

## University of Nebraska - Lincoln DigitalCommons@University of Nebraska - Lincoln

---

Drought Mitigation Center Faculty Publications

Drought -- National Drought Mitigation Center

---

2014

# High Level Meeting on National Drought Policy: Summary and Major Outcomes

Mannava V.K. Sivakumar

*27 Chemin des Corbilletes, 1216 Cointrin, Geneva, Switzerland*

Robert Stefanski

*World Meteorological Organization, 7bis Avenue de la Paix, 1211 Geneva 2, Switzerland*

Mohamed Bazza

*Food and Agriculture Organization of the United Nations, viale delle Terme di Caracalla, 1. 00153 Rome, Italy*

Sergio Zelaya

*UNCCD Secretariat, UN Campus – Room LEU 1321-22, Hermann-Ehlers-Str. 10, 53113 Bonn, Germany*

Donald A. Wilhite

*University of Nebraska - Lincoln, [dwilhite2@unl.edu](mailto:dwilhite2@unl.edu)*

*See next page for additional authors*

Follow this and additional works at: <http://digitalcommons.unl.edu/droughtfacpub>

---

Sivakumar, Mannava V.K.; Stefanski, Robert; Bazza, Mohamed; Zelaya, Sergio; Wilhite, Donald A.; and Magalhaes, Antonio Rocha, "High Level Meeting on National Drought Policy: Summary and Major Outcomes" (2014). *Drought Mitigation Center Faculty Publications*. 46.

<http://digitalcommons.unl.edu/droughtfacpub/46>

This Article is brought to you for free and open access by the Drought -- National Drought Mitigation Center at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Drought Mitigation Center Faculty Publications by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

---

**Authors**

Mannava V.K. Sivakumar, Robert Stefanski, Mohamed Bazza, Sergio Zelaya, Donald A. Wilhite, and Antonio Rocha Magalhaes



ELSEVIER

Contents lists available at ScienceDirect

# Weather and Climate Extremes

journal homepage: [www.elsevier.com/locate/wace](http://www.elsevier.com/locate/wace)

## High Level Meeting on National Drought Policy: Summary and Major Outcomes



Mannava V.K. Sivakumar <sup>a,\*</sup>, Robert Stefanski <sup>b</sup>, Mohamed Bazza <sup>c</sup>, Sergio Zelaya <sup>d</sup>, Donald Wilhite <sup>e</sup>, Antonio Rocha Magalhaes <sup>f</sup>

<sup>a</sup> 27 Chemin des Corbillettes, 1216 Cointrin, Geneva, Switzerland

<sup>b</sup> World Meteorological Organization, 7bis Avenue de la Paix, 1211 Geneva 2, Switzerland

<sup>c</sup> Food and Agriculture Organization of the United Nations, viale delle Terme di Caracalla, 1. 00153 Rome, Italy

<sup>d</sup> UNCCD Secretariat, UN Campus – Room LEU 1321-22, Hermann-Ehlers-Str. 10, 53113 Bonn, Germany

<sup>e</sup> School of Natural Resources, University of Nebraska, Lincoln, NE 68583-0988, USA

<sup>f</sup> Center for Strategic Studies and Management, Brasilia, DF 70384-010, Brazil

### ARTICLE INFO

#### Article history:

Received 22 December 2013

Accepted 18 March 2014

Available online 21 April 2014

#### Keywords:

Drought monitoring

Early warning and information systems

Drought prediction and predictability

Drought vulnerability and impact assessment

Drought preparedness and mitigation

Drought response and relief

### ABSTRACT

Drought is widely recognized as a slow creeping natural hazard that occurs as a consequence of the natural climatic variability. In recent years, concern has grown world-wide that droughts may be increasing in frequency and severity given the changing climatic conditions. Responses to droughts in most parts of the world are generally reactive in terms of crisis management and are known to be untimely, poorly coordinated and disintegrated. Without a coordinated, national drought policy, nations will continue to respond to drought in a reactive, crisis management mode. In order to address the issue of national drought policy, the World Meteorological Organization (WMO), the Secretariat of the United Nations Convention to Combat Desertification (UNCCD) and the Food and Agriculture Organization of the United Nations (FAO), in collaboration with a number of partners, organized the High-level Meeting on National Drought Policy (HMNDP) in Geneva, Switzerland, from 11 to 15 March 2013. The goal of HMNDP was to provide practical insight into useful, science-based actions to address key drought issues and various strategies to cope with drought. During HMNDP, detailed discussions were held during a scientific segment over 3.5 days, leading to the adoption of a HMNDP Declaration in a High Level Segment, calling on all the governments around the world to develop and implement national drought policies. The major outcomes of the scientific and high level segments are presented.

