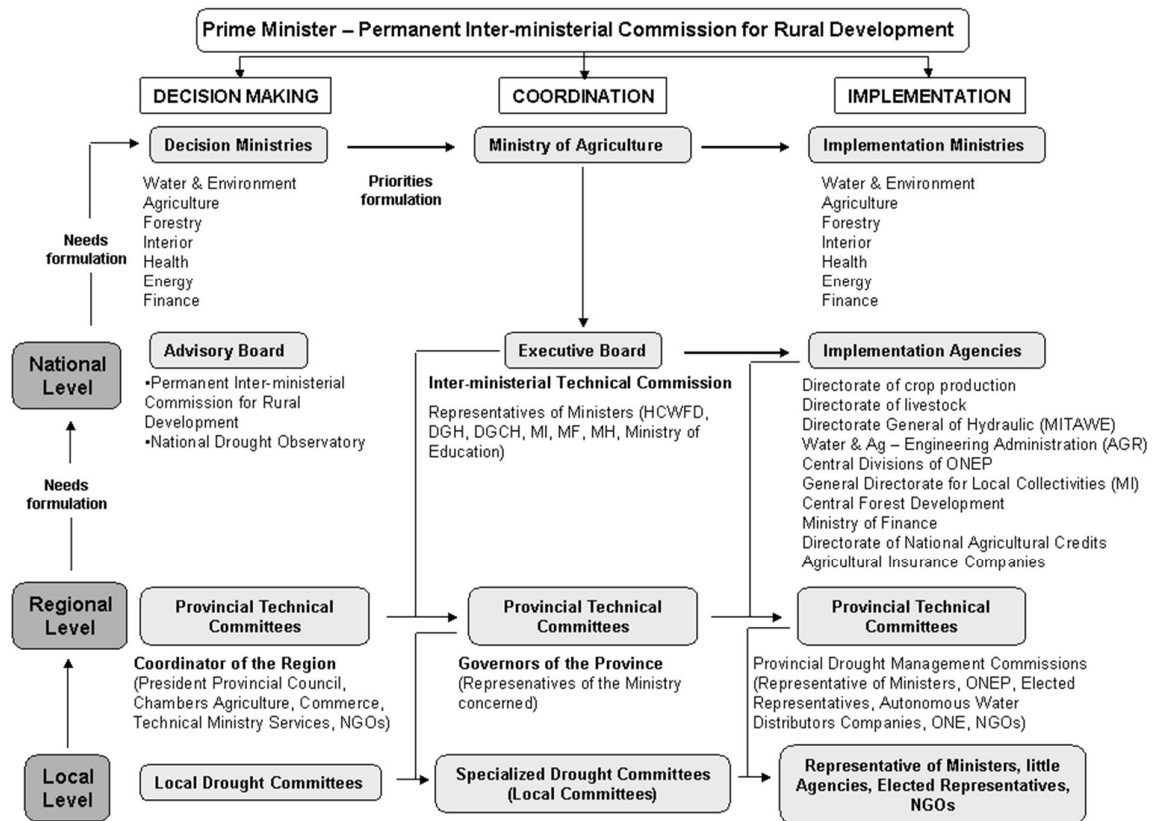


Figure 3 Drought mitigation in Morocco (Ouassou et al, 2007)

The communication lines for drought response from national to local levels, derived from case study experiences are shown in Figures 4 to 6.

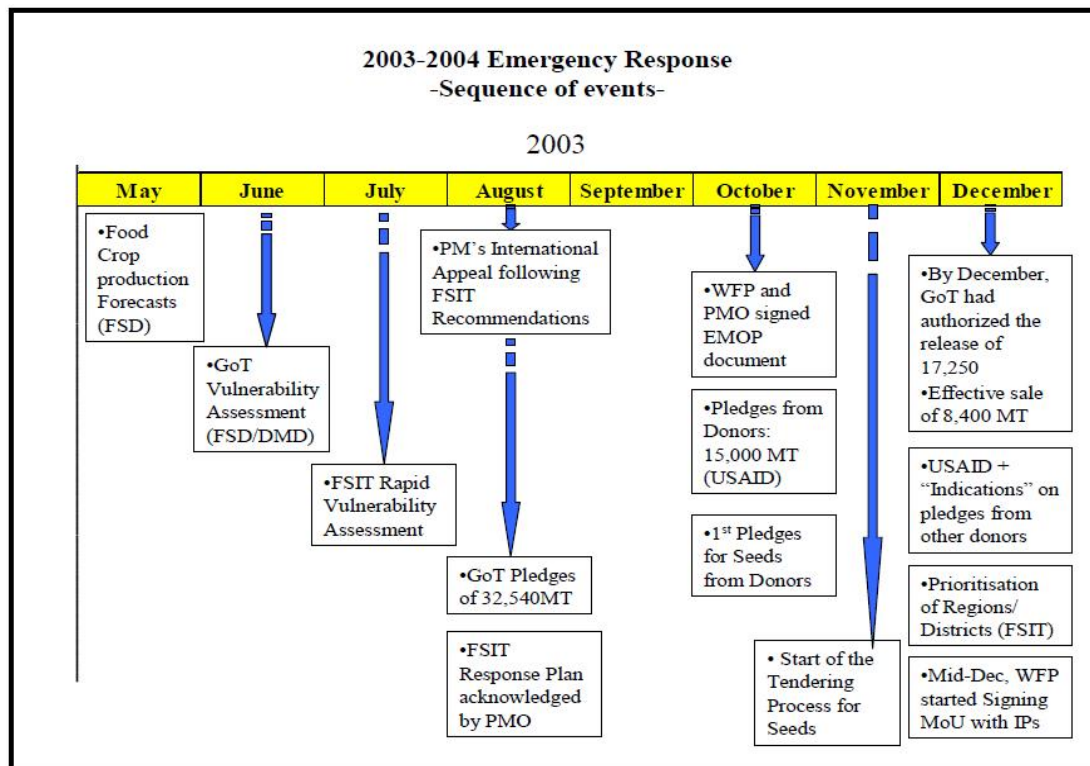


Figure 4 Sequence of events and triggers

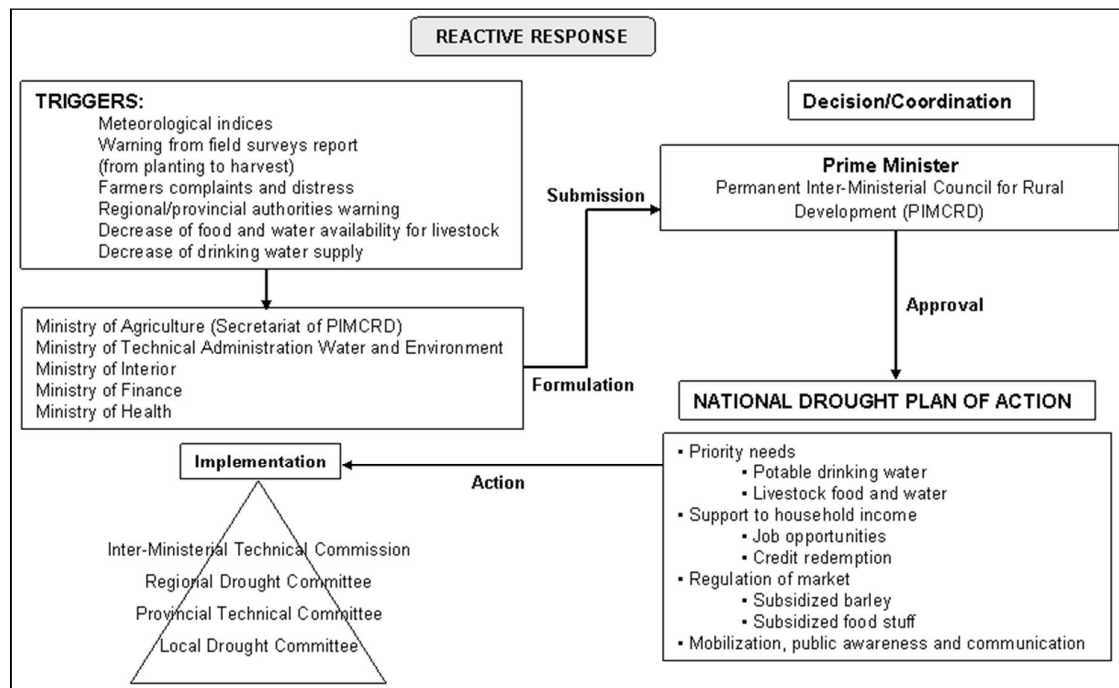


Figure 5 Response diagram: Agricultural drought

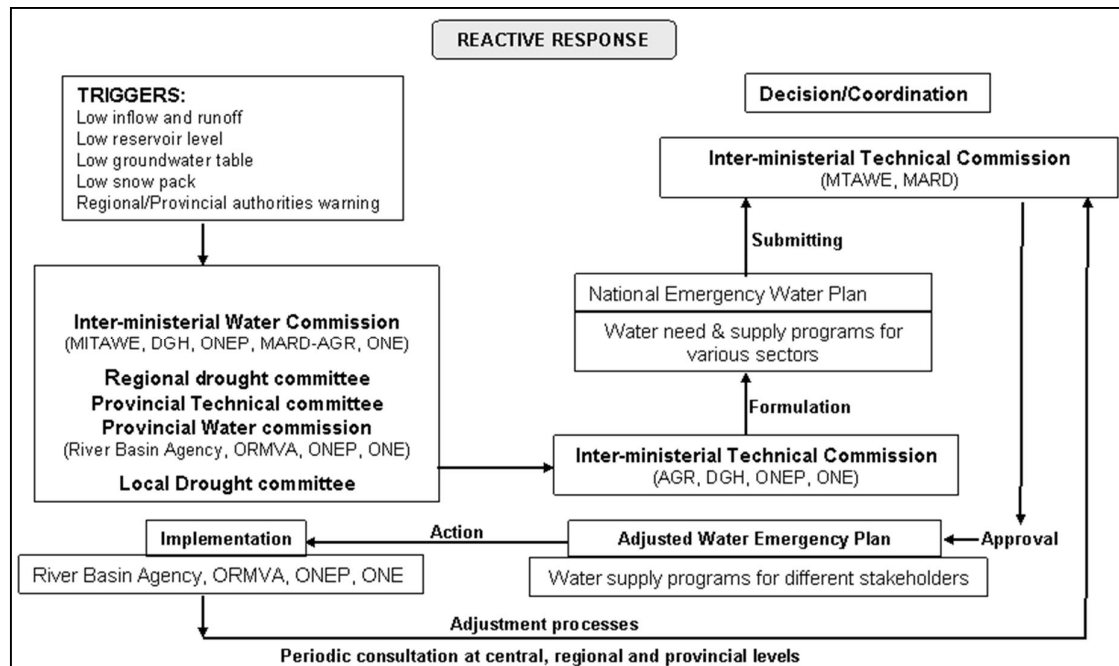


Figure 6 Hydrological drought in Morocco (Ouassou et al, 2007)

NATIONAL COMMISSIONS

In addition to the political board represented by the Permanent Inter-ministerial Council for Rural Development the other members of the National Advisory Board on drought are the National Drought Observatory, the National Meteorology Office, the Superior Council for Water and Climate and the National Environment Council. The first two structures have advisory role to their respective ministry on a continuous basis while the last two others have much less frequent consultative role on drought issues.

The Inter-ministerial Technical Commission (ITC) is the basis of the National Executive Board. It includes ministry representatives of Agriculture (MADR), Forestry (HCFWFD), Water (DGH, ONEP), Energy (ONE), Interior (MI), Health (MH), Finance and Credits (MF, CNCA). The ITC meets weekly to report to the Permanent Inter-Ministerial Council for Rural Development which, based on the Commission report and the information provided by the advisory bodies, may or may not declare drought and drought affected regions. If drought is declared nationwide, then the National Drought Mitigation Plan is set for execution. This is basically the reactive relief dimension of the plan that has to be implemented and supervised at the national, regional / provincial and local levels.



The Regional Drought Committee is headed by the Wali of the Economic Region, who normally supervises more than one province in the Region while the Province is headed by a Governor. The regional drought committee is responsible for all decisions pertaining to the national drought mitigation plan related measures and actions to be implemented in the region. This committee includes representatives of key ministries (ONEP, ORMVA, DPA) and elected members of the rural and urban collectives of the region, in addition to active NGO's operating in the region. The coordinating role and the composition of the Provincial Technical Committee at the province level are similar to those of the regional drought committee at the region level. At the local level, a number of Local Drought Committees / Specialized Drought Committees representing ministry line agencies and NGO's are responsible for detailed examination of the content of the proposed measures in order to match the needs of the local drought affected population, livestock and environment. At the different levels of implementation of the national drought mitigation plan, political pressure groups and elected members of the local communities become actively involved.

THE DROUGHT NATIONAL COMMISSION (DNC)

The DNC includes representatives of MAERH, and of ministries of Interior, Economic Development, Finances, Commerce, Transport, and Public Health. Its main missions are to: (i) to keep track of the drought circumstance; (ii) to elaborate the measures and provisions against the drought situation (intensity, duration, etc.); and (iii) to coordinate the execution of drought mitigation operation programs.

THE DROUGHT REGIONAL COMMISSIONS (DRC)

For each one of the 24 Tunisian Governorates, there is a Drought Regional Commission (DRC). The members belong to the Regional Departments of all Ministries involved in drought mitigation. The UTAP is associated. The main task of DRCs is to present the situation of the different sectors and inform the national authorities about the necessary measures for drought management if observed in their regions.

THE DROUGHT SPECIALIZED COMMISSIONS (DSC)

The drought Specialized Sectors Commissions (DSC(s)) are responsible for the preparation of the drought indicators observed in each field. They propose an operation planning and scenarios for mitigation of the different eventual drought events. The DSC(s) include the Water Resources Management, livestock safeguard and Cereal Sector management and arboriculture committees.

