



Food and Agriculture
Organization of the
United Nations

PROACTIVE APPROACHES TO DROUGHT PREPAREDNESS

Where are we now and where do we go from here?



WHITE PAPER

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PROACTIVE APPROACHES TO DROUGHT PREPAREDNESS

Where are we now and where do we go from here?

FAO – Food and Agriculture Organization of the United Nations

with the collaboration of:

UNCCD – United Nations Convention to Combat Desertification

WMO – World Meteorological Organization

GWP – Global Water Partnership

IDMP – Integrated Drought Management Programme

WASAG – Global Framework on Water Scarcity in Agriculture

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ACRONYMS

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
AI	Aridity Index
ANA	National Water Agency of Brazil
APAC	Pernambuco Agency for Water and Climate
CAGM	Commission of Agricultural Meteorology of the WMO
CBD	Convention on Biological Diversity
CONAGUA	National Water Commission of Mexico
COP	Conference of the Parties
DNOCS	National Department of Works Against Droughts (Brazil)
DRAPA	Drought Resilient and Prepared Africa
EDC	European Drought Center
Embrapa	Brazilian Company for Agricultural Research
FAO	Food and Agriculture Organization of the United Nations
GWP	Global Water Partnership
HMNDP	High Level Meeting on National Drought Policies
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDMP	Integrated Drought Management Programme
IFAD	International Fund for Agricultural Development
INEMA	Bahia Institute of Environment and Water Resources
IPCC	Intergovernmental Panel on Climate Change
LAC	Latin America and Caribbean
LGP	Length of growing period
NADM	North American Drought Monitor
NDP	National Drought Policy
NIDIS	National Integrated Drought Information System
NMHS	National Meteorological and Hydrological Services
PDMA	Provincial Disaster Management Authority of Balochistan
PICRD	Permanent Interministerial Council for Rural Development
PPIC	Public Policy Institute of California

SDG	Sustainable Development Goal
SMN	National Meteorological Service of Mexico
SPEI	Standard Precipitation and Evapotranspiration Index
SPI	Standard Precipitation Index
UCSUSA	Union of Concerned Scientists
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
UNISDR	UN Office for Disaster Risk Reduction
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNW-DPC	UN-Water Decade Programme on Capacity Development
WASAG	Global Framework on Water Scarcity in Agriculture
WFP	World Food Programme
WHO	World Health Organization
WMO	World Meteorological Organization

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INTRODUCTION

Climate variability and droughts affect all regions of the world. Drought can occur in virtually any climatic regime, in both high and low rainfall areas. In contrast to aridity, which is a permanent feature of the climate and is restricted to low rainfall areas, drought is a temporary condition brought on by water shortage. There are several definitions of drought, however all of them include a climate variability component. A drought occurs when rains fall below a long-term precipitation average in a given place. Location is critical. For example, a 10 percent decrease in precipitation in a humid area, like the Amazon River, may not be perceived as a drought, while a small climate variability in a semi-arid area might. In general, the drylands – areas that have an annual deficit in precipitation – are more drought-prone than humid lands. In the drylands, semi-arid areas, which are usually more populous and home to greater economic and social activity, suffer more from drought.

Throughout history, droughts have influenced the development of technology, especially water supply and irrigation, and have contributed to the rise and fall of civilizations. Droughts hit different parts of the globe between 2010 and 2017, bringing huge challenges. In the future, climate change may bring more frequent and severe droughts. Observed drought trends show significant regional differences in drought and its impacts (IPCC, AR5, 2014).

Droughts reduce the availability of water for human beings, animals and ecosystems. The social impacts are more significant when severe droughts hit poor regions and vulnerable populations. When droughts are combined with conflict, such as civil wars, the social impacts can become devastating, leading to major humanitarian disasters stemming from hunger, malnutrition and thirst. There is no way to calculate the cost of the social impact when millions of lives are lost. The economic impacts are also significant, affecting activities that depend on rainfall.

Agriculture and food production are particularly affected by drought. In some cases, agricultural production may fail, leading to lost income, unemployment, erosion of assets, malnutrition and poverty. Most extremely poor people live in rural areas and depend on rainfed agriculture for their livelihoods, making them extremely vulnerable to drought. The risk of hunger is significantly greater in such areas. For example, in 2015/2016 severe droughts linked to El Niño resulted in losses of 50–90 percent of the crop harvest in the dry corridor in Central America (FAO/IFAD/UNICEF/WFP/WHO, 2018). Environmental impacts are also significant, including the loss of biodiversity and increased land degradation and desertification. A recent study by the Integrated Drought Management Programme (IDMP) found that the cost of drought-related impacts and the cost of doing nothing to stop them, are much higher than the expense of financing proper public policy responses (WMO/GWP, 2017).

Society and governments have faced droughts since ancient times. Initially, their responses were directed towards providing water and food assistance. Later, while continuing short-term relief actions, they began to construct water infrastructure, both for drinking water and for irrigation. Over time, the concepts of integrated water management, drought preparedness, mitigation and response, and sustainable development have evolved. Nevertheless, present day societies, especially in the developing world, are not fully prepared to face the impacts of droughts or to reduce their vulnerability in the face of increasing population, land degradation and climate change. Consequently, drought continues to be a dangerous hazard in many parts of the world, especially in developing countries and in regions that are prone to conflicts and environmental degradation.

Biophysical conditions and governance are key considerations in building drought preparedness, mitigation and response. Governance refers to the formal and informal rules, organizations, structures and processes through which public and private actors articulate their interests, frame and prioritize issues, and make and implement decisions. In many cases, technical innovations for increasing drought preparedness, mitigation and response already exist, but their implementation is hampered because of governance and political economy factors.