© 2014 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

### 1. Introduction

Drought is a complex, pervasive natural hazard, often referred to as a 'creeping phenomena' (Tannehill, 1947) and ranks first among all natural hazards according to Bryant (1991) who ranked natural hazard events based on various characteristics, such as severity, duration, spatial extent, loss of life, economic loss, social effect, and long-term impact. According to CRED (2006), while drought disasters account for less than 20 percent of the proportion of disasters occurrence in Africa, they represent more than 95 percent of the death toll caused by disasters and more than 80 percent of the number of people affected by disasters in Africa.

Drought produces a large number of socio-economic impacts as water is integral to produce goods and provide certain services.

The socio-economic impacts of droughts may arise from the interaction between natural conditions and human factors, such as changes in land use and land cover, water demand and use. Excessive water withdrawals can exacerbate the impact of drought. Some direct impacts of drought are reduced crop, rangeland, and forest productivity; reduced water levels; increased fire hazard; reduced energy production, reduced opportunities and income for recreation and tourism, increased livestock and wildlife death rates; and damage to wildlife and fish habitat. A reduction in crop productivity usually results in less income for farmers, hunger, increased prices for food, unemployment, and migration.

There is growing evidence that the frequency and extent of drought has increased as a result of global warming. The fraction of land surface area experiencing drought conditions has risen from 10 to 15 percent in the early 1970s to more than 30 percent by early 2000 (Dai et al., 2004). There has been a general tendency towards decreased precipitation in the semi-arid regions. For example, Henry et al. (2007) showed that during the period

\* Corresponding author. Tel.: +41 22 788 1769.

E-mail address: [mannavas@gmail.com](mailto:mannavas@gmail.com) (M.V.K. Sivakumar).

1993–2006, there has been a strong and persistent rainfall deficit in eastern Australia and similarly reduced rainfall conditions in the south-west corner of Australia have continued. Reductions of up to 20 percent in annually averaged totals are common across large regions of Australia.

A global analysis has shown that abrupt changes in rainfall are more likely to occur in the arid and semi-arid regions, and that this susceptibility is possibly linked to strong positive feedbacks between vegetation and climate interactions (Narisma et al., 2007). For example, most of the Greater Horn of Africa (GHA) may be classified to have arid and semi-arid climate that is characterized by high variability in rainfall, and recurrences of extreme climate events such as drought and floods. Severe droughts then persisted over most parts of the eastern sector of equatorial GHA since the last quarter of 2010 with far reaching socio-economic implications that included lack of water, pasture, energy and food; famine; loss of livestock, life and property; mass migration and environmental refugees, among others. The persistence of drought over some of these areas has been associated with La Niña conditions.

## 2. Projections of future droughts and need for pro-active action

According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), a warmer climate, with its increased climate variability, will increase the risk of droughts (Table SPM2 in IPCC, 2007). An increase of droughts over low latitudes and mid-latitude continental interiors in summer is likely (Table SPM2 in IPCC, 2007), but sensitive to model land-surface formulation. The proportion of the land surface in extreme drought, globally, is predicted to increase by a factor of 10–30; from 1 to 3 percent for the present day to 30 percent by the 2090s. The number of extreme drought events per 100 years and mean drought duration are likely to increase by factors of two and six, respectively, by the 2090s (Burke et al., 2006).

Most semi-arid river basins in developing countries are more vulnerable to climate change than basins in developed countries, as population, and thus water demand, is expected to grow rapidly in the future and the coping capacity is low (Millennium Ecosystem Assessment, 2005). A number of global-scale (Alcamo and Henrichs, 2002; Arnell, 2004), national-scale (Thomson et al., 2005), and basin-scale assessments (Barnett et al., 2004) show that semi-arid and arid basins are the most vulnerable basins on the globe with respect to water stress. According to an FAO study in which the climate change impact was not considered (Bruinsma, 2003), an increase in irrigation water withdrawals of 14 percent is foreseen by 2030 for developing countries. If precipitation decreases, irrigation water demands, which dominate water use in most semi-arid river basins, would increase, and it may become impossible to satisfy all demands.