In Morocco, most ministerial departments dealing with water management including agriculture, water and environment, forestry, interior, health, energy and mines, and finance,



are also concerned with drought management. Overall coordination of drought management issues is the responsibility of the Permanent Inter-ministerial Council for Rural Development (PICRD), which is headed by the Prime Minister and has ability to officially declare the onset of drought. It is himself under the supervision of the Superior Council for Water and environment. The technical secretariat of this Council is under Ministry of Agriculture and Rural Development which heads the weekly meetings of the Inter-ministerial Technical Commission once a drought episode is declared. Overall drought management in Morocco is under the supervision of national and regional committees.

NATIONAL ADVISORY BOARD

In addition to the political board represented by the Permanent Inter-ministerial Council for Rural Development the other members of the national advisory board on drought are the National Drought Observatory, the National Meteorology Office, the Superior Council for Water and Climate and the National Environment Council. The first two structures have advisory role to their respective ministry on a continuous basis while the last two others have much less frequent consultative role on drought issues.

NATIONAL EXECUTIVE BOARD

The Inter-ministerial Technical Commission (ITC) is the basis of the executive board at the national level. It includes ministry representatives of Agriculture (MADR), Forestry (HCFWFD), Water (DGH, ONEP), Energy (ONE), Interior (MI), Health (MH), Finance and Credits (MF, CNCA). The ITC meets weekly to report to the Permanent Inter-Ministerial Council for Rural Development which, based on the Commission report and the information provided by the advisory bodies, may or may not declare drought and drought affected regions. If drought is declared nationwide, then the National Drought Mitigation Plan is set for execution. This is basically the reactive relief dimension of the plan that has to be implemented and supervised at the national, regional / provincial and local levels.

REGIONAL AND LOCAL SETTING OF DROUGHT MANAGEMENT

The Regional Drought Committee is headed by the Wali of the Economic Region, who normally supervises more than one province in the Region while the Province is headed by a Governor. The regional drought committee is responsible for all decisions pertaining to the national drought mitigation plan related measures and actions to be implemented in the region. This committee includes representatives of key ministries (ONEP, ORMVA, DPA) and elected members of the rural and urban collectivities of the region, in addition to active NGO's operating in the region. The coordinating role and the composition of the Provincial Technical Committee at the province level are similar to those of the regional drought committee at the region level. At the local level, a number of Local Drought Committees /



Specialized Drought Committees representing ministry line agencies and NGO's are responsible for detailed examination of the content of the proposed measures in order to match the needs of the local drought affected population, livestock and environment. At the different levels of implementation of the national drought mitigation plan, political pressure groups and elected members of the local communities become actively involved.

3.2 TUNISIA

3.2.1 Institutional responsibilities

The drought management system in Tunisia is based on drought announcement and MAERH Minister decisions to cope with drought and the duties loaded to the National Commission, which is charged by the supervision of the execution of all the operation actions related to the 3 drought management phases: (i) before–drought preparedness; (ii) during–drought management; and (iii) after–subsequent drought management. This process has a strong collaboration of the regional and sectorial or specialized committees. The MAERH, promulgates several decisions related to the different drought committees and the operations programme for the drought mitigation instead of its crisis management. The Tunisian Central Bank (BCT, Banque Centrale de Tunisie), delivers a circumstance circular establishing easiness in the credits delivery for farmers. Special decisions are taken in order to exempt the importation from the custom duties.

In order to reduce the resulting effects of the drought in Tunisia, a related management system was developed and adopted for the drought events that occurred during 1987-1989 and 1993-1995.

3.2.2 Communication lines for drought response

The drought management system in Tunisia consists of 3 major successive steps as follows:

Drought announcement: Referring to rainfall, hydrologic and agricultural indicators observed in the different regions affected by drought and transmitted by the agricultural, economic, and hydrologic districts (services) relevant to MAERH, a drought announcement is established by a circumstance memorandum. This announcement, qualified as a warning note, is transmitted to the MAERH Minister, who proposes a scheduled operations plan to the National Commission, which is composed by decision makers and beneficiaries. The National Commission is in charge of the supervision of the execution of all the operation

actions, with strong collaboration of the regional and specialized committees. The National Commission also supervises all operations when the drought is over. These steps are also illustrated in Figure 7.

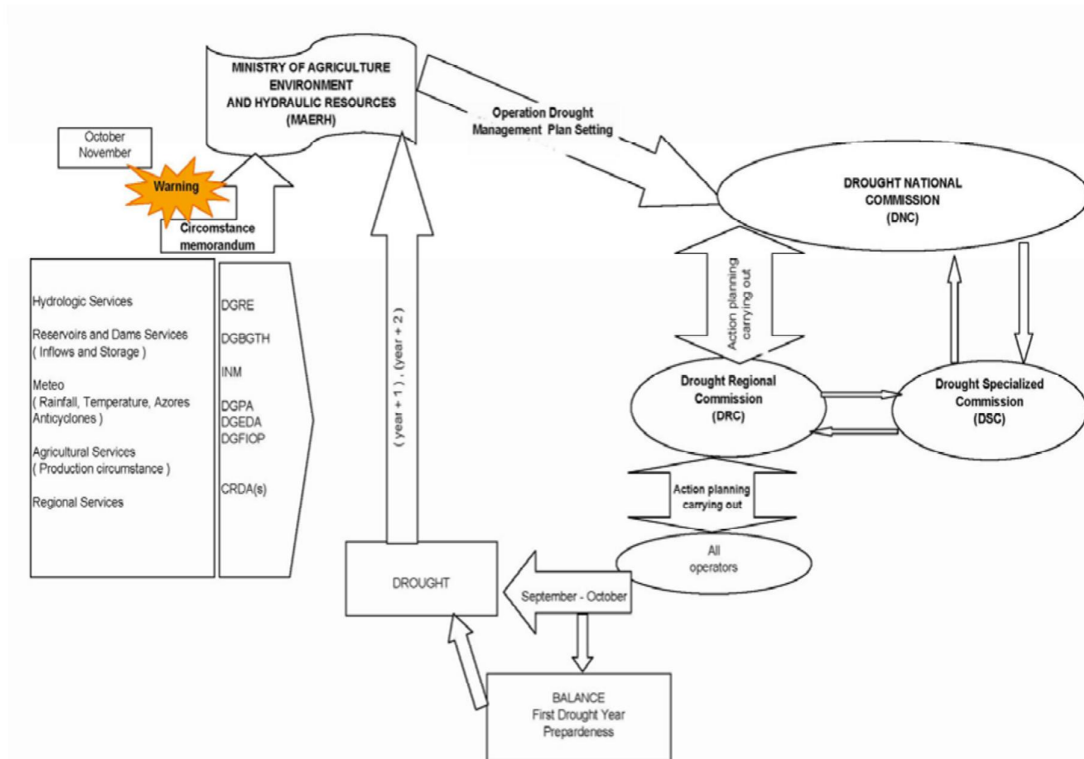


Figure 7 Drought preparedness and management in Tunisia (from Louati et al., 2007)

In order to ensure an efficient drought management, three types of committees are established namely: The Drought National Commission (DNC), The Drought Regional Commissions (DRC) and The Drought Specialized Commissions (DSC).

THE DROUGHT NATIONAL COMMISSION (DNC)

The DNC includes representatives of MAERH, and of ministries of Interior, Economic Development, Finances, Commerce, Transport, and Public Health. Its main missions are to: (i) to keep track of the drought circumstance; (ii) to elaborate the measures and provisions



against the drought situation (intensity, duration, etc.); and (iii) to coordinate the execution of drought mitigation operation programs.

THE DROUGHT REGIONAL COMMISSIONS (DRC)

For each one of the 24 Tunisian Governorates, there is a Drought Regional Commission (DRC). The members belong to the Regional Departments of all Ministries involved in drought mitigation. The UTAP is associated. The main task of DRCs is to present the situation of the different sectors and inform the national authorities about the necessary measures for drought management if observed in their regions.

THE DROUGHT SPECIALIZED COMMISSIONS (DSC)

The drought Specialized Sectors Commissions (DSC(s)) are responsible for the preparation of the drought indicators observed in each field. They propose an operation planning and scenarios for mitigation of the different eventual drought events. The DSC(s) are as following:

- **Water Resources Management Committee.** This Committee regroups representatives of all departments involved in the water management in MAERH. The INM (relevant of Ministry of Transport) and the Ministries of Interior and Public Health are also associated in this committee. Referring to the data collected by the DRC, this committee has to analyse the water resources situations, to establish the drought indicators related to water resources and to elaborate diverse water management scenarios that should be adopted. The DSC submits a measures programme to the approbation and decision making by DNC.
- **Livestock Safeguard Committee:** Organizations and institutions not involved in water management but that are associated in drought mitigation, are represented in the Livestock Safeguard Committee. The latter is formed by representatives of organizations and institutions that are involved in the animal husbandry within MAERH. The UTAP is associated in the activities of this committee, and the Ministries of Commerce, Transport, Interior, Finances and Economic Development. In collaboration with the DRC, the committee identifies the forage stocks and reserves, analyses the fodder crop fields and fits the livestock health situation. Depending on the drought intensity, this committee has to elaborate an intervention programme and to establish the eventual importations needs in order makeup the eventual forage deficit.
- **Cereal Sector Management Committee:** This committee is organized by the cereal sector intervening parties. Its members are representatives from different departments of the MAERH and also the Ministries of Finances and Economic Development. This



committee has to quantify the cereal production stocks and seeds reserves, to propose a programme in order to promote the irrigated cereal production, to enhance the production collecting, with a principal preoccupation of satisfying the seeds demand for the next year. In the case of insufficiency in cereals, an importation programme is elaborated.

- Arboriculture Sector Committee: The members of this committee work in the arboriculture departments of MAERH and are concerned with the situation of all trees and aim the arboriculture heritage (patrimony) safeguard.

3.3 EGYPT

3.3.1 Organisations involved in drought management

In 2002, EEAA formulated a vision for EEAA which included economic and social aspects in sustainable development. EEAA formulated the first National Egyptian Action Plan NEAP. A Climate Change Unit was established to be a focal point. In 1985 Ministry of water resources and Irrigation has implemented the planning sector for Nile forecasting and High Aswan Dam Operations. The forecasting center activities expanded and now he was developing a regional climate model supported by UK MetOffice. In 1994 the national water Research center establishment a research institute concerning with the environmental and climate changes issue with relevant to the water resources. Most of the previous sectors and ministries are mentioned, they are coordinating with the other sectors. The institutional framework is presented in Figure 8.

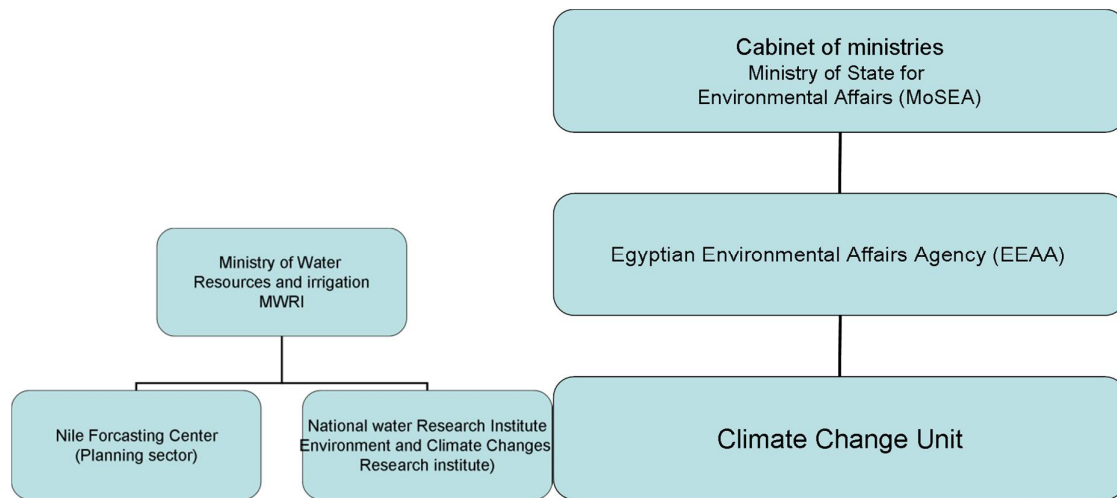


Figure 8 Intuitional framework for drought management in Egypt

3.4 TANZANIA

3.4.1 Chart of institutional responsibilities

A formal structure exists nationally for disaster preparedness, response and recovery management (see Figure 9). The central decision making body of executive government that address disaster management is National Disaster Relief Committee (TANDREC). TANDREC is chaired by the Permanent Secretary of Prime Minister’s Office. TANDREC has been in operation since 1990 when the law was enacted. The committee is composed of Permanent Secretaries from Ministries together with heads of early warning institutions namely: Tanzania Meteorological Agency (TMA), Food Security Department, and Fire and Rescue Department. Its main function is to oversee and coordinate activities of the government designed to secure effective prevention of disasters, preparedness and operational affairs in an event of disaster.