This paper presents current approaches to building proactive policies that support drought-stricken populations and activities, reduce vulnerability, and strengthen resilience to droughts. The paper analyses challenges and options for countries to adopt proactive drought preparedness policies, and addresses opportunities for enhancing the role of international organizations. The first section presents an overview of the regions and countries that are most affected by drought. The following sections present the context for drought, the main approaches to drought management, and the process to build a proactive drought policy that was started by the High-Level Meeting on National Drought Policies (HMNDP)¹, including some country experiences. We also discuss challenges and opportunities for adopting national drought policies in developing countries and offer some suggestions of support for current and future policies, including the role of international organizations.

¹ HMNDP was organized by WMO, UNCCD, and FAO in March 2013. HMNDP provided practical insight into useful science-based actions to address the key drought issues being considered by governments to cope with drought. The HMNDP declaration, adopted unanimously by the participants, encourages all governments around the world to develop and implement national drought management policies, consistent with their national development laws, conditions, capabilities, and objectives.

GLOBAL AND REGIONAL CONTEXTS FOR DROUGHT

Where droughts occur: all regions, developed and developing countries

Introduction

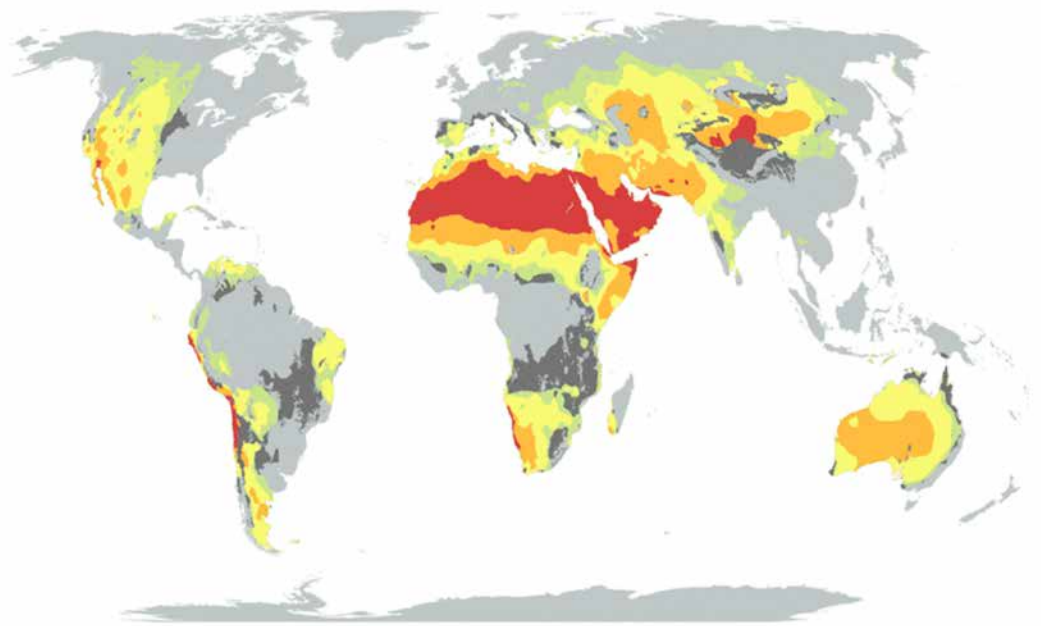
Drought affects many regions around the world,² including parts of the western and midwestern United States, Central America, northeastern Brazil, the sub-Saharan African belt, the Horn of Africa, Southern and Central Africa, Madagascar, Southern Spain and Portugal, Central Asia, Northwest India, Northeast China, Southeast Asia, Indonesia, and Southern Australia (Dilley *et al.* 2005).

Droughts have a range of pervasive effects (see Wilhite and Glantz, 1985). They can compromise agricultural systems: dry shocks can cause large changes in crop yields and are responsible for a net loss of food production that could feed eighty-one million people every day (Damania *et al.*, 2017). Droughts can also impact human health. For example, studies have associated droughts to stunting and wasting in small children (Singh *et al.*, 2006; Hoddinott and Kinsey, 2001). They can also accelerate the degradation of the environment (Slik, 2004), reduce economic growth and the long-term well-being of families (Damania *et al.*, 2017), and increase poverty levels.

Drylands are particularly sensitive to droughts and their related impacts (see Map 1 and Box 1). These are vulnerable marginal ecosystems from a climatic and socio-economic point of view. Dryland populations are frequently among the world's poorest people, who live with a higher risk of food insecurity, land degradation and desertification as a result of rainfall variability (FAO, 2008). Occupying around 40 percent of the world's land surface (according to the United Nations Convention to Combat Desertification [UNCCD]'s definition), or 45 percent (according to the FAO's definition) (see Box 1), drylands are home to over two billion people or about 34 percent of the global population. Ninety percent of the world's drylands populations live in developing countries, including in major cities such as Cairo, Mexico City and New Delhi. (UNCCD, 2012).

² There are four different definitions of drought: meteorological drought (a measure of the departure of precipitation from normal); hydrological drought (when surface and subsurface water supplies are below normal); agricultural drought (when the amount of soil water is not sufficient to meet the needs of a particular crop); and socio-economic drought (when physical water shortages affect people) (FAO, 2008).