Responses to droughts in most parts of the world are generally reactive, responding to drought after impacts have occurred. This approach – commonly referred to as crisis management – is known to be untimely, poorly coordinated and disintegrated. As a result of such ineffective responses to drought and its increased frequency, the economic, social and environmental impacts of droughts have increased significantly worldwide. Because of their long-term socio-economic impacts, droughts are by far the most damaging of all natural disasters.

## 3. Need for a National Drought Policy

With the world population projected to reach 7.5 billion, the world's farmers will have to produce 40 percent more grain in 2020,

and the challenge is to revive agricultural growth at the global level. According to FAO estimates (FAO, 2011), global agricultural production will need to increase by approximately 70% by 2050, in response to an approximately 29% increase in world population (from 6.9 to 9.1 billion) and changing levels of food consumption. Developing countries will need to achieve 100% increase in production.

Given the current concerns with climate change, projected increases in the frequency, intensity, and duration of droughts and resulting impacts on many sectors, in particular food, water, and energy, there is cause for concern regarding the lack of drought preparedness and appropriate drought management policies for virtually all nations.

The context of current droughts calls for pro-active future actions to be able to cope with their associated imperatives. Despite the repeated occurrences of droughts throughout human history and their large impacts on different socio-economic sectors, no concerted efforts have ever been made to initiate a dialog on the formulation and adoption of national drought policies. Lack of a clear national drought policy implies that governments at the national, state, and community levels will continue with the status quo, i.e., reacting to the impacts of drought with little coordination between national, state, and local agencies.

Without a coordinated, national drought policy (Sivakumar et al., 2011) that includes effective monitoring and early warning systems to deliver timely information to decision makers, effective impact assessment procedures, pro-active risk management measures, preparedness plans aimed at increasing the coping capacity, and effective emergency response programmes directed at reducing the impacts of drought, nations will continue to respond to drought in a reactive, crisis management mode.

## 4. Goals of the National Drought Policies

National governments must adopt policies that engender cooperation and coordination at all levels of government in order to increase their capacity to cope with extended periods of water scarcity in the event of a drought. The ultimate goal is to ensure effective and inclusive coordination mechanisms to create more drought resilient societies and ensure food security at the domestic level.

The goals of the national drought policies are:

- Proactive mitigation and planning measures, risk management, public outreach and resource stewardship as key elements of effective national drought policy.
- Greater collaboration to enhance the national/regional/global observation networks and information delivery systems to improve public understanding of, and preparedness for, drought.
- Incorporation of comprehensive governmental and private insurance and financial strategies into drought preparedness plans.
- Recognition of a safety net of emergency relief based on sound stewardship of natural resources and self-help at diverse governance levels.
- Coordination of drought programmes and response in an effective, efficient and customer-oriented manner.

## 5. High Level Meeting on National Drought Policy

In order to address the issue of national drought policy, WMO Congress at its Sixteenth Session held in Geneva in 2011 recommended the organization of a “High-level Meeting on National Drought Policy (HMNDP).” Accordingly, WMO, the Secretariat of the United Nations Convention to Combat

Desertification (UNCCD) and the Food and Agriculture Organization of the United Nations (FAO), in collaboration with a number of UN agencies, international and regional organizations and key national agencies, organized the HMNDP in Geneva from 11 to 15 March 2013. The theme of the HMNDP was “Reducing Societal Vulnerability – Helping Society (Communities and Sectors).” The objective of the HMNDP was to provide practical insight into useful, science-based actions to address the key drought issues being considered by governments and the private sector under the UNCCD and the various strategies to cope with drought.