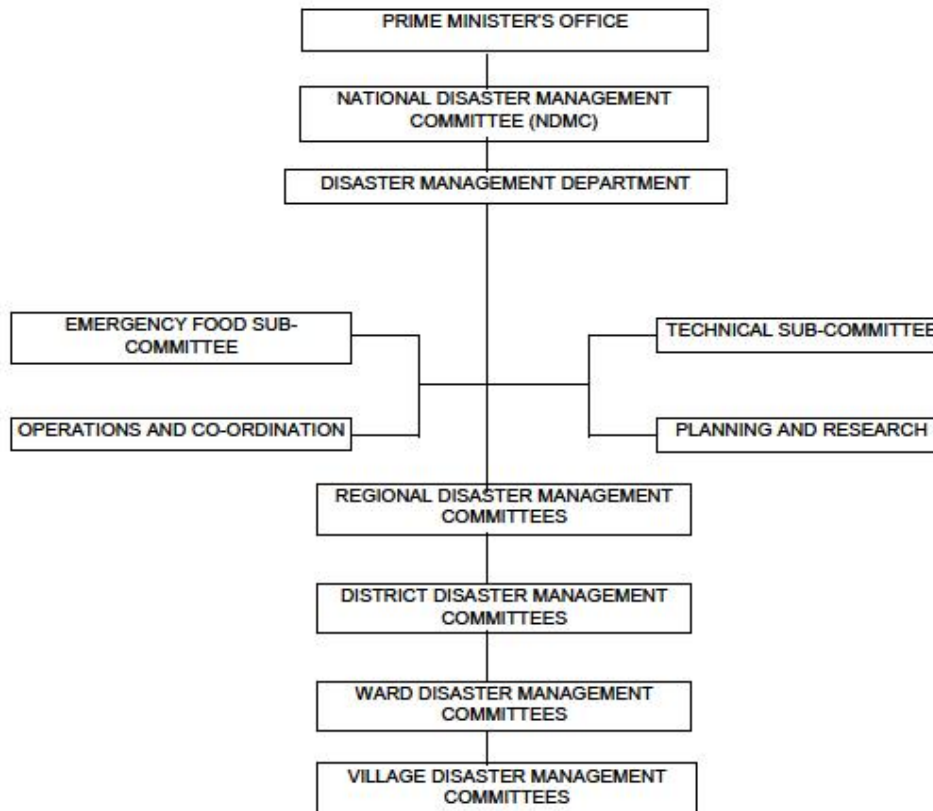


Figure 9 Current disaster management structure in Tanzania (Amani and Standen, 2004)

The functions of the DMD are set up in the Disaster Management Act No 9 (1990). Paraphrased in an action form for the purpose of guidelines these functions fremergency situations are (Amani and Standen, 2004):

- (1) Assume a coordination role for disaster response upon the government's declaration of a state of disaster-induced emergency until the national crisis ends;
- (2) Set up the provision of early warning predictions and other information required, and consult widely and prepare an appeal for donor assistance;
- (3) Implement the appropriate national disaster relief plan to meet current emergency requirements, assisting to mobilize the strategic reserves, other internal resources and external assistance;



- (4) Assist with the establishment of a national disaster relief budget to meet the requirements of the current emergency, to manage the budget, and to allocate funds for emergency disaster relief program;
- (5) Coordinate the implementation of a national reconstruction and rehabilitation plan during the current emergency, thus ensuring the country's full post-disaster recovery, and to assist with the funded plan's integration within government's mainstream national development plan; and Review and evaluate the response to the emergency, recording lessons learnt, conclusions drawn and recommendations made in the national post-disaster review report.

The initial composition of FSIT is presented in Table 6.

Table 6 The initial composition of the FSIT in Tanzania

Institutions	Specific Organization / Department
Government of Tanzania	Disaster Management Department (DMD), Prime Minister's Office (PMO)
	Food Security Department (FSD), Ministry of Agriculture, Food Security and Cooperatives (MAFC)
	National Bureau of Statistics (NBS), Planning Commission – Office of the President
	Tanzania Food and Nutrition Center (TFNC), Ministry of Health
	Tanzania Meteorological Agency (TMA), Ministry of Infrastructure Development
	Regional Coordination Department (Ministry of Regional Administration & Local Government)
International Agencies	DFID
	EU
	FAO
	UNICEF
	USAID/FEWS
	WFP/VAM
NGOs	CARITAS
	NPA
	OXFAM-GB
	Save the Children (SC-UK)
	Rural Food Security Team (IDS)

3.4.2 Communication lines for drought response

The communication lines for the institution responsible for early warning systems in Tanzania are outlined in Figure 10.

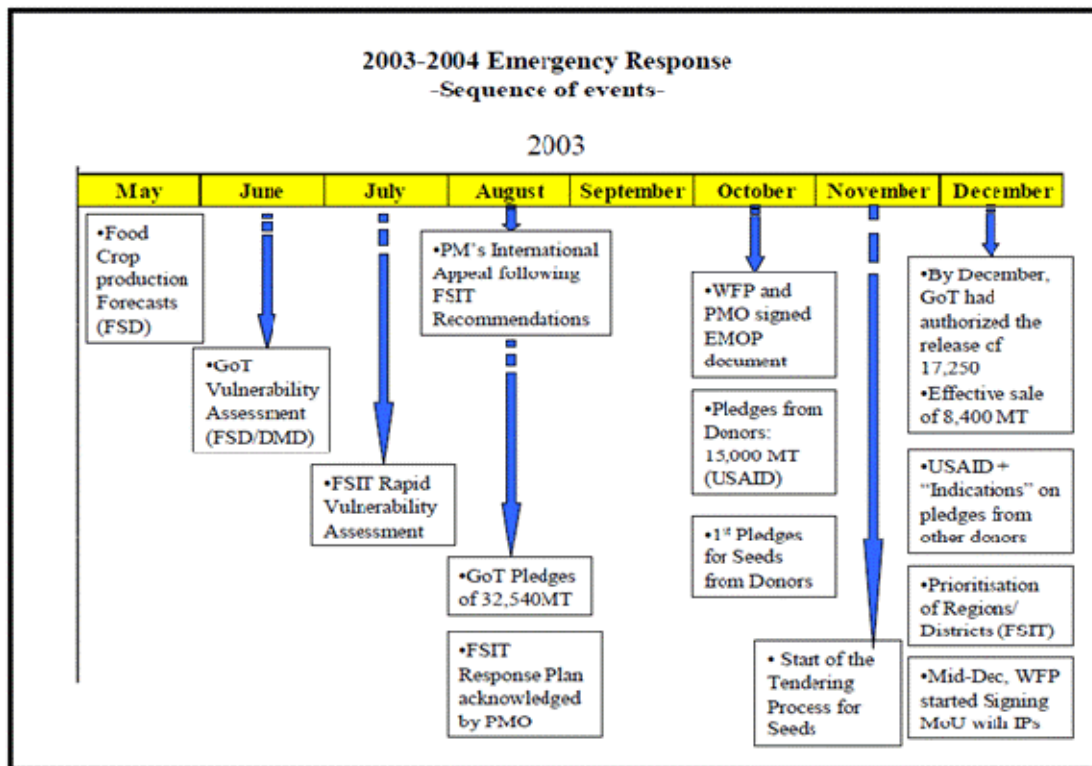


Figure 10 Sequence of events and institutions interactions during May to December 2003 in Tanzania. Source: Amani and Standen, 2004

3.5 BOTSWANA

3.5.1 Chart of institutional responsibilities and communication lines

The machinery of local government in Botswana reflects a long tradition of democratic consultation and devolved decision-making, and plays a crucial role in development processes, particularly in rural areas. There are four different types of local authorities as follows:



- District and urban councils have stipulated functions by law and their responsibilities include provision of primary education, primary health care, tertiary and access roads and water supplies, as well as related issues such as sanitation, social and community development, the administration of self-help housing agencies, municipal abattoirs and markets.
- Tribal administration is composed of chiefs, subchiefs, headmen, administrative staff and the local police force. Apart from holding office in the traditional house of chiefs, the chiefs preside over customary courts that handle 85 percent of criminal cases and 90 percent of civil cases in Botswana. There are 361 customary courts and 2 courts of appeal. Chiefs also take care of the kgotla, an important traditional meeting place where cases are tried, information disseminated on government policies, and where public participation is encouraged. Elections to the village development committees are held at the kgotla every two years, and these committees coordinate development activities within districts.
- Tribal land boards, of which there are 11, have statutory powers to allocate tribal land for residential, commercial, industrial, arable and grazing use. Some 50 percent of the land board members are elected, the remaining members being appointed by the Minister of Local Government, Lands and Housing. The land boards, which may grant customary and common law land rights in accordance with the Tribal Land Act, hold tribal land in trust. They can also cancel land use rights and impose restrictions on land use.
- District administration in Botswana is divided into 10 administrative districts and 15 subdistricts, with 9 district councils. The larger districts are divided into subdistricts for ease of administration. A district commissioner coordinates the range of development activities carried out at district level by central government, local authorities and other agencies. The district commissioner chairs the district development committee, which is an advisory body that addresses development issues that affect the district. It is made up of senior representatives of central government, the district council, the land board, the tribal administration, parastatal and other government development agencies at the tribal level.

The institutional framework is illustrated in Figure 11.

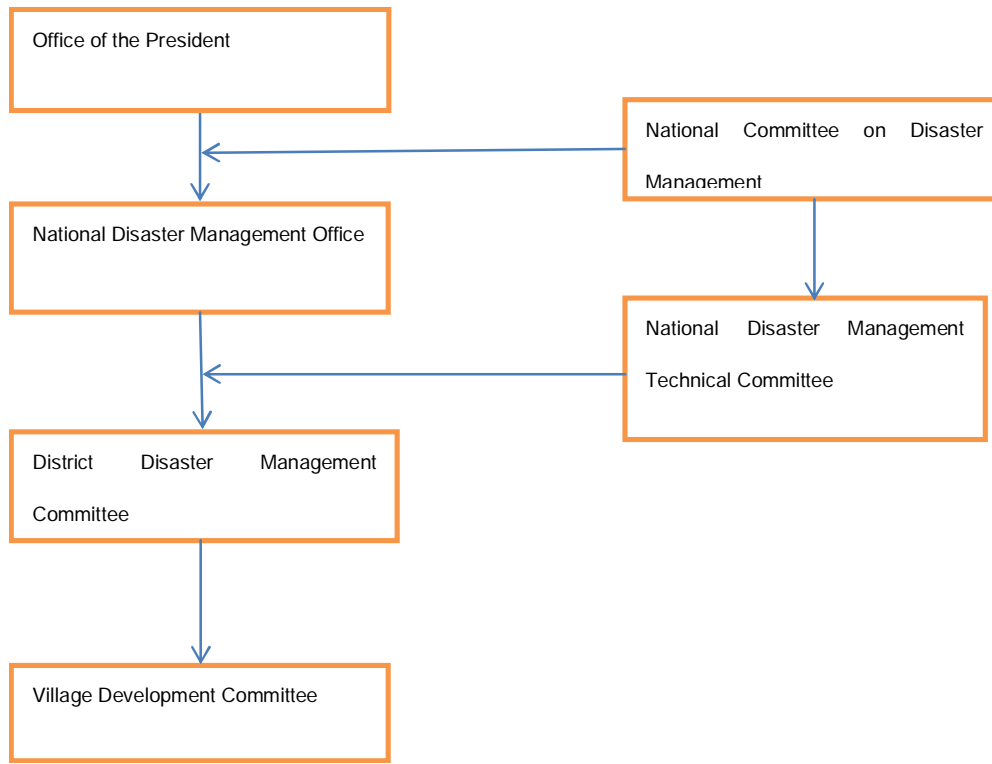


Figure 11 Disaster management framework in Botswana. Source: www.gov.op.bw

3.6 MOZAMBIQUE

3.6.1 Chart of institutional responsibilities and communication lines

According to MICOA (2006), in Mozambique there is not a specific Institutional Framework for droughts, there is only a Framework for mitigation which is used for all disasters phenomena. The Ministry of Agriculture (MINAG) and the Technical Secretariat of Food Security and Nutrition (SETSAN) with support of FAO have developed a preliminary Mitigation Action Plan. The purpose of the action plan is to establish basic means to overcome the adverse drought conditions by improving the ability of households to cope and adapt, based on local recommendations and experiences. Although the plan does not contemplate direct food assistance, some activities are implemented through *food-for-work*

and other intervention programs in coordination with local authorities (FEWS NET, 2005). The institutional framework is illustrated in Figure 12.

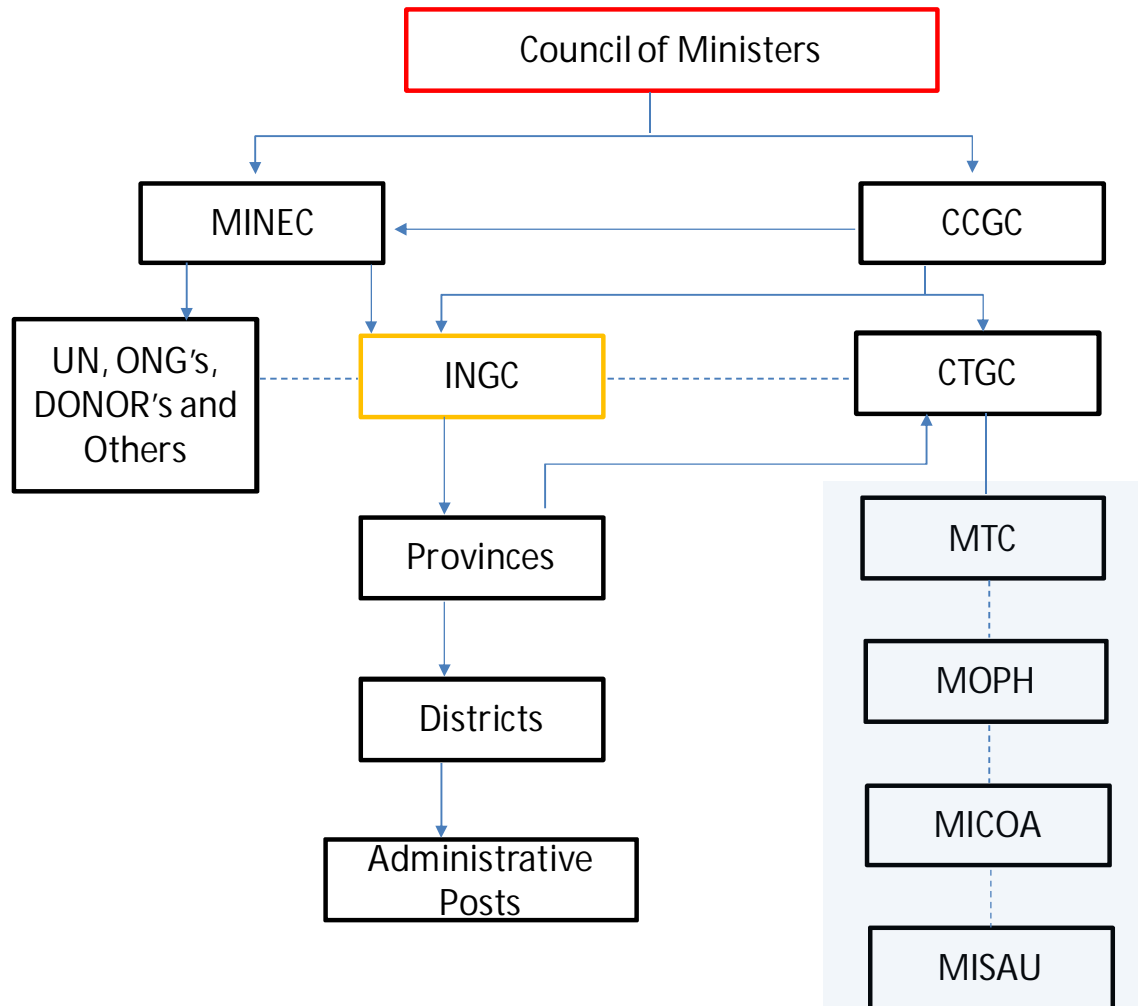


Figure 12 Institutions of coordination and management of disasters in Mozambique. Source: MICOA, 2006

The institutional framework for natural disaster management in Mozambique is illustrated in Figure 13.