Map 1: Drylands



Aridity zones*

Hyperarid - (P/PET < 0.05) Arid - (P/PET = 0.05 - 0.20) Semiarid - (P/PET = 0.20 - 0.50) Dry subhumid - (P/PET = 0.5 - 0.65) Excluded presumed drylands

*UNEP-WCMC, 2007, according to UNCCD and CBD definition

Source: FAO, *Global Dryland Assessment, 2014* according to the UNCCD and CBD definition <http://www.fao.org/in-action/global-forest-survey/activities/gfs-global-drylands-assessment/en/>

Despite their extreme vulnerability and water scarcity, drylands are home to 50 percent of the world's livestock and 44 percent of all cultivated land (UNCCD, 2012). Around one billion people rely on rainfed or irrigated farming or pastoralism for their daily survival. Droughts are usually combined with other stressors, such as overexploitation, deforestation and environmental degradation, which contribute to desertification and a decline in agricultural productivity in drylands (FAO, 2008; UNCCD, 2012). Irrigation can strengthen the resilience of farmers to climate shocks. However, if not well conceived, it may induce maladaptation and result in water-intensive crops that increase drought vulnerability (Damanian *et al.*, 2017). Other factors, such as political instability, lack of strong institutions and extreme poverty, intensify the impacts of drought in vulnerable populations. The incidence of droughts around the world are described in the next section.

Box 1. Definition of drylands

Different methodologies are used to define the term drylands. Two common definitions are offered by FAO and the UNCCD. FAO defines drylands as areas with a length of growing period (LGP) of 1-179 days; these include the arid (1-59 growing days), semi-arid (60-119 growing days) and dry sub-humid (120-179 growing days) climatic regions. The UNCCD's definition uses a ratio between average annual precipitation and total annual potential evapotranspiration (P/PET). Drylands are characterized by a P/PET of between 0.05 and 0.65 (arid: 0.05–0.20, semi-arid: 0.20–0.50, and dry sub-humid: 0.50–0.65). Hyperarid zones (LGP=0 and P/PET < 0.05) are not included among drylands in either definition.

	UNCCD		FAO	
	Aridity Index (AI) = P/PET	Share of world's land surface	Length of growing period in days	Share of world's land surface
Arid	0.05<AI<0.2	12.1%	1 to 59	7%
Semi-arid	0.2<AI<0.5	17.7%	60 to 119	20%
Dry sub-humid	0.5<AI<0.65	9.9%	120 to 179	18%
Total drylands	0.05<AI<0.65	39.7%	1 to 179	45%

Sources: FAO, 2008; UNCCD, 2012

Droughts in Africa, Asia, Latin America, North America, Australia, Europe

Droughts occur all over the world, with potentially devastating effects on population, the economy, livelihoods and the environment. According to the IPCC (Intergovernmental Panel on Climate Change), impacts from recent climate-related extremes, such as droughts "reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability (IPCC, 2014a)."

Africa

Moderate to extreme droughts occur in Africa and are a main driver of famine, displacement, disease outbreaks, loss of livestock and agricultural production, and poverty in general. Droughts in the Horn of Africa have caused at least one famine per decade over the past 30 years (FAO, 2000). In November 2017, about 15 million people in Kenya, Somalia and Ethiopia were declared to be severely food-insecure and in need of emergency food assistance (UNOCHA, 2017). Projections at the time indicated that 5.6 million children in the region would be acutely malnourished. The combination of drought and conflicts had displaced 3.7 million people in the region by July 2017 (UNOCHA, 2017a). Measles outbreaks were also on the rise in Somalia and Ethiopia (UNOCHA, 2017).

Other regions of Africa are also affected by severe multi-year droughts. For example, the years 1972–1973, 1983–1984 and 1991–1992 were extreme drought years throughout the continent; Northwest Africa suffered with droughts in 1999–2002; Western Africa (Sahel) was struck in the 1970s and 1980s and southern and southeastern Africa in 2001–2003 (Masih *et al.*, 2014). In the Sahel region, recurrent droughts, combined with low agricultural investment levels, armed conflicts, environmental degradation, high population growth and extreme poverty, created a chronic vulnerability to shocks among the population (Oxfam, 2012). The 2010 and 2012 droughts in the Sahel caused crop failure and high food prices, contributing to food insecurity and malnutrition. In 2017, an estimated 30 million people were food-insecure in the region, with almost 12 million at crisis and emergency levels (UNOCHA, 2017b). In Southern Africa, the 2015/16 El Niño caused the worst drought in the region for 35 years; five countries declared national emergencies and nearly 29 million people became food insecure due to droughts, floods and other structural factors (UNOCHA, 2017c).

Asia

Asia is highly affected by droughts. In South-East Asia, several countries were affected by the 2015–2017 drought. Viet Nam saw the worst drought in 90 years. In Indonesia, extreme drought was associated with acute respiratory infection that affected over 270 000 people. In Nusa Tenggara Timur, one of the poorest provinces of Indonesia, drought impacts were highly exacerbated by poverty and malnutrition. In the Philippines, a total of 17 provinces were in a state of calamity, and agricultural damage in the Province of Davao del Norte was estimated at USD 19.2 million. In Myanmar, a total of 146 villages suffered from water shortages, while in Sabah, Malaysia, several hundred hectares of crops were destroyed by fires in early 2016. In Cambodia and Timor-Leste, a prolonged drought contributed to an increased level of food insecurity (UNOCHA, 2017d).

In Central Asia, Afghanistan suffered three consecutive years of drought, with the result that five million people had little or no access to food in 2001 because of near total failure of rainfed agriculture, reduction of irrigated farm production and decimation of livestock (FAO, 2001).