The HMNDP was sponsored by the African Development Bank (AfDB) <http://www.afdb.org>; the Ministry of National Integration (MI), Brazil <http://www.integracao.gov.br/>; the Center for Strategic Studies and Management, (CGEE), Brazil; the China Meteorological Administration (CMA); the OPEC Fund for International Development (OFID); the National Oceanic and Atmospheric Administration (NOAA) <http://www.noaa.gov/>; the Ministry of Foreign Affairs, Government of Norway; Saudi Arabia; the Swiss Agency for Development and Cooperation (SDC) and the United States Agency for International Development (USAID).

Four hundred and fourteen (414) participants from 87 countries as well as representatives of International Organizations Regional Organizations and UN Agencies participated in the HMNDP (<http://www.wmo.int/hmndp>).

## 6. Organization of HMNDP and main outcomes

The HMNDP was organized in two parts, a three and half days of Scientific Segment followed by one and half days of High-level segment. The following sections present brief summaries of the Scientific and High-Level Segments.

### 6.1. Scientific Segment of HMNDP

The Scientific Segment of HMNDP addressed seven major themes relevant to the National Drought Policy in fifteen different sessions including seven plenary sessions, two round table discussion sessions and six parallel sessions. Nineteen invited speakers made presentations on specific topics in these sessions and twenty eight experts served as discussants. The Scientific Segment covered different aspects such as Drought Monitoring, Early Warning and Information Systems; Drought Prediction and Predictability; Drought Vulnerability and Impact Assessment; Enhancing Drought Preparedness and Mitigation; Planning for appropriate response and relief within the framework of national drought policy; and Constructing a framework for national drought policy: The way forward.

#### 6.1.1. Conclusions and Recommendations of the HMNDP Scientific Segment

##### 6.1.1.1. General

- It is important to develop national drought policies and preparedness plans that place emphasis on risk management rather than crisis management.
- There is a need to harmonize drought policies at regional levels with those at national to local levels and vice versa.
- Use should be made of several drought indicators as recommended by WMO in monitoring and forecasting of impending drought – fit-for-purpose.
- The HMNDP should formulate networks/collaborations to enhance knowledge and information sharing to improve public understanding and preparedness to drought.

6.1.1.2. *Drought Monitoring, Early Warning and Information Systems.* Droughts span a range of time scales and are caused by a number of complex variables-land surface feedbacks. Managing risks rather than responding to crisis builds resilient communities. An Early Warning System (EWS) is the systematic collection and analysis of relevant information about and coming from areas of impending risk that: (a) informs the development of strategic responses to anticipate crises and crisis evolution; and (b) Communicate options to critical actors for the purposes of decision-making and response. EWS is the platform for providing integrated information to decision makers, vulnerable communities and sector based stakeholders. The following recommendations were made in the session on Drought Monitoring, Early Warning and Information Systems:

- Establishment of scientifically sound, comprehensive and integrated drought Early Warning Systems will need additional research and development.
- Early Warning Systems (EWS) must be able to operate under data-rich as well as data-poor conditions.
- In the data-poor conditions, explore using satellite derived products, global modeling outcomes and input from global initiatives to trigger action (e.g. use of a fully developed GDM in a way similar to use of EFAS).
- EWS must be ongoing services operating during droughts as well as at other times.
- Prepare guidance material for developing the Drought Monitoring and Early Warning Information Systems. Key features to include, but not limited to, integrated climate, surface and groundwater and on-ground information from drought impacted vulnerable sectors to provide decision makers (ranging from politicians, public servants, NGOs to community and individuals) with comprehensive regional, national, district and local level information.
- Design and construct drought information, products and services to end users incorporating input from them, and deliver information using their preferred mode of receiving information (digital platforms including mobile phones, paper, face to face briefings etc.).
- Educate end users to interpret information and demonstrate how they can use the information to trigger actions to reduce risks.
- Catalog three operating EWSs working in each of rich, medium and poor data environments to illustrate what is possible.