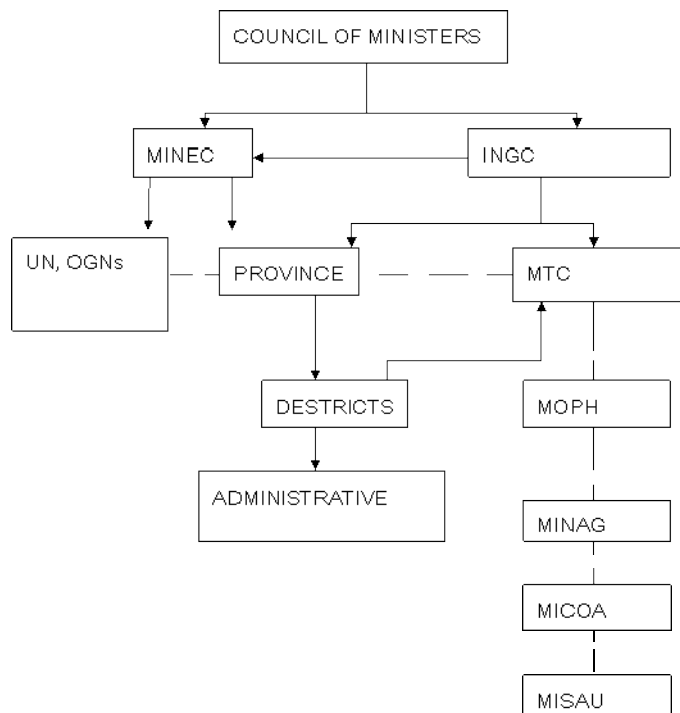


Figure 13 Institutions that coordinates disasters management in Mozambique (MICOA, 2006)

The organizational structure is the same at local level. After the information has been processed by INAM, the MINAG and INGC interpret this information in terms of crop water satisfaction index. The analyses are planned and done from September where other institutions are invited to provide their inputs. Thereafter, and through the extension officers this information is broadcasting to the provincial and district governments and then farmers.

3.7 SOUTH AFRICA

3.7.1 Chart of institutional responsibilities

During the 1992 drought, a large number of NGOs and government departments launched the National Consultative Forum on Drought (NCFD) to coordinate a response to the drought crisis in the country. This initiative represented the broadest grouping of forces in the history of drought response in the country (AFRA, 1993). The objective of the NCFD was to ensure that relief reached the worst affected sectors and to promote the cause of the rural poor.

Serious problems emerged in the implementation of the drought relief activities. The problems included: inadequate funding, rigid geographical jurisdictions, poor coordination,



lack of personnel, lack of drought relief experience, poorly publicized relief measures, lack of legitimacy, poor community relations, and rigid “top-down” approaches. Owing to the absence of a common national approach to relief, most state structures at local and regional level had to act ad hoc through the drought period. The absence of meaningful community representation on any of the drought relief structures meant lack of accountability and the communities were excluded from the process of drought relief (AFRA, 1993). Additional shortcomings of past drought relief programmes included:

- Inefficient delivery mechanisms made it easier to deliver aid to communities that had better access (e.g. communications, social and physical infrastructure) than to the really disadvantaged rural dwellers.
- Ineffective credit schemes prevented farmers from developing better farm management capacity or understanding a constructive credit culture. By writing off production credit, the main aid recipients were the government-controlled banks and development corporations, which were protected from risk, rather than the farmer borrower.
- Ineffective livestock schemes, such as feed provision, subsidizing purchased feeds, subsidizing and encouraging farmers to offload surplus stock, and even operating State feedlot schemes, failed to be equitable. Moreover, they encouraged livestock owners to expect government to bear the full risk.
- Interpret diagram

The institutional framework at the National level is is illustrated in Figure 14.

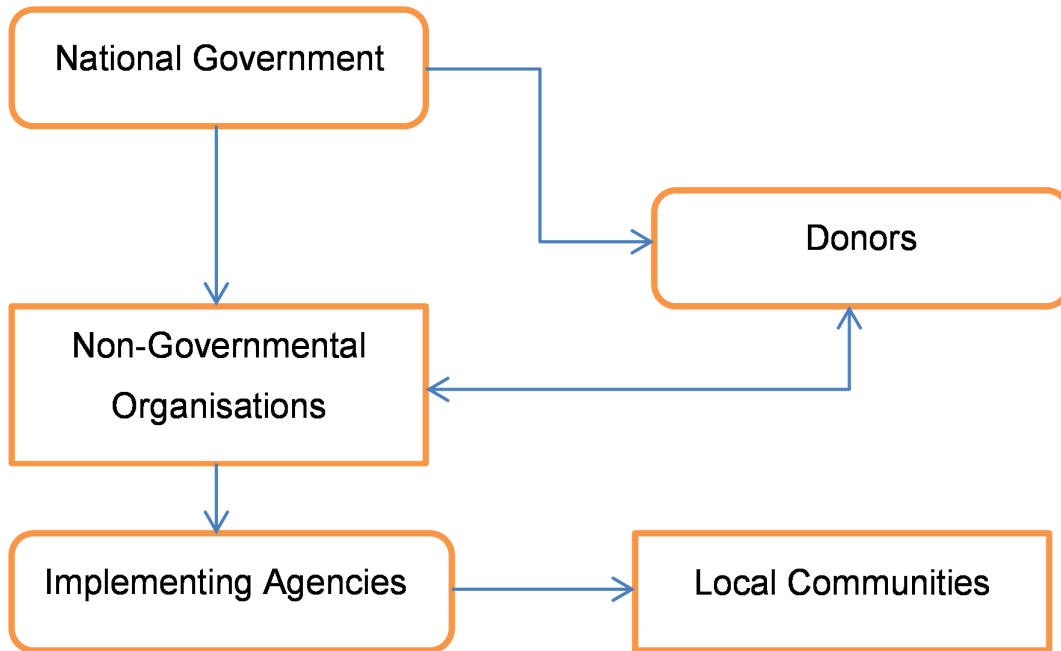


Figure 14 Drought institution coordination framework in South Arica

The National Disaster Management Framework in South Africa is presented in Figure 15.

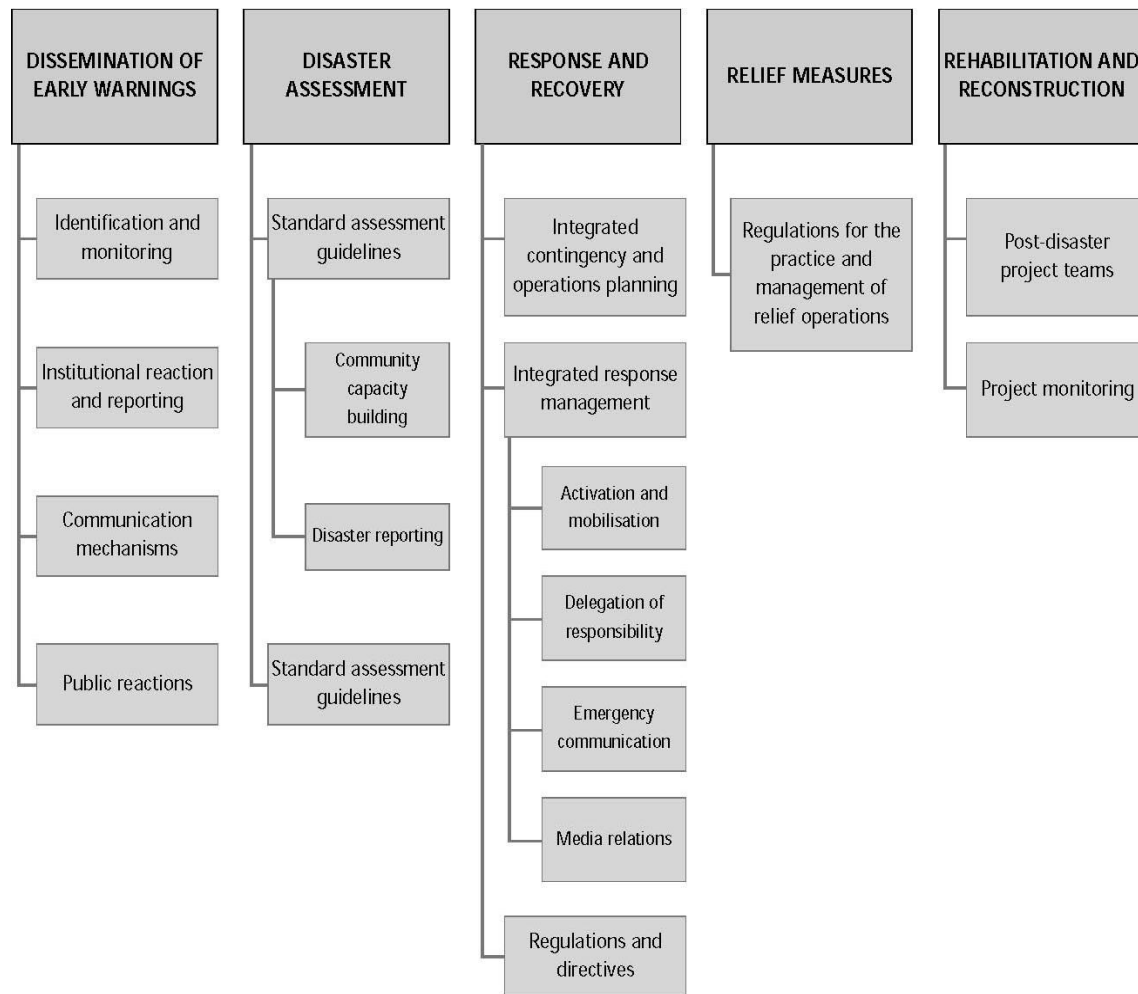


Figure 15 National disaster management framework in South Africa

3.7.2 Communication lines for drought response

The communication lines for drought response from national to local levels, derived from case study experiences are shown in Figure 16.

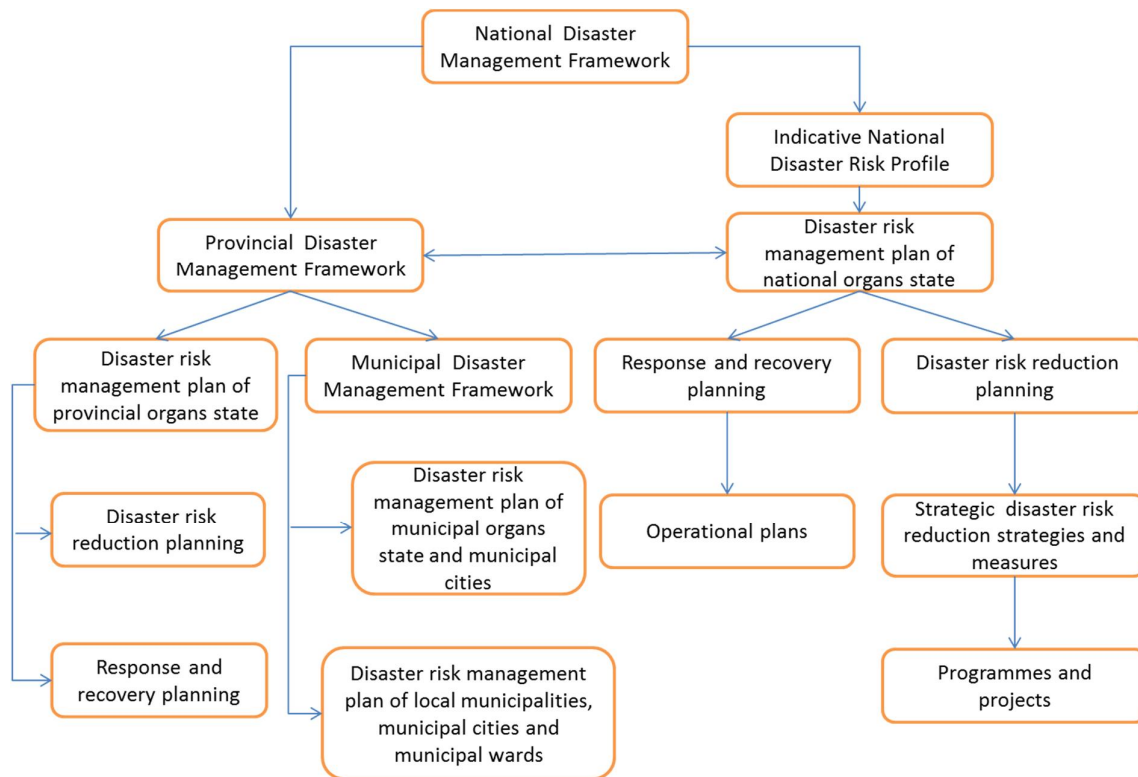


Figure 16 National and provincial disaster management in South Africa

3.8 ZIMBABWE

3.8.1 Chart of institutional responsibilities

The National and Provincial institutional setup was put in place to tackle the 1992 drought in Zimbabwe. The National Drought Consultative Council, chaired by the Vice President, consisted of representatives from Ministries as well as international agencies directly involved in drought relief. The Drought Relief Programme carried out to relieve the impacts of 1991/92 drought was a major success as it helped to avert famine for half of the population severely affected by drought (Munro 2006; World Bank 1995).