In South Asia, severe multi-year droughts have increased water crises and the food insecurity of millions of people. In India, 330 million people were affected by the drought of 2015–16. Women and children were among the most seriously affected, with increases in wasting among mothers, an increase in child labour and cases of trafficking and child marriages in some of the affected states (UNICEF, 2016). In Pakistan, the drought of 1998–2002 was considered the worst in 50 years. In the province of Balochistan, the drought caused famine, slowed economic growth, raised food prices, disseminated diseases and malnutrition, and destroyed 80 percent of apple trees and orchards, among other impacts (PDMA, 2012). In Bangladesh, droughts and food insecurity in the northern region, coupled with poor coping strategies, have contributed to the rise of radicalism in the region (UNOCHA, 2014). In Vietnam, the worst drought in nearly a century – attributed to the El Niño event – occurred in 2016. In addition to damaging crop production and livelihoods (especially of vulnerable groups such as women and ethnic minorities), the drought also resulted in intensified saltwater intrusion in coastal areas (FAO, 2016). In Sri

Lanka, a severe drought followed by heavy rainfalls reduced the production of paddy rice, the country's staple food, by almost 40 percent in 2017, threatening the food security of about 900 000 people (FAO, 2017a).

In China, the Inner Mongolia Autonomous Region, Liaoning and Jilin provinces have suffered the effects of severe droughts (UNOCHA, 2017e). In Inner Mongolia, for example, economic losses from a recent drought were estimated at USD 780 million (Wong, 2017).

Latin America and Caribbean

In the Latin America and Caribbean region, the rural poor mostly inhabit the arid and semiarid subtropical regions, which include northeastern Brazil, northern Mexico, northeastern Venezuela, the Pacific coastal and central areas of Honduras and Nicaragua, northern Chile and most of coastal Peru (Quijandria *et al.*, 2001).

Severe drought impacts can be seen throughout the region, affecting economies, people and environments, causing substantial agricultural losses, pests and epidemics, human migration and poverty. As a result of the 2012 and 2013 drought in northeastern Brazil, for example, nearly all rainfed agriculture was destroyed and cattle stock died, were transferred, or sold at a lower than market price. The Rio São Francisco river flow reached its lower levels, and saline water intrusion impacted fishing and water supply in the lower basin. In Cuba, the droughts of 2004 and 2005 caused losses of USD 37 million. In Mexico, 2.7 million hectares were affected in 2011, particularly in Sinaloa, Zacatecas and Guanajuato, by a drought considered to be the worst in six decades. The 2010 drought in Peru affected over 66 000 families and over 330 000 hectares (Tsegai and Ardakanian, 2014). The 2015–2016 drought in Bolivia was considered one of the worst in the last 100 years; it caused widespread water shortages, resulting in a national state of emergency in November, 2016 (UNOCHA, 2016).

The 2009–2010 drought in the Caribbean, one of the worst the region has experienced, led to severe water deficits, large losses in the agriculture and livestock sectors and increases in food prices and bush fires (FAO, 2016a). The dry corridor of Central America was struck by the 2014–2017 drought – the worst in decades – leaving 3.5 million people in need of humanitarian assistance. Guatemala, Honduras and El Salvador were the most affected countries (FAO, 2016b).

North America

Severe droughts have afflicted North America throughout its history. The “Dust Bowl” in the 1930s and the droughts of the 1950s are among the most severe droughts the United States have seen (Folger *et al.*, 2013). As opposed to the Dust Bowl years where economic and social impacts were significant with many families having to abandon their farms, the impacts nowadays are mostly economic. Drought response and mitigation programmes have been able to reduce the impacts of drought in the USA, in particular, agricultural losses. In general, the western half of the United States and the southern regions of the Canadian Prairies are more susceptible to droughts. Some recent examples of droughts include the 2011–2013 Texas droughts, the 1999–2005 drought in the Canadian prairies and the 2012–2017 California drought (NIDIS, 2018).

The recent California drought heavily affected the agricultural and environmental sectors. Because of the drought, farmers received 50 percent less surface water in 2015, which they compensated by pumping additional groundwater (PPIC, 2015). Groundwater overdraft reduced the economic impacts on the agricultural sector, but increased the burden on current and future generations, which will be forced to dig deeper wells in search of alternative drinking water sources (Cooley, 2015). Among the environmental effects of the drought, low flows and high-water temperatures threatened native fish, and forests were at increased risk of wildfire and tree mortality (PPIC, 2015).

Australia

With the lowest rainfall and one of the most irregular rainfall patterns of all inhabited continents, Australia has been deeply affected by droughts (ABARES, 2012; Steffen, 2015). Some of the most severe droughts included the Federation Drought (1895–1903), which led to the death of millions of cattle; the World War II drought (1939–1945), which significantly decreased wheat production in the country and caused losses of nearly 30 million sheep and severe bushfires; and the Big Dry or Millennium Drought (1996–2010), which led to a decrease of 1 percent in the gross domestic product and a 28.5 percent fall in the gross value-added for the agricultural industry (Steffen, 2015; ABARES, 2012). Direct drought assistance to farmers by the Australian Government amounted to \$4.4 billion by mid-2010 and an estimated \$70 million was lost in the Murray River region because of reduced number of visitors in 2008 (Steffen, 2015).

Europe

Several European regions have been affected by extended drought events, including the Mediterranean, Southern, Western and Central Europe, the British Isles, Scandinavia, Eastern Europe and Russia, with Southern and Western Europe recording the highest drought frequency and severity from the early 1990s onwards (Spinoni *et al.*, 2015; EDC, 2018). In 2017, droughts affected extended regions of the Iberian Peninsula and central Italy, significantly reducing cereal production. Northwestern Europe and large parts of the Mediterranean region were also affected (UNOCHA, 2017f; Reuters, 2017).

Eastern Mediterranean

The Eastern Mediterranean Levant region, comprising Cyprus, Israel, Jordan, Lebanon, Palestine, Syria and Turkey, likely suffered the worst drought of the past nine centuries during 1998–2012, according to a recent study. Such dry extremes indicate the influence of anthropogenic climate change (Cook *et al.*, 2016). In Syria, severe droughts, beginning in the mid-2000s, crop failures and the related economic deterioration, increased the migration of rural communities to the cities, contributing to urban unemployment, economic dislocation, social unrest and political instability (Gleick, 2014).