6.1.1.3. *Drought Prediction and Predictability.* Major drought patterns are forced by major SST patterns and skillful drought predictability depends critically on skillful predictability of major SST patterns. Understanding physics of teleconnections between SST patterns and drought patterns is very important. Recent publications show that skillful prediction of decadal, global-average temperature and North Atlantic SSTs is possible. Very encouraging preliminary results are emerging from the multiyear to decadal drought hindcasting using output from WCRP’s Coupled Model Intercomparison Project 5 (CMIP5). Tests are also underway using the Hybrid Dynamical-Statistical Prediction System for Decadal Climate and Hydro-meteorology. Prediction of impacts and continuous interactions with stakeholders is vital for success of drought policies guided by drought prediction and other information. The following recommendations were made in the session on Drought Prediction and Predictability:

- Prediction of impacts and continuous interaction with stakeholders is vital for the success of drought policies guided by drought prediction and other information.
- Drought predictions cannot substitute for early warning systems, but should be used to enhance already existing drought monitoring and EWSs.
- A collaborative approach for research that takes into account user community needs should be promoted. Drought prediction needs a lot of collaborative efforts from climate scientists and end users.
- The formation of collaborative platforms for developing country scientists to work together with leading agencies such as NOAA, WMO, etc., should be promoted to develop capacity and to ensure sustainability in forecasting and communication.
- Establishment of networks to enhance knowledge and information sharing should be promoted to improve public understanding and preparedness to drought.

*6.1.1.4. Drought Vulnerability and Impact Assessment.* There are two factors in the equation of risk, i.e., exposure to the hazard and vulnerability. Vulnerability is very context and location specific and takes into account socioeconomic and cultural aspects and includes the coping capacity of the affected communities. Risk assessment involves the use of (a) Drought risk models to account for drought losses and impacts; (b) Ongoing monitoring of drought risk through observations (climate, remote sensing, food prices...); and (c) Assessing drought impacts, number of households affected etc. The following recommendations were made in the session on Drought Vulnerability and Impact Assessment:

- Pursue the efforts undertaken by WMO to promote standard indicators to measure drought throughout the world.
- Encourage countries to systematically collect data that will allow the assessment of drought impacts.
- Institutionalize the collection of disaster loss data that covers all hazards, including droughts.
- Comparison of drought vulnerability assessment among countries should be facilitated by the collection of a common minimum datasets.
- Factor climate change dimension in drought risk assessment and management policies
- Account for context specificity by involving local communities in drought impact and vulnerability assessments
- Need for long term monitoring to ensure reliability of vulnerability and impact assessments
- Use not just a top-down, but also bottom-up, approaches in designing adaptation strategies to allow inclusion of local knowledge and facilitate appropriation by the target communities.
- Go beyond economic cost-benefit considerations and include social and cultural dimensions in designing drought adaptation strategies.
- Use Inclusive Wealth Index (IWI), rather than GDP or income, for evaluation of success or failure.

*6.1.1.5. Enhancing Drought Preparedness and Mitigation.* The fragile agroecosystems of dry areas cover 41% of the earth's surface and with over 2 billion inhabitants – and the majority of the world's poor. About 16% of the population lives in chronic poverty, particularly in marginal rainfed areas. The challenges to coping with drought and enhancing food security in dry areas include inadequate agricultural policies for sustainable agricultural development and insufficient investment in agricultural research and development. We cannot prevent drought, but actions can be taken to better prepare to cope with drought, develop more resilient ecosystems and better ability to

recover from drought, and mitigate the impacts of droughts. The following recommendations were made in the session on Enhancing Drought Preparedness and Mitigation:

- Drought policies play a vital role for drought risk management and should be promoted.
- Policy processes should target institutional/interagency collaboration.
- Implementation of preparedness and mitigation strategies at the community and farm levels should be promoted.
- Ensure that technologies, measures and practices adapted to drought conditions are freely available.
- Promote indigenous species/crops, plants, trees, etc.
- Consider both long- and medium-term measures for drought preparedness and mitigation.
- Link drought relief and drought plans at local and state levels.
- Ensure that information to meet users' needs is disseminated on accessible mediums.
- Promote efficient water management for irrigated, rainfed and mixed systems.
- Emphasize water productivity optimization in lieu of yield maximization.
- Promote community approach in drought preparedness and mitigation.
- Ensure economic inclusion: youth programs are very important.
- Promote integrated approach to drought preparedness and mitigation.
- Determine most vulnerable zones and accessibility.
- Emphasize effective communication.
- Translate forecasts into a language/concept that users can understand.
- More than just providing food/water, need to focus on jobs, etc.
- Promote the development of safety nets and their implementation.