The institutional framework is illustrated in Figure 17.

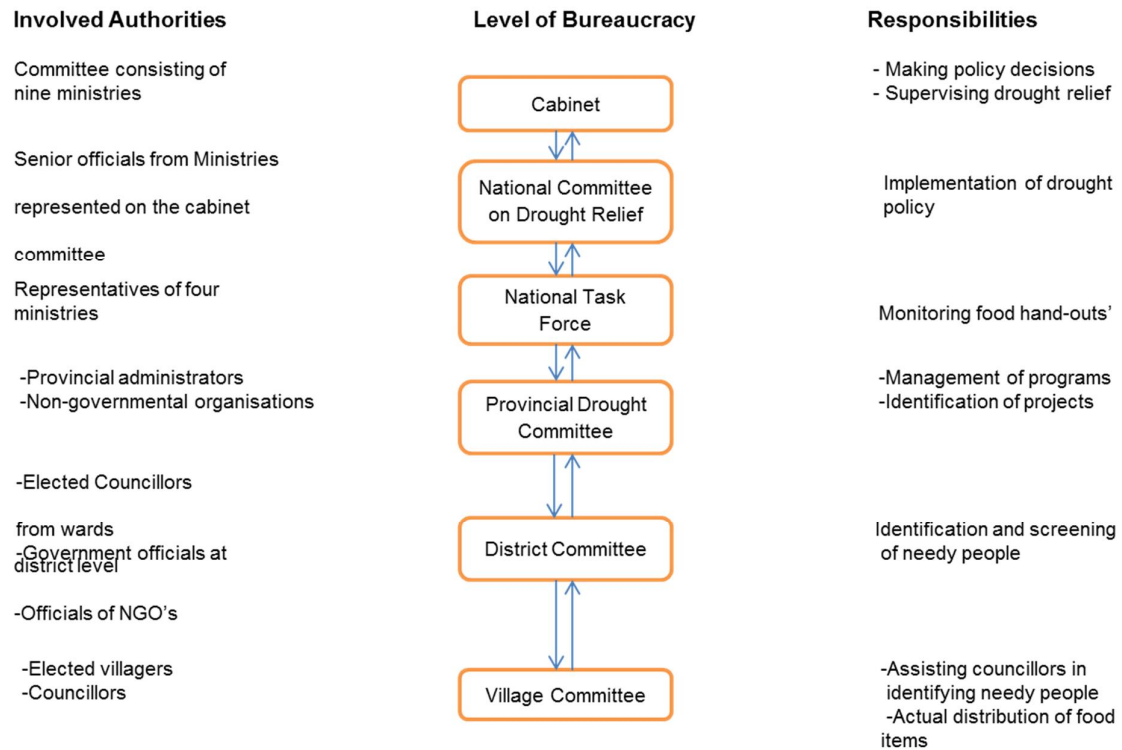


Figure 17 Drought Institution coordination framework in Zimbabwe

3.8.2 Communication lines for drought response

The communication lines for drought response from national to local levels, derived from case study experiences are shown in the following diagram:



3.9 PROPOSED INDICATORS IN THE CASE STUDIES

Table 7 summarises the suggested indicators in the case studies based on the objectives and the tools and models available in Dewfora.

Table 7 Summary of the suggested indicators in the case studies based on the objectives and the tools and models available in Dewfora

Case study	Focus of the early warning	Suggested indicators
Oum-er-Rbia Basin	<p>Agriculture</p> <p>Strategic importance providing water to irrigated and rain-fed agriculture, mining, large manufacturing industries, and water transfers to large cities, including Casablanca and Marrakech. Optimisation of water release to irrigators and analyze the effectiveness of adapted agricultural practices on vulnerability.</p> <p>Optimisation of crop management to dryland, early warning doe insurance</p> <p>Committee that takes decisions on drought</p>	Streamflow, crop yield, rainfall, adaptive capacity, exposure
Niger River basin	<p>Wetlands</p> <p>Encompasses nine countries, about 30% of the basin is located in Mali, one of the poorest countries in the world where agriculture is a main economic activity that depends on the onset and intensity of the annual monsoon</p> <p>Application of a mesoscale distributed eco-hydrological model combining hydrology, vegetation and agriculture.</p> <p>Pilot the drought preparedness by predicting future hydrological and agricultural drought risk through climate projections. Wetlands in the inner Niger delta.</p>	Precipitation, streamflow, reservoir operation, state of ecosystems, adaptive capacity, exposure
Limpopo Basin	<p>Institutional</p> <p>Only source of water for millions of people, shared basin</p> <p>Improve the flow of information</p> <p>Mental model</p> <p>Regional analysis because the shared basin has sto have a good coordination struncture</p> <p>To give the gap analysis, to look into the institutional set-up</p> <p>Provide recommendations for improving institutional structure</p> <p>Include several types of end-users and analyze how the issued warnings flow through the institutional structure</p>	Precipitation, streamflow, crop yields, management rules, institutional response, adaptive capacity, exposure
Eastern Nile Basin	<p>Water</p> <p>Only source of water for millions of people</p> <p>Water allocation is a controversial issue and cause of tensions between the countries, analyse Blue Nile and Atbara Basins</p>	Hydrological indicators, adaptive capacity, exposure
Pan-African	<p>Value of the forecast</p> <p>Develop and test a pre-operational system for drought monitoring and forecasting in Africa at the continental scale, using medium-range, monthly and seasonal probabilistic forecasts</p> <p>Extreme forecast indices Development and implementation of the African drought map server</p>	Extreme forecast indices, Precipitation, SPI



4. OVERVIEW OF THE CURRENT DROUGHT MANAGEMENT STRUCTURE

4.1 REGULATION FRAMEWORK

Drought management policies should be based on integrated evaluation of all those measures required to implement the objectives of the water policy together with those measures required under other policies and relevant legislation. This section reviews the extant legal initiatives and present legislation explicitly focussing in drought risks. The section provides a description, ordered hierarchically, of all laws, rules, norms, and statutes that are presently in force in each country with connection to water uses, management, conservation as well as land uses and the natural environment, as it concerns or are influenced by all types of drought. The water and drought Legal Framework are all laws and regulations related to water resources management, wastewater management, non-conventional water resources and environment related issues. The legal framework includes all laws on national, regional, district and local levels including international agreements or regulations in force.

African countries have extensive legal provisions (legislation and normative) related to water management focusing on water scarcity. The existing legislation enables governments to develop specific drought mitigation plans, both of proactive and reactive nature. The legislation is an instrument that allows governments to implement drought mitigation plans and drought relief policies. Effective legal provisions need to include budget for implementation of the measures. In general the laws focus on drought management strategies adopted under stress situations, providing conditions for emergency actions.

The United Nations Convention to Combat Desertification (UNCCD, 2000), provides the framework for implementing drought mitigation strategies. The convention is especially relevant to Southern African countries.

In the DEWFORA countries, the legislation has evolved as consequence of severe historical drought episodes, such as 1993-95, and 2001. Identification of the legal base in African Countries that enables governments to develop specific drought mitigation plans, both of proactive and reactive nature. The current legislation offers opportunities to governments to use instruments to develop, and allocate budget, to mitigation plans and drought relief policies. Ultimately, the legislation is the instrument that provides the means to produce drought management plans.

The idea is to achieve an overview of the measures needed to achieve sustainable drought management in relation to a particular geographical area (e.g. a basin in a county). This approach allows a degree of rationalisation and co-ordination of the different existing



measures taken by integrating political decisions (e.g. economic incentives or fees) with technical analysis of the area.

The drought policy must be flexible to avoid imposition of inappropriate or unnecessarily strict requirements simply for the sake of harmonisation. Such flexibility would also ensure that, where a problem is regionally specific, measures appropriate to that particular area could be taken. The range of environmental conditions in the African basin is very wide and this must be taken into account.

A cost-effective strategy implies assessment from an economic perspective of advantages and disadvantages of the three basic sets of policy instruments: regulations and standards, new technology and internalisation of external pollution costs through pricing and market-based incentives. These sets of policy instruments are not mutually exclusive and can be used as complementary or alternative measures depending on their relative cost-effectiveness to address water pollution as well as water scarcity issues. Main goal of the project is to co-ordinate the use of the water cycle management as a tool to integrate all policy instruments on quantified and qualified basis.

Drought policy is not to be seen in isolation, but as a contributory element in the wider search for a balanced and sustainable development. And such a sustainable approach cannot be neither planned nor implemented in a satisfactory and efficient way without providing for broad consultation and participatory procedures of all actors concerned.

Most of the African Countries recognize drought as a direct consequence of water resources availability and management, therefore the legal base related with drought is directly derived from the water code of each country. This is a legal body that is on the top of the hierarchy of laws which cover all issues and aspects related to water policies, organization, procedures, finance, civil work planning and public participation. Consequently this legal framework consider drought a hydrological phenomenon. There are no specific legal provisions that consider drought as a meteorological phenomenon.

4.2 NORMATIVE IN AFRICAN COUNTRIES

The international legal provisions related to drought is the Hyogo framework and UNISDR framework and the International Convention (United Nations), 1994 Agreement, enforced in 2000, that is a Strategy to combat drought and desertification of the United Nations and National Governments. The strategies to fight desertification and mitigate drought to be implemented by countries all Nations that signed the Convention



In general in all countries there is normative to treat natural hazards or disaster so it has developed a legislation to implement competencies and action of public institutions to face a natural disaster. In Morocco and Tunisia have develop specific drought mitigation plans, both of proactive and reactive nature. The contingency plans include supply reliability and the future development of supply plans for large cities. The reactive responses include emergency works, decision on reservoir management and users strategies. The legal base to meteorological drought is based on the development of an insurance law.

Tunisia has developed a specific contingency plans (Operation Drought Management Plan Setting) but it not based on an specific legal provision. In this case the plan is implemented in based on drought announcement and on the MAERH minister decision which establish a drought committee and design an operation program for drought mitigation instead its crisis management.

South Africa has a great amount of normative related with water management, soil conservation, water quality, civil protections etc. Proactive and reactive responses to drought include some actions plans in order to anticipate to drought and to mitigate his effects. The performance of these actions plans can be or not defined by a legal framework.

Morocco has defined a specific legal provision for these actions plans that are currently in force. Operational proactive plans designed ad-hoc to mitigate drought are in Tunisia but they are not envisage by any law.

Actions plans define different pro-active responses by mean of program of measures. Some measures are specifically defined by water resources law, for example the definition of order of priorities of users during scarcity or the possibility to carry out of some economics instruments. The first is considered in most of water law evaluating here, establishing that urban use have priority over agricultural, industrial o recreation use. Economics instruments that allow water allocations mechanism are not included in any country water code. In most cases countries have not considered this possibility, because water is considered as a public good. Some time the reason is that water property right is not well defined. In Morocco there are a coexistence of the modern legal system based on public property and the inheritance of Islamic law, so the administration recognize private appropriation and free transactions on water right, forming a mixed system not yet fully solved. In other cases legislation view water resources as a primary good that cannot be trade, but there is a general opinion against deregulation of water market.

In general terms in all countries the advisory authorities have competencies to allocate and reallocate water during drought periods. The legal framework in most countries gives



competencies to the council of ministers to allocate and reallocate water resources according to the existing water availability and the priority of needs. Also the council of ministers have the right to expropriate private or other water rights for the public interest. Morocco based on the 10/95 Water law creates the Superior Council of Water and Climate which constitutes a real forum of dialogue of the stakeholders group in the water sector. This council formulates the general orientations of the national water and climate policy, water national plans and integrated management plans on water resources.

Others demand management's instruments like save campaign, adoption of water saving measures has a clear framework for implementation in Tunisia or Morocco were there are some specific contingency plans containing these kind of mitigation measures. In Morocco the National Hydrological Plans regulated by law include these kinds of measures. Operation Drought Management Plan setting of Tunisia is not based on a specific law. Drought National Commission has the role of supervision of the execution of the operation actions. Drought specialized commission establish drought indicators, which are the triggers of the preparation actions designed such as dams management plans according to climate condition or store water evaluation and demand identification. In Morocco the Superior Council of Water and Climate grants the distribution of water between user sectors, the transfer of water and the protection of water resources.

In South Africa the National Program of prediction, prevention of contingency and assistance plans and the National Program against drought and desertification are the specific legislation to implement proactive measures in order to reduce vulnerability, such as the construction of new water infrastructure.



4.3 CONTINGENCY PLANS BASED ON CURRENT NORMATIVE

Table 8 summarizes the normative and legal provisions that support the contingency plans.