Drought and its impacts on agriculture, energy and industry

An FAO study shows that 22 percent of the damage and losses caused by disasters between 2003 and 2013 fell on the agriculture sector, 25 percent if only climate-

related disasters are considered. However, if droughts alone are considered, over 80 percent of the damage and losses were to the agriculture sector, in particular livestock and crop production. In sub-Saharan Africa, over 363 million people were affected by droughts between 1980 and 2014 (FAO, 2015). Another FAO study shows that most of the natural disaster-related costs incurred from 2005 to 2015 were due to drought impacts, amounting to USD29 billion in agricultural losses to developing countries (see Table 1). Droughts are the main cause of severe food shortages and affect all dimensions of food security, including availability, stability, access and use, triggering malnutrition and famine in vulnerable drought-prone countries (FAO, 2011).

Droughts impact vulnerable people, particularly women and children in developing countries. During drought events, they must walk longer distances to fetch water, for example. Throughout their lives, bear the marks of malnutrition, receiving less education and becoming less wealthy (Damania *et al.*, 2017).

Depending on mitigation capacity and resilience levels, droughts can also present a significant challenge for energy production in many regions. Water is critical for generating electricity at hydropower plants, but is also required for renewable technologies and for cooling thermoelectric plants. Water is necessary for fuel extraction and processing (fossil and nuclear fuels and biofuels), and for fuel transportation and emissions control (Spang *et al.*, 2014; UCSUSA, 2017). Thus hydroelectric power is usually hit hard by severe droughts. During prolonged droughts, countries and regions have replaced hydropower with natural gas and coal-fueled power plants (Lawrence, 2014; Dezem, 2014). However, thermal plants are also often affected by droughts (van Vliet *et al.*, 2016; Harto and Yan, 2011). For example, because of rainfall deficits in Uganda in 2010–2011, the share of hydropower and bagasse electricity generation decreased by nearly 4 percent and 40 percent (due to lack of availability of sugar cane) respectively. As a result, higher fuel imports were required to produce more electricity using thermal power plants (FAO, 2015).

Water is an important source of refrigerant for industrial production processes, meaning that water shortages can have a direct impact on production (Wilhite, 2016). Manufacturing output declined by 9.5 percent in Zimbabwe in 1992, largely due to the 1991–92 drought. The impact on the manufacturing sector was the result of water shortages, electricity shortages, input supply difficulties, reductions in demand and macroeconomic conditions (Benson and Clay, 1998).

Table 1. Cost of natural disasters to the agriculture of the developing world, 2005-2015 (in US dollars)

Disaster type	Cost
Drought	USD 29 billion in losses
Floods	USD 19 billion
Earthquakes/landslides/ sea movements	USD 10.5 billion
Other meteorological disasters, such as extreme temperatures and storms	USD 26.5 billion
Biological disasters, such as diseases and infestations	USD 9.5
Wildfires	USD 1 billion

Source: FAO, 2018.

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Droughts and climate change

Climate change is projected to alter the frequency and magnitude of droughts. Dryland regions are disproportionately at higher risk, and poverty and disadvantageous conditions are expected to increase in some populations as a result. It is likely that the frequency and intensity of droughts will increase, particularly in the Mediterranean region and southern Africa (IPPC, 2019). It is also fairly likely that risks from droughts and precipitation deficits are projected to be higher at a 2°C as compared to a 1.5°C increase in global warming in some regions (IPCC, 2018)

MAIN APPROACHES TO DROUGHT MANAGEMENT

The impacts of drought may vary, depending on where and when they occur and the approach taken to respond to them. In developing regions, like the Sahel and Northeast Brazil, drought is a social problem because of its consequences for the livelihoods of the poor, especially in rural areas. When coinciding with conflicts, like in Ethiopia in 1984 and Syria in 2011, drought becomes an even bigger problem, with impacts that reach beyond country borders, such as population displacements. A continuing drought in one region may have different impacts at different times if the environment has already been degraded by human activities, especially deforestation and land degradation. Environmental degradation results in increased drought vulnerability.

A major objective of drought response is to provide relief to the affected population, especially water, food and health care. This has traditionally been, and continues to be, an important way to deal with the effects of droughts. In the developing countries of Africa and Central America, the international community, including United Nations organizations, bilateral agencies and civil society, has intensely supported these relief activities. Many countries have now developed disaster risk reduction institutions, following the guidelines of the United Nations Office for Disaster Risk Reduction (UNISDR) and the recommendations of the Conference on Disaster Risk Reduction in Japan, especially the Sendai Framework for Disaster Risk Reduction 2015-2030.

The High Level Meeting on National Drought Policies (HMNDP), convened by the World Meteorological Organization (WMO), the Secretariat of the UNCCD and the Food and Agricultural Organization of the United Nations (FAO) in March 2013, provided an important benchmark in this regard. According to the HMNDP, “the time has come to move forward with a paradigm shift from crisis to risk management.” (WMO and GWP, 2014).

Large developing countries, like Brazil, have a national system of disaster risk reduction or civil defense, which includes drought response among its aims, together with other forms of natural disasters. A civil defense system usually includes rules and regulations for government recognition of an emergency, such as drought, and this allows the local population to receive financial and other support without having to follow the lengthy processes that normally apply to new government expenditures. In the case of droughts, the main support comes in the form of funds provided to the stricken population, water distribution, and food for people and animals. In the case of smaller countries facing budget constraints, such as in the Caribbean and in Africa, there is scope for additional support. International organizations, such as FAO, and civil society organizations have played important roles to support local populations suffering the impacts of drought.