*6.1.1.6. Planning for appropriate response and relief within the framework of national drought policy.* There is a need to move from reactive to proactive within the framework of national drought management policy. There is also a need to establish inter-linkages with early warning, preparedness and long-term resilience building. Appropriate approaches should consider the cross-sectoral and multi-disciplinary nature, and strengthen collaborative decision-making. It is crucial to engage all stakeholders concerned including private sectors and seek coordination of response measures at all levels. The following recommendations were made in the session on "Planning for appropriate response and relief within the framework of national drought policy":

- Bridge the gaps between early warning and preparedness by utilizing traditional and newly developed tools to evaluate cross-sectoral impacts and the effects of relief measures.
- Enhance better understanding of drought phenomena and the associated risks and implications at all levels.
- Encourage immediate assistance (quick response) in a science-based and user-oriented manner.
- Promote the application of tools in support of proactive response, risk reduction and long-term adaptation.
- Invitational Drought Tournament (IDT) approach could serve as a model to engage stakeholders in coordinated discussions and planning for drought events preparedness and response in the main sectors.
- IDT could serve as support for institutional preparedness and response to drought by providing frameworks within which to conduct their assessments, identify strengths/gaps in preparedness and response, build upon assets and address vulnerabilities.

### 6.1.1.7. Constructing a framework for national drought policy: the way forward

- Understand the key climate drivers since climate system links directly to farm cash income.
- Recognize the key value in the use of crop simulation modeling in planning preparedness for agricultural droughts.
- Government programmes should help farmers to manage risk through appropriate decisions.
- Promote cooperation, consultation, communication, evidence-based policy and timing and partnerships between several organizations – national and international, NGO's, private sector and media.
- Establish national campaigns with the participation of national services, academic, research and cultural organizations.
- Avoid duplication of efforts and resources.
- Create regional meteorological and support systems.
- Promote proactive response specially for Early Warning Systems.
- Establish a system that allows integrated management of the different resources, especially in the Least Developed Countries (LDCs).
- Emphasize dissemination information to all users and in all languages.
- Evaluate the different activities that compete for water usage.
- Promote legislation dedicated to water resources usage and management.
- Improve the treatment systems of waste water.

## 6.2. High-level Segment

The High-level Segment was addressed by Heads of State and Government, ministers, heads and representatives of international organizations and sponsors.

His Excellency Mr. Brigi Rafini, Prime Minister of the Republic Niger chaired and addressed the opening of the High-Level Segment of the Meeting, with supporting keynote addresses by the Secretary General of the United Nations, HE Mr. Jakaya Mrisho Kikwete, President of the United Republic of Tanzania, His Royal Highness the Prince of Orange, Chair of the UN Secretary-General's Advisory Board on Water & Sanitation (UNSGAB), Prof. Dr. Bernard Lehmann, Director General, Swiss Federal Office of Agriculture and other dignitaries.

The High-Level Segment adopted the following Meeting Declaration encouraging all Governments to develop and implement National Drought Policies.

### 6.2.1. Final Declaration of HMNDP

#### (DECLARATION OPENING)

**DO 1:** We, the Heads of State and Government, Ministers, Heads of Delegations and Experts, attending the High Level Meeting on National Drought Policy (HMNDP) in Geneva, 11–15 March 2013:

#### (PREAMBULAR PART)

#### *Urgency of the problem*

**PP 1:** Acknowledging that droughts are natural phenomena that have caused human suffering since the beginning of humanity, and are being aggravated as a result of climate change;

**PP 2:** Noting the interrelationships between drought, land degradation and desertification (DLDD), and the high impacts of DLDD in many countries, notably the developing and the least developed

countries, and the tragic consequences of droughts, particularly in Africa;

**PP 3:** Acknowledging the role of the UN agencies, and in particular the United Nations Convention to Combat Desertification (UNCCD) in line with its mandate, provisions and principles in particular Parts II and III of the Convention, to assist in the combat against drought and desertification;

**PP 4:** Observing that drought has major implications in terms of the loss of human lives, food insecurity, degradation of natural resources, negative consequences on the environment's fauna and flora, poverty and social unrest and that there are increasingly immediate short-term and long-term economic losses in a number of economic sectors including, inter alia, agriculture, animal husbandry, fisheries, water supply, industry, energy production and tourism.