Table 8 Summary of the drought contingency plans in selected countries

	Morocco	Tunisia	South Africa	Egypt
National strategy plans	x	x	x	x
Specific drought plans	x	x	x	x
Crisis and emergency measures	x	x	x	
Insurance	x			
Drought committee	x	x	x	x
Budget provisions	x	x	x	
Specific reactive measures, economic compensations, such as taxation abatement, and emergency measures, such as drilling wells and water transfer	x	x	x	x
Water reallocations	x			x
Demand management	x	x		x
Insurance scheme	x			x
Long-term measures: new water infrastructure	x		x	x
Reactive measures depend on the scenario of drought		x		x
Policy Planning Process	x		x	x
Proactive plans that anticipate costs and effects	x	x		x
Operation Drought Management depends on the phase of drought: Combined methods of physical and socio- economic data		x		x
Proactive Actions Plans based on most probable scenarios				x
Hydrological National Plan: supply reliability and supply plans for cities				x
Operation Drought Management depends on the phase and severity of drought (National Drought Plan), National Water Plan: water supply for drinking water and irrigation	x			x

4.4 INSTITUTIONAL RESPONSIBILITIES

In all cases, there is a clear and constant conflict between water uses during drought periods; related regulations still need development and evaluation. Also the view on water use rights exchange varies dramatically from one institution to another, making more difficult the real application of such instrument. There is also a conflict concerning emergency works. On the one hand some of these works are necessary for the normal functioning of the Basin and the emergency situation accelerates the approval process, on the other hand these works result in larger costs and efforts than would have normally implied. The traditional treatment of drought has rarely incorporated environmental issues. The European Water Framework Directive makes an important focus on the 'ecological status of the heavily modified water bodies', and how restoring the ecological water quality is integrated in the planning strategies.



A common characteristic of the countries in the region is the weak cooperation among the different institutions related to water management, and the fragmented roles of the State, the administrative regions and the river basin authorities, that result in administrative conflicts that are an impediment for adequate water management. Table 9 summarizes the drought management actions in selected African countries (Source of data: Iglesias and Moneo, 2005).

No single management action, legislation or policy can respond to all the aspects and achieve all goals for the effective drought management. Multiple collaborative efforts are needed to integrate the multidimensional effects of drought on society. The United Nations Convention to Combat Desertification (UNCCD, 2000) provides the global framework for implementing drought mitigation strategies. The United Nations International Strategy for Disaster Reduction (UNISDR, 2002) establishes a protocol for drought risk analysis.

**Table 9 Overview of the institutional responsibilities (Source WP2.2)**

Mitigation actions	EG	SU	ET	KY	TZ	RB	BW	MZ	SA	ZW	TU	AL	MO	NG
Giving priority to drinking water		X	X	X	X			X		X	X			
Public awareness campaigns										X	X			X
Restructuring bank debt											X			
Rescheduling of farmers' credits						X		X	X		X			
Debt forgiveness								X			X		X	X
Better and easier access credit												X		
Importing and subsidizing drilling										X	X			X
Restricting summer crops						X			X		X			
Wells digging and irrigation					X	X			X	X	X			
Farmers cropping strategies	X				X					X	X		X	X
Water use efficiency	X	X	X	X	X	X			X	X	X			X
Drought relief program	X	X				X		X	X	X	X	X	X	X
Saving livestock	X	X	X		X	X		X	X	X		X		X
Livestock watering points									X	X		X		
Opening of preserved pastures												X	X	X
Controlled forest grazing						X		X	X		X		X	
Livestock feeding program	X	X	X	X	X	X		X	X			X		
Livestock vaccination campaign						X		X	X	X		X	X	X
Importing & distributing stockfeed												X		
Setting of preserved pastures												X	X	X
Livestock vaccination campaign						X								
Boreholes, wells and small dams	X	X	X	X		X		X	X	X		X	X	X
Diversification of income sources	X	X		X					X	X		X		
Livestock husbandry practices					X									
Food storage and crop varieties					X									
Food security information					X									
Harvesting of rainfall water	X					X	X		X	X				X
New drought tolerant crops	X	X	X	X	X		X	X		X	X		X	X
Natural forest plantations						X								
Agroforestry						X		X	X	X				
Food aid				X		X	X	X	X	X	X	X	X	X
Vegetative material				X				X						
Agro-pastoral fares								X						
Horticulture	X	X	X					X	X	X				
Local seed production		X	X						X	X	X	X	X	X
Fruit production				X				X	X					
Irrigation systems	X							X	X		X	X	X	X
Use of lowlands								X						X
Irrigation management	X								X	X				
Cloud seeding										X				



The most common drought mitigation actions include food aid, drought relief programs, growing of drought tolerate crops, saving livestock, improved water use efficiency and installation of boreholes, wells and small dams.

There are different types of institutions (distinguished by role) involved in drought mitigation. The following table presents a summary of the types of institutions identified (Table 10).

Table 10 Overview of drought mitigation actions and institutions involved (Source WP2.2)

Type of Institutions/Role	EG	SU	ET	KY	TZ	RB	BW	MZ	SA	ZW	TU	AL	MO	NG
Water Infrastructure Development	1	1	1	1	1	1	1	2	1	1	3	1	3	1
Forecasting	1		1	1	1	1	1	1	1	1	3	1	1	1
Early Warning			1	1	1	1			1	1	3		1	1
Agriculture Extension Services	1	1	2	1	1	3	1	2	3	3	8		11	1
Food aid		1	2	5	3	3	1	2	1	4	2		1	3
Management of Water Infrastructure	1	1						2	1	1	5	1	2	1
Funding		1	1	2	2		1	1	4	2	6			1
Policy	1	1	1	2	3	2	1	1	1	1	3	3	1	1
Advocacy	2	1		2	5	1	1	1		1			7	2
Water supply										1	1		1	
Total	8	6	16	15	7	12	5	11	8	15	36	6	31	11

The most common mitigation actions are agriculture extension services, food aid, policy, advocacy and water supply (Table 11).

Table 11 Overview of the institutions (Source WP2.2)

Type of Institutions/Role	EG	SU	ET	KY	TZ	RB	BW	MZ	SA	ZW	TU	AL	MO	NG
Forecasting	1				1			1						
Early Warning	1			1										
Agriculture Extension Services		1	1			1	1	2						
Food aid		1	1		4		1	3	3	4	1		1	1
Management of Water Infrastructure	1					1							2	
Funding			1	1			1	3	2	2	3		1	1
Policy		1	1		2	1		1	1	1			1	1
Advocacy	1		1	1			1	1	1	1				
Water supply														
Total	4	3	5	3	8	3	4	11	7	8	4		5	3



5. GAPS AND OPPORTUNITIES FOR EARLY WARNING SYSTEMS

5.1 NORTH AFRICA

5.1.1 Current early warning systems

The main structures that are directly or indirectly involved in drought and/ or water management are scattered among several departments (see D 2.2 for a detailed list of these departments and services) including: water and environment, agriculture, forestry, energy and mines, industry and transport, interior.

In Tunisia, the drought management system consists of 3 major successive steps (drought announcement by the MAERH, proposition of a scheduled operation plan to the national commission composed of decision makers and beneficiaries, supervision of the implementation of these actions by the national commission, with strong collaboration of regional and specialized committees. In order to ensure an efficient drought management, three types of committees are established:

The institutional organization of drought management in Morocco and Tunisia is therefore well structured and defined theoretically on “the paper”. Indeed, it is supported by a wide arsenal of legal bases like in most African countries where the legislation has evolved as a consequence of severe drought episodes. These countries recognize drought as a direct consequence of water resources availability and management, therefore the legal base related with drought, when it exists, is directly derived from the water code of each country. (Iglesias *et al.*, 2007). In Morocco, the legislation related to drought is very advanced but its control is not very well developed. The new water law of 1995 includes many points related to water management under drought conditions. This law also introduces elements like water basin agencies and the creation of the Superior Council for water and Climate as the main consultative body for the formulation of the general orientation of the national water and climate policy, water national plans and integrated management plans on water resources. However, in Morocco, the new water law still coexists with ancient rules inherited from the Islamic law, this forming a mixed system not fully solved. Nevertheless, in Tunisia, the specific drought contingency plan (Operational Drought Management Plan setting is not based on a specific legal provision. It is implemented on the basis of a drought announcement and the decision taken by the Ministry of Agriculture (MAEH) to establish a drought committee and design an action program. Other demand management instruments like awareness campaigns for water conservation of adoption of water saving measures have



a clear framework for implementation in Morocco and Tunisia where there are some specific contingency plans containing these kinds of mitigation measures (Iglesias *et al.* 2007).

Thus, this legal framework represents a strength of Tunisian and Moroccan drought management systems' organizational structures. In Morocco, it is reinforced by a policy of decentralization materialized by the integrated water resources management at the river basin level, the distinguish between drought management in irrigated areas that fall under the jurisdiction of the ORMVA's and drought management in rainfed areas that is under the responsibility of Regional Directions of Agriculture. A law passed in 1990 provided a legal basis for establishing water user associations (WUAs), with responsibility for managing irrigation at the tertiary level. Nevertheless, although this legal framework and the policy of decentralization allowing the implementation of regional drought management strategies represents a strength of Moroccan drought management actions, their implementation and effectiveness are hampered by some weaknesses of their organizational structure, materialized by:

- The lack of coordination between the large number and variety of institutions involved in drought management and the conflicts of interests that emerge among them.
- The limited progress in mobilizing stakeholder participation and investment
- The inadequate financial resources.
- The division of responsibilities among many governmental jurisdictions.
- The lack of technical capacity and the insufficient human resources training regarding drought management
- The weak science-policy interface

In Morocco, the analysis of the institutional performances during the major past drought episodes reveals that they are good in implementing reactive actions plans and adaptation actions but that proactive mitigation measures still stay scarce. Indeed, although the need for a shift from a crisis management to a more proactive approach based on risk management is a clear objective of drought management since the years 2000, it does not seem to be reached. Nearly 12 years after, no operational drought plans are available. Approaches to Drought management remain mainly oriented towards emergency relief and attention to DRM evaporates soon after humid periods come back. The best illustration can be given by the National Drought Observatory (ONS) in Morocco that was created in 2001 as the



spearhead of this new drought management approach but is, a decade after its creation, not functional.

The ministerial departments involved in drought management and which are, for most of them, also implied in drought monitoring, gather large quantities of data and information. However, the main impediment to a plain and full efficiency of drought management actions is the weak bridge and transfer and use of information between drought monitoring and mitigation and the lack of definition and development of drought indicators and triggers that could guide the implementation of appropriate mitigation measures. In addition, there is a poor integration of information into government structures: Typically, data collection and reporting functions are conducted separately by different ministries in the government, which often leads to data collection activities and policy-making processes being done independently with little or no information flow between the activities. People who collect and report data typically have no authority to make independent decisions and decision makers often do not have the full set of information from the field to make well-informed decisions.

5.1.2 Lessons learned from other countries

The increase of drought frequencies and severities at the global level during the last decades as a consequence of Climate Change led policy makers to couple already implemented relief actions with a proactive management strategy based on drought risk management and the implementation of mitigation actions. As a result to this new orientation:

- The United-States succeeded to develop drought management plans at different levels (state to farms) relying on a high performance and efficient national drought monitoring system and timely effective drought early warning systems. In addition, the drought management system is supported by several institutions and ministerial departments collaborating in an efficient and permanent manner, with a clear scope of activities and responsibilities for each of these services. The drought management system in the US also relies on a strong capacity building and awareness raise program at all users' levels, and with a special focus on end's users. It makes also the emphasis on the science-policy interface with a strong involvement of research institutes. However, USA still did not succeed to adopt a national drought policy and the main actions are conducted at the state level.
- The history of the Australian drought policy is quite a good example of a shift from a crisis management to a risk management. Indeed, until 1992, drought management in Australia was mainly achieved through relief and subsidies actions implemented by States and national governments. From 1992 and onwards, the Australian drought policy



promotes producers to adopt self-reliant approaches and the role of the government is to provide farmers with skills/tools like research into climate variability and prediction, decisions support tools (drought risk and impacts assessments, early warning systems, seasonal weather forecasts), training and education, tax incentives and social support. The direct government intervention is warranted only when drought is exceptional. (Wilhite, 2005). Further reforms of the Australian drought policy aim to help better prepare farmers and rural communities for a changing climate on the basis of the economic assessment of drought support measures, the assessments of the social impacts of droughts on farmers and rural communities and a climatic assessment of the likely future climate patterns and the current exceptional circumstances standard of one-in-20-to-25-years event.

- At the European level, Drought management strategies are now relying on Drought management plans established for most drought prone countries at the national or river basin levels. There are also supported by the creation of drought dedicated structures to encourage experience sharing and regional collaboration on this important issue.

The comparison of these strategies and organizational structure of drought management with the ones currently developed at the north-African level and more particularly in Morocco since it is the best know example for us, reveal that even though this country decided also to move on to a more proactive drought management strategy more than a decade ago with the assistance and transfer of technology from the NDMC, it did not succeed to plainly fill this objective. Indeed, this analysis shows that the weaknesses previously identified in point 13.2 are in fact the strengths of these successful state of the art drought management strategies. They are mainly:

- A strong, efficient and permanent collaboration between institutions involved in DM and a clear definition of the scope of activity and duties of each one.
- An effective proactive action based on a efficient drought monitoring system and thus a good information flow between monitoring and mitigating activities.
- The development of drought management plans at national or even lower levels
- A strong involvement of Science
- The development of a national drought policy

This last point is of major importance. In this context, the WMO is organizing in March 2013, a high level meeting on national drought policies because:



- No concerted efforts have ever been made to initiate a dialogue on the formulation and adoption of national drought policies
- Only Australia has a national drought policy which provides a clear description of when and how communities affected by droughts could seek drought relief under a legal framework (Stefanski, 2012).