Historically, society and governments have built water infrastructure, such as wells, dams, aqueducts and cisterns, to increase water security and reduce vulnerability to droughts. More recently, many countries – both developing and developed – have introduced improvements in integrated water management practices to enhance water supply and manage demand and quality using tools like water rights and the market system. One common challenge in integrated water resources management is how to adapt to reductions in water supply. Institutions in the water sector have sought to adapt to water crises provoked by drought through imposing mandatory measures, such as controlling water use, or market measures, such as water pricing. Irrigation is, by far, the main user of water in many countries, being responsible for around 70 percent of freshwater withdrawals (over 90 percent in the least developed countries). Many semi-arid regions use irrigation to reduce their vulnerability to droughts while increasing agricultural production, food security and employment. However, irrigated agriculture may be heavily affected during periods of intense or back-to-back droughts. Indeed, for many countries employing integrated water resources management, precedence in times of water shortage is given to human and animal water supply needs. Irrigation is not a priority when the available water is not sufficient to meet the needs of all users.

Science, technology and innovation are key to social and economic progress and to environmental sustainability. Increasing productivity and efficiency are at the heart of development. Throughout history, new knowledge and techniques have helped to improve agriculture and water use. Such progress has accelerated in the 20th and 21st centuries with the development of crops that are more resistant to water stress and production systems that are better adapted to drylands. Many research international and national institutions are dedicated to technology research in drylands, including the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India, the Brazilian Company for Agricultural Research (Embrapa), and the International Center for Agricultural Research in the Dry Areas (ICARDA) in Lebanon. Unfortunately, efforts to strengthen institutions and adopt new technologies usually come after an emergency has already occurred. To recover water quality in major rivers or to restore degraded and desert lands requires political will and significant investments, which are not always available in developing countries. There are international, national and local institutions devoted to climate and drought research and drought response. At the international level, institutions such as FAO, UNCCD, WMO, the Global Water Partnership (GWP), UNESCO, UN Environment, UNDP and related initiatives like the IDMP – Integrated Drought Management Programme, and WASAG – Global Framework on Water Scarcity in Agriculture, among others, have included drought among their concerns. At the country level, national meteorological and hydrological services (NMHS), which are linked to the WMO system, and multi-stakeholder platforms in the GWP network focus on advancing integrated water resources management, including drought management.

In general, developed country institutions, such as the Bureau of Reclamation in the United States, have shown a capacity to function well and to adapt to new circumstances. By contrast, drought-related institutions in developing countries and regions, such as the National Department of Works Against Droughts (DNOCS), in Northeast Brazil, which was created in 1909, find it difficult to adapt to new rea-

lities such as climate change. There are also institutions, like the Funceme-Ceará Foundation for Meteorological and Water Research, that operate at the state, provincial or basin levels and have made important contributions to research and policy on drought.

In short, many countries have considerable experience in terms of drought policies and institutions. Any progress in policy and planning should build on these experiences and the lessons learned so far.

In this paper, we advocate a proactive approach to drought management that does not just respond to specific events, but recognizes that drought planning is a permanent and continuing need. Guidelines have been developed by governments and international organizations and are being applied to the development of proactive national drought plans and policies (WMO and GWP, 2014). Droughts will continue to hit vulnerable populations. Increases in population and unsustainable economic growth are placing additional stress on natural resources, resulting in water depletion, deforestation, erosion, land degradation and desertification. The growing pressure of human activities on the natural environment, coupled with climate change, threatens the capacity of the planet to sustain civilizations unless the problem is tackled adequately and soon.

The following table presents the main approaches to drought management at present.

Table 2. Approaches to drought management

Approaches	What	Cost
1. Reactive drought response	Assistance to vulnerable populations: water, food, health care	During droughts
- Relief		
- Reduction of vulnerability*	Water Infrastructure: wells, aqueducts, dams, irrigation, water distribution	Triggered during droughts
2. Proactive drought policies and planning	Preparedness or contingency plans, programmes; drought policy institutions	Continuing
- Readiness and relief		
- Reduction of vulnerability*	Hydraulic infrastructure: wells, aqueducts, dams, irrigation, water and sanitation systems	Continuing, especially in non-drought years
- Sustainable development	Proactive drought policies as part of sustainable development planning; integrated water resources management; environmental policy; drought and environment as part of sectoral and regional policies; institutional development and capacity building; participation and civil society role.	Continuing

* Even reactive responses to drought include some measures that may result in less (or greater) future vulnerability. Many dam constructions have been undertaken in response to specific drought episodes. Proactive drought management also includes actions taken during drought.

TOWARDS A PROACTIVE NATIONAL DROUGHT POLICY

In March 2013, the World Meteorological Organization (WMO), the United Nations Convention to Combat Desertification (UNCCD) and the Food and Agricultural Organization of the United Nations (FAO) convened a High Level Meeting on National Drought Policies (HMNDP) in Geneva, Switzerland, with the participation of 87 countries from all regions, major UN organizations and civil society, to discuss and recommend actions for proactive drought policies around the world.

The HMNDP was a turning point in developing drought policy recommendations at the global level. Over a period of two years, an organizing committee with representatives from drought-prone countries like Brazil, China, Ethiopia, Russia, South Africa, USA, and organizations like FAO, WMO, UNCCD, UNISDR, WB, ICRISAT and UNESCO, held preparation workshops in Geneva, Brasilia and Rio de Janeiro, producing a scientific report and a policy document. The documents assessed lessons from regional, national and local experiences and provided the elements for proactive drought policies at all levels. The scientific document emphasized the need for greater knowledge and understanding of drought-related impacts, vulnerability and risk, and an assessment of proactive mitigation measures. During the HMNDP, participants agreed on a conference declaration, which was approved in plenary.