**PP 5:** Concerned with the impacts of climate variability and change and the likely shift in the patterns of droughts and possible increase in the frequency, severity, and duration of droughts, thus further increasing the risk of social, economic and environmental losses;

**PP 6:** Underscoring that addressing climate change can contribute to reducing the aggravation of droughts and that it requires action, in accordance with the principles and provisions of the United Nations Framework Convention on Climate Change;

**PP 7:** Noting that desertification, land degradation and drought are global challenges that continue to pose serious challenges for the sustainable development of all countries, in particular the developing countries;

**PP 8:** Acknowledging that there are insufficient policies for appropriate drought management and pro-active drought preparedness in many countries around the world and that there is need for enhancing international cooperation to support all countries, in particular developing countries in managing droughts and building resilience, and that countries continue to respond to droughts in a reactive, crisis management mode;

**PP 9:** Recognizing also the urgent needs for countries to manage droughts effectively, and better cope with their environmental, economic and social impacts;

**PP 10:** Recognizing that to better cope with droughts, countries need to understand the need for improved risk management strategies and develop preparedness plans to reduce drought risks.

#### *Scientific progress in drought monitoring and early warning systems*

**PP 11:** Recognizing that advances in drought monitoring and early warning and information systems, under government authority, and the use of local knowledge and traditional practices can contribute to enhanced societal resilience and more robust planning and investment decisions, including the reduction of consequences of drought impacts;

**PP 12:** Recognizing that scientific advances in seasonal to inter-annual and multi-decadal climate predictions offer an additional opportunity for the continued development of new tools and services to support improved management of droughts.

#### *Need for vulnerability and impact assessment*

**PP 13:** Noting the need for urgent intersectoral coordination of the assessment of drought vulnerability and drought management.

*Need for rapid relief and response*

**PP 14:** Noting the need to identify emergency measures that will reduce the impact of current droughts while reducing vulnerability to future occurrences, relief must be targeted to the affected communities and socio-economic sectors and reach them in a timely fashion.

**PP 15:** Noting also the need to create synergies between drought relief measures and the preparedness, mitigation and adaptation actions for long term resilience.

*Need for effective drought policies*

**PP 16:** Recalling the commitment in the outcome document of the UN Conference on Sustainable Development (Rio+20) to significantly improve the implementation of Integrated Water Resources Management at all levels, as appropriate.

**PP 17:** Recalling that the UNCCD is pertinent to the promotion of sustainable development and that it calls for the establishment of effective policies to combat land degradation and desertification and mitigate the effects of droughts.

**PP 18:** Recalling also the call of the COP10 of UNCCD for an advocacy policy framework on drought for promoting the establishment of national drought management policies.

**PP 19:** Recalling the decision of governments to create the Global Framework for Climate Services (GFCS) to strengthen production, availability, delivery and application of science-based climate prediction and services.

## (OPERATIVE PART)

**OP 1:** Encourage all Governments around the world to develop and implement National Drought Management Policies, consistent with their national development laws, conditions, capabilities and objectives, guided, inter alia, by the following:

- Develop proactive drought impact mitigation, preventive and planning measures, risk management, fostering of science, appropriate technology and innovation, public outreach and resource management as key elements of effective national drought policy.
- Promote greater collaboration to enhance the quality of local/national/regional/global observation networks and delivery systems.
- Improve public awareness of drought risk and preparedness for drought.
- Consider, where possible within the legal framework of each country, economic instruments, and financial strategies, including risk reduction, risk sharing and risk transfer tools in drought management plans.
- Establish emergency relief plans based on sound management of natural resources and self-help at appropriate governance levels.
- Link drought management plans to local/national development policies.

**OP 2:** Urge the World Meteorological Organization (WMO), the UNCCD and the Food and Agriculture Organization of the United Nations (FAO), other related UN agencies, programmes and treaties, as well as other concerned parties, to assist governments, especially the developing countries, in the development of National Drought Management Policies and their implementation;

**OP 3:** Urge the developed countries to assist developing countries, especially the least developed countries, with the means of

implementation towards the comprehensive development and implementation of National Drought Management Policies in accordance with the principles and provisions of the UNCCD;

**OP 4:** Encourage the promotion of international cooperation, including north-south cooperation complemented by south-south cooperation, as appropriate, to foster drought policies in developing countries;

**OP 5:** Invite WMO, UNCCD and FAO to update the draft versions of the Science and Policy documents taking into account the recommendations from the HMNDP and circulate them to all Governments for their review prior to finalization, to assist governments in the development and implementation of the National Drought Management Policies.