5.1.3 Possible improvements

The comparison of drought mitigation practices currently adopted in African countries with the globally state-of-the art practices and the user's requirements revealed that although policy makers recommend, since more than a decade, a shift towards a risk based drought management approach, it remains mainly oriented towards drought impacts relief actions. The possible improvements to this situation concern in priority the decision support tools that can guide the implementation of appropriate mitigation measures such as:

- The Definition and development of accurate and suitable drought indicators and triggers to ensure real-time information concerning the development of drought conditions. These indicators must be based on carefully processed climate information. Thus, since access to climatic information encounter some problems (see D 2.4), there is a need to look for the use of global data sets. At present there are current low-resolution geospatial climatic products like the dataset of African climate data available at the Global Historical Climatology Network (GHCN) and other climatic sources (WMO telecommunication net, Climate Prediction Centre precipitation, etc. see <http://climexp.knmi.nl/>) that may be used to produce climate layers. In addition a global SPEI dataset is already available for the African continent at a spatial resolution of 0.5° (Beguería et al., 2010) which can be used to assess drought risk and drought vulnerability in a variety of systems.
- Their integration in Drought early warning systems operating in real time and regularly up-dated
- The development of seasonal weather forecasts and forecasts of the likely evolution of the drought
- The development of agro-meteorological monitoring. The livelihoods of most rural populations in North-Africa are dependent on traditional agriculture that is dependent on seasonal rainfall. In this context, agro-meteorological monitoring refers to the continuous assessment of rainfall and agricultural conditions. Continuous monitoring of rainfall amount and distribution coupled with available crop growth models can be used for



targeted areas, chosen on the basis of their agronomic importance and/or relevant meteorological events (e.g., areas with serious delay in the start of the rainy/growing season). The capacity for large-area crop monitoring is rapidly improving because of improved satellite observations. Using satellite-based remote sensing technologies, scientists are now able to more accurately monitor cropped areas and estimate crop yields and production. The integration of crop model results, satellite-derived indicators of vegetation conditions such as the normalized difference vegetation index (NDVI), and field reports can often be used to identify widespread crop failures several weeks before the end of the growing season and then take specific and appropriate decisions.

- An accurate drought risk assessment quantifying the degree of hazard and the vulnerability of regional levels. The combination of state-of-the art methods of drought hazard analysis (spatial-temporal, non-stationary, multivariate extreme events analysis) would provide maps of the probability of occurrence of droughts in terms of their duration, intensity and magnitude, in order to identify (and quantify) the most drought-prone regions and the presence (or not) of long term time trends in the severity of droughts.
- The assessment of the drought vulnerability of several systems (water resources, natural vegetation and crops) to quantify the impact of drought in terms of both the system's resistance and resilience, and to produce drought impact curves to each system and region.

5.1.4 Specific actions

Capacity building. This is necessary for the consolidation of education, training and diffusion of best practices in drought response, preparedness and mitigation: Capacity building on drought management planning and in particular on the use of geospatial drought information products is of paramount importance for achieving the desired level of impact on the end-users and, in general, to improve the management of drought hazard. Training courses and workshops for institutional resource managers focused on urban and irrigation water management may provide efficient forums to discuss and understand the potential uses and limitations of Drought Preparedness Plans, geospatial data and drought information systems in their planning and decision-making activities. Organizations such as the FAO Regional Office for the Near East (FAO-RNE), the International Centre for Agricultural Research in the Dry Areas (ICARDA) and the International Centre for Advanced African Agronomic Studies (CIHEAM) have been historically involved in promoting capacity building through training courses, workshops and seminars on drought risk management. Nevertheless, capacity



building must go beyond these initiatives and focus on different levels, at the same time improving the use of current technologies and information on drought conditions and predictions that provide drought monitoring and early warning systems for better and early decision making.

Community-to-community visits and training-by-doing: In field exchange and peer assistance tools should be used widely to improve diversification of livelihoods, crops and livestock, such as introduction of early-maturity, short-duration and drought-tolerant crop varieties and changing cultivation practice.

Raising awareness about the importance of continued actions to build community resistance in drought prone areas even when the rains come.

Raising awareness in the media about interventions in drought mitigation.

The enhancement of drought mitigation concern and actions in the domestic and industrial sectors.

The development of Awareness and Education Programmes: Education programmes would have to be designed aiming not only to raise public awareness of the development and implementation of Drought Management Plans but also to ensure that people are aware of way to respond when drought occurs. The information provided should be tailored to the needs of stakeholder groups and would ideally be presented through press and various events.



5.2 EQUATORIAL LAKES REGION

Table 12 shows indicative evaluation of institutions organisation for effective drought management in Tanzania.

Table 12 Strengths, weaknesses and opportunities of institutions for drought management in Tanzania

Institution	Strengths	Weakness	Opportunities
Government Institutions (Disaster Management Department (DMD); Food Security Departments in the MAFSC & MoW; National Bureau of Statistics (NBS); Regional Coordination Department in the Ministry of Regional Administration & Local Government; Tanzania Meteorological Agency (TMA); etc.)	Availability of vast national resources; Good organization structure and functions	Limited financial capacity; Limited human capacity; Limited knowledge sharing	National resources; International & regional cooperation
Prime Minister's Office- Disaster Management Department (DMD)	Good structure from the national level to the village level and functions for early warning and forecasting	Limited involvement of private sector	Reform policies with a favourable environment for the growth of the private sector in production; and in taking up the provision of services, processing and marketing, previously undertaken by the state
Ministry of Agriculture, Food Security and Cooperatives	Tanzania has a comparative advantage in the production of many crops; mainly export crops (except cashews), maize and paddy	No good policies for achieving high agricultural growth	Policy reforms
Disaster Management Department (DMD); Tanzania Meteorological Agency (TMA)	Good structure from the national level to the village level and functions for early warning and forecasting	Limited coordination of the functions and of different players; Limited financial capacity; Limited involvement of research institutions	Policy and regulation enforcement reforms



Table 13 shows a comparison of the state-of-the-art organisational structures for drought management with those in Tanzania

Table 13 Strengths, weakness and opportunities for drought management in Tanzania

Strengths	Weakness	Opportunities
Availability of the National adaptation programmes of action (NAPA) with a focus in the agriculture, water, energy, health and forestry sectors	inadequate efficiency as they lack equipment, personnel and funds; no comprehensive warning system in the country	Effective dissemination and use of early warning information, and public education programs at both the national and local level
Availability of National and private research institutes	No research into modeling and methodologies to drought management	Setting national research agenda; Set research funds; International & regional collaborations

5.2.1 Possible Improvements

Below is a list of opportunities to improve drought mitigation practices in the drought areas of Tanzania

- Good soil water management
- Watershed management
- Agro-forestry practices that help to capture carbon dioxide in the atmosphere, increases soil fertility and water storage and enhance agricultural production
- Improve human and financial capacity
- Improve drought events monitoring and documentation
- International cooperation
- Practice effective knowledge sharing especially for the highly vulnerable sectors such as water and agriculture and in the sub-Saharan region

5.3 EASTERN NILE REGION

Egypt is setting up and strengthened the institutions working on water management and environmental issues. The establishment of these institutions initially responded to the need for the protection of natural resources. Thus, their goals initially focused on measures for water conservation and management, soil and vegetation through the development of protected areas and wildlife reserves, the protection mechanisms of arid lands against different types of degradation, etc. On climate issues in general, efforts have focused on



strengthen a committee and developing a national action plan. This section is displaying the analysis of the major ministerial services and department which are concerned with or involved in drought and /or water departments Showing their strengths and weaknesses. Table x shows the assessment of the organizational structures for drought management in Egypt in terms of strengths, weakness and opportunities (Table 14).

Table 14 Evaluation of organizational structures in Egypt

Organization	Strengths	Weakness	Opportunities
Ministry of Water Resources and Irrigation (MWRI), Nile Forecast Center NFC- Planning Sector	Long term historical data, good observation network, ability to predict;	Lack of capacity, means and ways to disseminate data information and products. Lack of Hydrologist.	To be in the center of stage in the drought management and mitigation in Sudan.
Ministry of Land Reclamation and Agriculture	Integration of the planed strategy with other ministries planning strategies. Human resources well trained in the field of risk assessment and management	No clear desertification strategy implemented. No especial units or department with the organization structure. lack of integration with other sectors	Exchange the meteorological data and the applied research results to manage the impact of desertification and drought in different sectors
Egyptian Environmental Affairs Agency (EEAA)	Building capacity of other concerning sectors	Lack of professional persons specialized , lack of data exchange	

There is no formal organizational structure of drought management in Nile Basin countries. In addition, the institutional framework is constantly changing. The meteorologists provide forecasts for stakeholders and decision maker to support taking actions. In Egypt, the Egyptian Meteorological Authority is consider the official source for the weather prediction but not fully co-operation to the other organizations concerning with meteorological information, each of these organizations or Ministries had it own research department or sectors concerning with collecting these type of data such as the Ministry of Reclamation land and Agriculture and the Ministry Water Resources and Irrigation. The data collected is non-uniform and the data exchange is also not executed.

5.3.1 Possible Improvements

Mitigation measures could be through on improvements of crop production, water resources management (irrigation scheduling, water harvesting, short maturity varieties) and livestock management (number of animal per area, increase carrying capacity). Raise the awareness



of local communities. Involve the media (T.V. and Radio) in dissemination of the research findings. The mitigation practices can be adopted by many ways:

- Bring all the drought mitigation actors into the center of stage.
- Establish a national Drought Management and Mitigation Plan.
- Make use of all available data to produce National Drought Monitoring System.

5.4 SOUTHERN AFRICA

The SWOT analysis results of the institutions involved in drought mitigation and adaptation in Mozambique are listed in Table 15.

Table 15 SWOT analysis results of the institutions involved in drought mitigation and adaptation in Mozambique

Institutions	Strengths	Weaknesses	Opportunities
INGC	Coordinate the efforts of disaster management and receives support from public and private institutions.	Lack of a department that deals specifically with drought related issues; Lack of a drought forecast systems	Creating a department to deal specifically with drought Development of a drought early warning system
MICOA	Coordination and implementation of inter-sectoral vision of the correct use of natural resources (implementation of the strategy and action plan for the prevention of drought).	Lack of qualified personnel in drought management. Limited funding	Increase qualified personnel;
INAM	Monitoring weather parameters across the country	Lack of appropriate equipment and technology that can increase the credibility of the generated results	Development of appropriated and most comprehensive technology particularly those related to droughts.
FewsNet	Supporting the preparation of contingency plans for disaster response; Improved the utilization of information for drought prevention	The resolution of the generated results is not good enough	Need to improve the sampling mechanisms
ARA -Sul	River basin management units in place	Lack of a Department and personnel that deals specifically with drought Lack of a drought forecast systems	Creation of a drought management department Development of early warning systems.
Ministry of Agriculture (MINAG)	Development of decadal bulletins that present crop needs for different agricultural seasons	Lack of infrastructure to achieve its global goals	Development of a drought early warning system. Development of appropriate and comprehensive technologies



Various institutions are involved in drought management within Zimbabwe including government departments, traditional institutions and NGOs. The private sector is not very visible in drought management, only NGOs are involved in different aspects of drought risk reduction; many offering short-term assistance (relief services) that satisfies immediate needs. Some also provide technical assistance and financial/material support for initiatives that help communities in rebuilding their livelihoods. Major activities include, harnessing of surface and ground water, rehabilitation of water sources, small livestock support, agricultural inputs, supporting irrigation schemes, supporting conservation farming, promoting planting of drought tolerant crops, promoting small gardens, food relief and capacity building in various aspects of drought coping and risk reduction. Informal institutions have not played a major role in drought risk reduction. It can be noted that local institutions like chiefdoms are only active in food distribution and trying to promote the concept of *Isiphala senkosi* (Chief's granary). Traditional norms and beliefs are no longer effective in reducing land degradation because law enforcement is now weak. The scale of intervention differs as some of the institutions give help to the needy on an individual basis whereas other institutions give help to a particular area as a whole. Most institutions indicate that they carry out a needs assessment before an intervention is initiated. However, some communities express dissatisfaction with some of the organisations who they feel do a superficial assessment that is not representative of the community needs. Government departments are commonly constrained by inadequate resources (both financial and material) to implement programmes; they don't have transport or the resources for training farmers. High staff turnover due to poor remuneration has led to high farmer to extension worker ratio, particularly in the case of AGRITEX, with the result that extension workers are not able to cover all the farmers in their working areas. Most NGOs have a small number of staff, based at district level and not at ward or local level making monitoring of NGO projects weak. Challenges common to both NGOs and Government departments include political interference in day to day activities that sometimes derail implementation of drought risk reduction activities. The existing economic environment has also led to high staff turn-over in most government departments and shortages of inputs and materials required for drought risk reduction. The recurrent droughts have made it difficult for communities to recover, resulting in a continuous need for drought relief. Migration of some members of the household, especially the bread winners and able bodied, to neighbouring countries such as Botswana and South Africa has led to a shortage of labour affecting some drought risk reduction activities. The rate of adoption of appropriate mitigation initiatives has been a



challenge in some communities with planned interventions either curtailed or not taken up at all. Funding for disaster reduction is limited. Most institutions do not have a budget for drought reduction. These institutional challenges increase the vulnerability of communities

5.4.1 Possible improvements in South Africa

Funding constraints. Budgetary resources are often not available for preventive measures, but also for disaster response. Most drought monitoring, early warning and forecasting institutions in the catchment lack the financial capacity to carry out drought forecasting activities and let alone to acquire up to date data collecting equipment .Funding stands out as the major challenge or hindrance for effective drought monitoring.