The HMNDP brought together 30 years of drought policy experience from developed and developing countries, together with academic research and institutional progress at the international, national and local levels. These country experiences, and work by the University of Nebraska, which helped to define drought policies in the United States and for many countries, were critical to the development of the HMNDP proposals (HMNDP, 2013).

The HMNDP process concluded that drought policy should include the following steps: i) promote standard approaches to vulnerability and impact assessment; ii) plan and implement drought monitoring, early warning and information systems; iii) enhance preparedness and mitigation plans and programmes; and iv) plan and implement emergency and relief measures. (HMNDP, 2013).

The HMNDP Declaration encouraged “all countries around the world to develop and implement National Drought Management Policies” and urged UN agencies, especially FAO, WMO and UNCCD, to help governments develop and implement drought programmes. The declaration also urged developed countries to support efforts by developing countries, and encouraged international cooperation in the development of national drought policies (HMNDP, 2013).

The HMNDP process launched two important initiatives: the Integrated Drought Management Programme (IDMP) and the UN-Water Capacity Building Initiative.

The IDMP aims to assist countries and regions to develop and implement drought policies and strategies. It is an initiative of the WMO and the Global Water Partnership, with support from FAO, UNCCD and other organizations. The IDMP provides the expertise of over 30 leading drought management institutions through a help desk with three components: Ask, Find, and Connect.

Through the Ask function, people wishing to know more about how to develop drought policies or solve specific problems related to drought policy pose questions to specialists. With the support of the Find window, people can search for resources to help define drought policies, including literature on droughts, a handbook on drought indicators and indices (WMO and GWP, 2016), and guidelines on the three pillars of integrated drought management: (i) drought monitoring and early warning systems; (ii) drought vulnerability and impact assessment; and (iii) drought preparedness, mitigation and response. The Connect function puts users in contact with institutions or countries that can provide technical assistance on the development of drought policy. The IDMP webpage also gives detailed information on the HMNDP and its main documents (IDMP, 2019).

The UN-Water Capacity Building Initiative, launched during the HMNDP, is a collaboration of the World Meteorological Organization (WMO), the Food and Agriculture Organization of the United Nations (FAO), the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD), in cooperation with the UN-Water Decade Programme on Capacity Development (UNW-DCP).

Based on the recommendations of the HMNDP, the capacity building initiative organized training seminars around the world: Eastern and Southern Africa (held in Addis Ababa, Ethiopia); Near East and North Africa (held in Cairo, Egypt); Asia-Pacific (held in Hanoi, Viet Nam); Latin America and the Caribbean (held in Fortaleza, Brazil); Eastern Europe (held in Bucharest, Romania); and West and Central Africa (held in Accra, Ghana). The seminars took place during 2013 and 2014 with the aim of building capacity, in developing and transition countries, in planning and implementing risk-based national drought policies, based on the needs identified in each country. The proceedings of these workshops are available on the IDMP webpage (IDMP, 2013).

PROGRESS SINCE HIGH LEVEL MEETING ON NATIONAL DROUGHT POLICIES (HMNDP)

Much progress has been made since the HMNDP recommended that countries plan and implement proactive national drought policies and urged all UN organizations to support these efforts. In addition to the capacity building seminars and the IDMP initiatives described above, important regional conferences were held in Africa and in Latin America.

The Africa Drought Conference took place in Windhoek, Namibia, from 15 to 19 August 2016. The conference was convened by the Ministry of Environment of Namibia, with support from the UNCCD, and included high-level representatives from African countries. The African conference aimed to build a framework to increase resilience to drought impacts in Africa. It produced two main outputs:

- I. the Windhoek Declaration; and
- II. a white paper on a drought-resilient and prepared Africa (DRAPA).

Under the Windhoek Declaration, countries committed to DRAPA, based on six principles: i) policy and governance for drought risk management; ii) drought monitoring and early warning; iii) drought vulnerability and impact assessment; iv) drought mitigation, preparedness, and response; v) knowledge management and drought awareness; and vi) reducing underlying factors of drought risk. Principles ii), iii) and (iv) correspond to the three pillars of the drought policy and are critical. Principles i), v) and vi) are cross-cutting principles underpinning the central principles.

The Latin America and Caribbean (LAC) Drought Policy Conference was held in Bolivia, from 14 to 16 August 2017. It was jointly organized and implemented by the Ministry of Environment of Bolivia and the UNCCD, FAO and WMO. The conference was attended by representatives of LAC governments, as well as UNCCD, FAO, WMO and IDMP. The Latin America and Caribbean Conference produced two main documents (UNCCD, FAO and WMO, 2016):

- I. the Declaration of Santa Cruz de la Sierra; and
- II. A background paper, 'Towards drought policies in LAC.'

The Declaration of Santa Cruz de la Sierra invited participants to work with their governments to adopt drought risk management policies based on the three pillars recommended by the HMNDP. The background paper elaborated on each pillar

and presented the cross-cutting measures to be taken by countries and supported by international organizations and developed country governments. These include national policies; international and regional cooperation; institutional and gender dimensions, including coordination, implementation, capacity building, participation and gender issues; financing, and evaluation.