## 7. Conclusions

There is growing evidence that the frequency and extent of drought has increased as a result of global warming. Crisis management has typically characterized governmental response to drought. This approach has been ineffective, leading to untimely and poorly coordinated responses. Hence the High-level Meeting on National Drought Policy (HMNDP) was organized by the World Meteorological Organization (WMO), the Secretariat of the United Nations Convention to Combat Desertification (UNCCD) and the Food and Agriculture Organization of the United Nations (FAO), in collaboration with a number of UN agencies, international and regional organizations and key national agencies. HMNDP provided practical insight into useful, science-based actions to address the key drought issues being considered by governments and the various strategies to cope with drought. The HMNDP declaration, adopted unanimously by the participants in the meeting, encourages all Governments around the world to develop and implement National Drought Management Policies, consistent with their national development laws, conditions, capabilities and objectives.

## References

- Alcamo, J., Henrichs, T., 2002. Critical regions: a model-based estimation of world water resources sensitive to global changes. *Aquat. Sci.* 64, 1–11.
- Arnell, N.W., 2004. Climate change and global water resources: SRES scenarios and socio-economic scenarios. *Global Environ. Change* 14, 31–52.
- Barnett, T.P., Malone, R., Pennell, W., Stammer, V., Semtner, B., Washington, W., 2004. The effects of climate change on water resources in the West: introduction and overview. *Clim. Change* 62, 1–11.
- Bruinsma, J., 2003. World Agriculture: Towards 2015/2030 – An FAO Perspective. Earthscan, London, England.
- Bryant, E.A., 1991. *Natural Hazards*. Cambridge University Press, Cambridge, England.
- Burke, E.J., Brown, S.J., Christidis, N., 2006. Modeling the recent evolution of global drought and projections for the 21st century with the Hadley Centre climate model. *J. Hydrometeorol.* 7, 1113–1125.
- CRED, 2006. CRED Crunch December 2006. Centre for Research on the Epidemiology of Disasters, Belgium.
- Dai, A., Trenberth, K.E., Qian, T., 2004. A global set of Palmer Drought Severity Index for 1870–2002: relationship with soil moisture and effects of surface warming. *J. Hydrometeorol.* 5, 1117–1130.
- FAO, 2011. DG's Speech for launching of the inaugural edition of the Report on the State of the World's Land and Water Resources for Food and Agriculture – SOLAW. Rome, Italy (November).
- Henry, B., McKeon, G., Skyktus, J., Carter, J., Day, K., Rayer, D., 2007. Climate variability, climate change and land degradation. In: Mannava, V.K., Sivakumar, Ndegwa, Ndiangu (Eds.), in *Climate and Land Degradation*. Springer, Berlin Heidelberg, Germany, pp. 20–221.
- IPCC, 2007. Summary for Policymakers. In: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M., Miller, H.L. (Eds.), *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, England.
- Millennium Ecosystem Assessment, 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, District of Columbia, USA.



- Narisma, G.T., Foley, J.A., Licker, R., Ramankutty, N., 2007. Abrupt changes in rainfall during the twentieth century. *Geophys. Res. Lett.* 34, L06710, <http://dx.doi.org/10.1029/2006GL028628>.
- Sivakumar, Mannava V.K., Motha, R.P., Wilhite, D.A., Qu, J.J. (Eds.), 2011. *Proceedings of an Expert Meeting on the Preparation of a Compendium on National Drought Policy*. World Meteorological Organization, Washington DC, USA: Geneva, Switzerland (July 14–15, 2011).
- Tannehill, I.R., 1947. *Drought, Its Causes and Effects*. Princeton University Press, Princeton, New Jersey.
- Thomson, A.M., Brown, R.A., Rosenberg, N.J., Srinivasan, R., Izaurrealde, R.C., 2005. Climate change impacts for the conterminous USA: an integrated assessment. Part 4. water resources. *Clim. Change* 69, 67–88.