Research and data sharing. With a few exceptions, countries in sub-Saharan Africa lack the capacity to conduct research on natural and human-induced hazards and disasters, or to apply the knowledge and deploy technologies to mitigate disasters. Data sharing is often inadequate between government agencies and research institutions, and the high cost of data also limits their application. Drought-related research is critical in the production of innovations and technology that lead to improved drought preparedness. Currently a coordinated and integrated drought research program does not exist at the national level and even at catchment level, despite the enormous impact of droughts every year on the nation's economy, society and the environment. Furthermore, drought research is scattered across many agencies, universities, and other research institutions, without formal coordination or planning to maximize the value of the research dollars spent and without effort to ensure that the priority needs of the public and decision-makers are being addressed. The simple act of coordinating drought research within and between levels of government, as well as with private entities and universities, will help accelerate the development and provision of scientifically-based information products, thereby, enabling users to better prepare for, manage and respond to the impacts of drought in the catchment. Governments in Africa tend to rely on international donors rather than to build indigenous research capacity; that is, rather than investing in research they more often depend on donor funding for research projects in their countries. There is therefore a need to improve training and to build capacity so as to facilitate better use of research results in policy- and decision-making.

Management of water resources. For the case of Zimbabwe management of river systems and monitoring is only limited to cities, towns and some growth points and as such most rural areas are not covered. Thus the is a difficult in controlling water use in remote areas especially in drought years.



Poor technology. Remote sensing images provide excellent information relevant to studies of hazards, such as, for example, the hydrology, topography, and land use of catchments, and variables such as soil moisture and snow cover. However, in Zimbabwe; lack funds, infrastructure, software, and skills to download and interpret the remote sensing data. Free data sets (for example, Landsat, NOAA, MODIS, Meteosat), while very useful, often have low spatial and/or temporal resolution. While Landsat data has comparatively high spatial resolution, only historical data is available, as the system has ceased to operate. More accurate high resolution data obtainable from sources such as SPOT are very expensive.

In summary, disasters like flooding have rarely had direct costs such as human lives in Zimbabwe. Costs have mostly been confined to damaged livelihoods, hence responses to such disasters have largely been reactive than proactive. This short sighted response is despite that damaged or disrupted livelihood systems take time to rebuild and mend.

There is currently a heavy bias towards emergency response and relief. Not much has been done in the area of disaster mitigation. Following major droughts (1992 and 2003) and the resultant livestock losses, focus has largely been on restocking efforts without addressing the critical issue of carrying capacity, sustainability thresholds and the ecological footprint of large numbers of livestock in a context of diminishing grazing area. Although a multi-sectorial hazard and vulnerability mapping exercise was undertaken, its results largely have circulated particularly to the grassroots communities who are the most affected and therefore logically the most in need of such information.

The challenge has been how to package the information so that it is easily understood and utilized by such grassroots communities. Another challenge is the fragmented nature of pieces of legislation dealing with disaster management and above all the weaknesses of the Civil Protection Act. It is apparent that environmental disasters affect people, more than anything else. However, in Zimbabwe, handle disaster management and environmental management are handled as separate entities. Under the current arrangement presided over by the Civil Protection Unit, it is the central government that initiates hazard reduction measures through relevant ministerial sectors. This is complicated by the fact that the Department of Civil Protection is housed under the Ministry of Local Government, Public Works and Urban Development and instead of the Ministry of Environment and Tourism.

There is need to rethink this arrangement in the light of coordination, attitudes, and accountability. Although there has lately been an acknowledgment of community early warning system based on indigenous knowledge systems; these have not been properly documented and widely shared.



The interface between the scientific and the traditional still requires more negotiation. Indigenous knowledge systems on seasonal rainfall predictions have been documented for many parts of Zimbabwe. There is a striking similarity between some of the indigenous and contemporary climate indicators especially those related to wind direction, temperature and clouds. Observations of plant and animal behaviour dominate indigenous climate forecast systems in many parts of the country. Inter-annual fluctuations in fruit production in certain tree species have been used as an advance seasonal rainfall indicator. Animal behaviour is also used to predict weather conditions. At political level, it looks like it is a question of priorities. Like in most low-income countries, in Zimbabwe developmental priorities are still placed on health, job creation and education than on environmental protection and hence disaster mitigation and adaptation strategies receive comparatively lower priority in national policies and development plan.

For climate change mitigation efforts to pay off there is need to promote such activities in such a way that the community buys-in ownership and that ensures sustainability of the exercise. As long as solutions are imposed, communities may remain alienated to life saving knowledge and at times remaining superstitious. Thus instead of appreciating and embracing the technology of lightning conductors, such knowledge is greeted with suspicion. In short Disaster Mitigation plans need to be incorporated or packaged into development projects so that they can easily accommodate disasters that may befall communities. Developing separate or standalone disaster management plans could be counterproductive. There is thus, need to implement projects which reduce communities' vulnerability to natural hazards there by strengthening community livelihoods. The media could be engaged to play a more significant role in dissemination of information from assessments, policies and strategies relevant to vulnerability

- Limited use of a participatory methodology in designing mitigation and adaptation programs (i.e., NGOs are not invited for program planning and implementation);
- Absence of a consensus methodology to diagnose the magnitude of drought in a disaggregated manner.
- Inadequate monitoring mechanisms including impact assessment.
- Lack of harmonization and coordination in terms of funding for mitigation and adaptation programs.



5.4.2 Possible improvements in Zimbabwe

TOWARDS AN INTEGRATED APPROACH

There is need for an integrated approach for effective drought monitoring, which involves thorough investigation of all available information resources and tools that are available at catchment level. Meteorological services department (MSD) provides climate information and predictions for the whole country. However, the collection of agricultural and hydrological data is typically fragmented among many agencies and ministries because of the government structure of most of the countries (WMO, 2006). In the case of Zimbabwe and Mzingwane catchment collection of agricultural data is done by mainly Agricultural Technical and Extension Services department (AGRITEX) and other collaborating NGOs. Hydrological data is collected by mainly Zimbabwe National Water Authority (ZINWA).

INCREASE THE DENSITY OF DATA COLLECTION STATIONS

Meteorological and hydrological data networks are inadequate in terms of the station density for collecting all major climate and water supply parameters required for these systems in the catchment. The key forecasting organisations (MSD; ZINWA e.t.c) rely more on in-situ input data collection methods. The number of stations are limited as stated earlier, leading to inadequate output data or forecasts and as such inadequate information for the users. Data quality is also compromised because of missing data and/or an inadequate length of record. In most cases the output information to be relayed to users tends to be more generalised.

DEFINE EARLY WARNING PRODUCTS

Information delivered through early warning systems is often too technical and detailed for decision makers to effectively use. Information need to be usable and dependable. In this respect, ENSO bulletins need to be more user-oriented (users, in an early warning context, are not always climatologists or meteorologists), providing assessments of the likely impact (e.g., risk analysis) on rainfall and other weather conditions in particular parts of the catchment. Forecast by Meteorological Services Department (MSD) are relevant only to seasonal timescales and relatively large areas and may not fully account for all factors that influence weather and climate. This information has to be tailor made for specific users to ensure its successful use in the drought management process.

TOWARDS MORE RELIABLE FORECASTS TO IMPROVE THE TRUST FROM USERS

Forecasts are often unreliable on the seasonal timescale and lack the specificity required for use in agriculture and other sectors. Most of these early warning or forecasting products need to be downscaled to give reliable information and facilitate effective drought mitigation.



IMPROVE THE DISSEMINATION OF DATA/FORECASTS

Delivery systems for disseminating drought information and data to users in a timely manner are often not well developed, limiting their usefulness for decision support. In addition, the quality, collection, and dissemination of meteorological data are key factors for their reliability and use of the drought monitoring products in drought mitigation and adaptation.

IMPROVE COMMUNICATION ON CLIMATE CHANGE

Observed increase in climate change variability in most Southern African countries and particularly in Zimbabwe has increased uncertainty in seasonal rainfall prediction and poses a greater challenge to scientists in their efforts to improve forecasts and their reliability. Pertinent action is therefore needed in order to address this challenge to ensure drought risk reduction efforts are successfully met in a climate driven changing environment.

IMPROVE FUNDING AND FINANCIAL RESOURCES

Budgetary resources are often not available for preventive measures, but also for disaster response. Most drought monitoring, early warning and forecasting institutions in the catchment lack the financial capacity to carry out drought forecasting activities and let alone to acquire up to date data collecting equipment. Funding stands out as the major challenge or hindrance for effective drought monitoring.

IMPROVE RESEARCH AND DATA SHARING

Data sharing is often inadequate between government agencies and research institutions, and the high cost of data also limits their application. Drought-related research is critical in the production of innovations and technology that lead to improved drought preparedness. Currently a coordinated and integrated drought research program does not exist at the national level and even at catchment level, despite the enormous impact of droughts every year on the nation's economy, society and the environment. Furthermore, drought research is scattered across many agencies, universities, and other research institutions, without formal coordination or planning to maximize the value of the research dollars spent and without effort to ensure that the priority needs of the public and decision-makers are being addressed. The simple act of coordinating drought research within and between levels of government, as well as with private entities and universities, will help accelerate the development and provision of scientifically-based information products, thereby, enabling users to better prepare for, manage and respond to the impacts of drought in the catchment.

AVOID DELAYS IN RESPONDING TO EARLY WARNINGS

According to the Early Warning Unit and the Drought Monitoring Centre significant time lag between warning and action, created emergencies, this in turn elevated the demand for



drought relief. Different users take varied time to respond either to forecasts or warnings issued. An example is the Drought case of 1992, when the drought warning was issued as early as March 1991, by SADC REWS and the Zimbabwean government only responded as late as March 1992. As such this stalled resource mobilisation and thus the effects of this drought was significant. It was not until such stocks had dropped to critical levels that reactions were initiated, by which time it was already too late to avoid the maize shortages which hit countries like Zambia and Zimbabwe during the early part of 1992 (Pawadyira and Ndlovu, 1993). The time taken lag between a warning or forecast and response, can cause a big difference in drought mitigation and adaptation.

5.4.3 Strengths and opportunities

The following strengths

- Multi-sectorial work;
- Conservation of water used for small-scale irrigation and human and animal consumption;
- Use of local materials and basic construction techniques using local labour.

The following opportunities

- Greater involvement of local structures, especially the administrators, NGOs and District Agricultural Departments.
- Establishment of feedback information mechanisms to districts.
- Installation of a monitoring system to track not only the execution of intervention but also to measure the impact and report to donors (i.e., UN and Government) on the progress.

5.4.4 Possible Improvements

The lack of data and information in many districts in Mozambique is related to limited broadcasting programmes through formal and informal channels regarding drought related issues. Possible improvements include the following:



- The opportunities to improve drought mitigation practices are related to the development of a drought mitigation program to be used by users as drought related national institutions does not have a specific program.
- Increased knowledge of mitigation improved techniques among the rural population through small training sessions.
- Distribution of agricultural inputs beyond seeds.
- Increase equipment for opening and maintenance of reservoirs, could increase the number and quality of those in rural areas.
- Equip farmers with management techniques and approaches to conduct their small scale irrigation schemes.

The most common mitigation actions implemented in Botswana and South Africa are food aid, drought relief programs, growing of drought tolerate crops, saving livestock, improved water use efficiency and installation of boreholes, wells and small dams. There is a need to improve on the following areas in order to improve drought mitigation in these areas:

- Training and public awareness campaigns: increased public awareness in situations where the country is approaching a drought season
- Improved early warning systems e.g. seasonal climate outlooks: there is a need to improve early warning systems available in the basin. Currently farmer's uses information from South African Weather Services, SARCF and practices from the department of water affairs. The purpose of these is to provide a forecast for the region and at local level for the farmers on the availability of water but has limitation that it does not provide information at local scale.
- Integrating scientific and Traditional monitoring: based on the survey conducted in the basin there is a need to integrate indigenous knowledge with the scientific knowledge to improve drought early warning and this will in turn improve drought mitigation
- Effective Transfer of Information to Policy- and Decision-makers: To facilitate and improve a close link between relief efforts and development programmes, different bodies at different levels need to be assigned and adhere to specific responsibilities at different levels. The policy document should discuss general drought management issues and reviews government capacities and structures to deal with drought preparedness, mitigation and response issues



Throughout the recent drought periods in Zimbabwe, the response by the Government of Zimbabwe (GOZ), local communities and authorities, as well as donors, has focused on short-term emergency response.(FAO,2004) Most local government authorities lacked the capacity to react to these disasters, let alone prepare for them in an effort to mitigate the possible impact of drought.(FAO,2004).

The GOZ realized the need to develop appropriate action plans to counter both the short-term and long-term effects of drought, to develop institutional capacity, and to invest more resources in order to meet the needs of the most vulnerable population groups. To address these issues, the GOZ developed the National Policy on Drought Management (NPDM), which was formulated in 1998 and approved in 1999 (GOZ-NEPC, 1999). The policy aims at a congruence of relief effort and planned development to strengthen economic fabric of the disaster-prone areas so as to mitigate the suffering of the affected population and enhance their capability to face the challenge of such disasters in the future. To ensure that there is a close link between relief efforts and development programmes, different bodies at different levels need to be assigned specific responsibilities. This policy delineates functions and responsibilities in disaster management at various levels. The policy document discusses general drought management issues and reviews government capacities and structures to deal with drought preparedness, mitigation and response issues.

The Civil Protection Act [Chapter 10:06 of the Laws of Zimbabwe], complemented by sections of other laws, provides a legal framework for the management of disasters in general including those induced by droughts in Zimbabwe. Disaster preparedness programmes are initiated by GoZ through relevant sector ministries and local administration takes the responsibility for implementing and maintaining its effectiveness (Marjanovic and Nimpuno 2003).The current system uses the existing government, private sector and NGOs whose regular activities contain elements of disaster risk prevention and community development (Marjanovic and Nimpuno 2003;UNISDR 2004). Table 16 shows the comparison.

Table 16 Comparison of state of the art and local drought management structures

State of the art organisational structures for drought management	Zimbabwean organisational structures for drought management
Mainly coordinated by Ministry of Agriculture /Environment/Meteorological/Water departments with hands on experience and technical expertise for drought management	Coordinated by Local government
Clearly developed partnerships, lines of communication and local stakeholders were included in the design process of the plan.	Not very clear partnerships, lines of communication and local stakeholders were included in the design process of the plan.



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