The UNCCD Conferences of the Parties (COP)

Desertification, land degradation and drought are interlinked themes of concern to the UNCCD, which followed up on the recommendations of the HMNDP during the last three COPs to the Convention. At COP 11, in Namibia in 2013, the UNCCD approved the Windhoek Declaration, urged country parties to develop and implement drought management policies consistent with their national development priorities, and invited the FAO, the WMO and other UN agencies to support these efforts. At COP 12 in Turkey in 2015, the Ankara Initiative signaled its support for Sustainable Development Goal (SDG) 15, Target 3: to achieve land degradation neutrality by the member countries. And at COP 13, in Ordos, China in 2017, the UNCCD approved an advocacy approach on droughts, inviting countries to pursue proactive policies based on the three pillar structure arising from the HMNDP recommendations. During COP13, country parties requested the Secretariat and appropriate UNCCD institutions and bodies including the Science-Policy Interface, to implement the Drought Initiative during the 2018-19 biennium. The drought initiative focuses on: (i) Drought preparedness systems, (ii) Regional efforts to reduce drought vulnerability and risk; and (iii) a toolbox to boost the resilience of people and ecosystems to drought.

Other initiatives in the UN system

All relevant organizations of the United Nations system, including FAO, WMO, UN Environment, UNDP, UNCCD, UNCBD, UNFCCC, UNESCO, have been engaged on issues related to drought and drylands. Beyond the contributions of each agency, there are great opportunities for synergies, both among the UN Conventions (UNCCD, UNFCCC, UNCBD) and among the agencies as well as with other inter-governmental organizations, such as the Global Water Partnership. As noted previously, the HMNDP was a collaboration between WMO, FAO and UNCCD, with the participation of other agencies. There is also much room for collaboration between UN Agencies and civil society organizations, such as the IDMP, which is jointly managed by WMO and GWP in partnership with other agencies.

The FAO has several initiatives on drylands, drought and land degradation. In 2016, for example, FAO launched the Global Framework on Water Scarcity in Agriculture (WASAG), a partnership that brings together “key players across the globe and across sectors to tackle the collective challenge of using water better in agriculture to ensure food security for all (FAO-WASAG, 2019). WASAG is an effort to draw greater attention to the issue of water scarcity in agriculture in the context of climate change and to generate greater political will for overcoming the related challenges throughout the world, including drought. The work of WASAG is structured in six working groups, one of which is devoted to drought preparedness.

The members of WASAG, led by FAO with the support of the Governments of Cabo Verde, Italy and Switzerland, and the International Fund for Agriculture Development (IFAD), convened the 1st WASAG International Forum on Water Scarcity in Agriculture from 19-22 March 2019 in Praia, Cabo Verde. WASAG partners adopted the Praia Commitments, which includes support for “the institutionalization of a pro-active and risk-based approach to drought preparedness (FAO-WASAG, 2019).” As noted previously, WMO and the GWP jointly manage the IDMP, which supports national drought policies in countries of Asia, Africa, Eastern Europe and America, following the general guidelines established by the HMNDP and operational guidelines developed by the IDMP (WMO and GWP, 2014). The GWP is a global action network with over 3 000 partner organizations, involving 183 countries. Its aim is to support regions and countries in improving water governance.

Drought has a slow-onset that can affect millions of square kilometres and millions of people, provoking massive social, economic and environmental impacts. In this regard, droughts have a larger impact than other natural disasters, which are usually more localized and have a rapid-onset. For this reason, a number of international tools and strategies have been developed to reduce the risk of natural disasters, usually under the auspices of the United Nations Office on Disaster Risk Reduction (UNISDR).

In 2015, the Third UN World Conference on Disaster Risk Reduction – organized in Japan by the UNISDR – approved the Sendai Framework for Disaster Reduction 2015-2030. The goal of the Sendai Framework is to reduce the risks that disasters – including droughts – pose to people, as well as the economic and environmental losses they provoke.

The Sendai Framework establishes four priorities:

- I. understanding disaster risk;
- II. strengthening disaster risk governance to manage disaster risk;
- III. investing in disaster risk reduction for resilience;
- IV. enhancing disaster preparedness for effective response, and to ‘Build Back Better’ in recovery, rehabilitation and reconstruction.

The Sendai Framework also established 13 principles that are valid for drought policy. These principles include the following: primary responsibility rests with countries and states; responsibility must be shared intergovernmentally and intersectorially; protection of persons and their assets; societal engagement; empowerment, inclusiveness and coherence; accounting of local characteristics; cost-effectiveness; global partnership, international cooperation; and support to developing countries.

To support the implementation of the Sendai Framework, in 2017 the United Nations adopted the Plan of Action on Disaster Risk Reduction for Resilience: Towards a Risk-Informed and Integrated Approach to Sustainable Development (UNISDR, 2017). The Plan of Action links the achievement of the Sendai Framework goals to the 2030 Agenda for Sustainable Development.

The Paris Agreement and the Sustainable Development Agenda

According to the IPCC, climate change will result in more frequent and intense droughts in future (IPCC, 2014). For this reason, the Paris Agreement, in Article 8.1, recommended parties to avert, minimize and address loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and promote the role of sustainable development in reducing the risk of loss and damage. In Article 8.4, the Paris Agreement recommended greater cooperation on early warning, emergency preparedness and slow onset events (UNFCCC, 2015).

The UN Sustainable Development Agenda comprises 17 Sustainable Development Goals (SDGs), with 169 targets to be met by 2030. The Agenda was approved at the UN Sustainable Development Summit in 2015, after two years of preparation. While all of the SDGs are relevant to countries affected by drought, some are particularly important because they deal with issues that are key to establishing drought policies.

SDGs 1 and 2, which concern poverty and hunger, food security and sustainable agriculture, are important for drought-stricken regions in developing countries, because these regions have the highest concentration of poor people, who suffer most from hunger and local conflicts. Target 1.5 aims to reduce the vulnerability of the poor to extreme events, and Target 2.4 aims to ensure sustainable systems for food production that can adapt to climate change and extreme events. SDG 6, on water and sanitation, is critical to drought policy, because it deals with the issues of water stress and quality. The lack of water is the most dangerous of the environmental, social and economic drought impacts. SDG 11 on sustainable cities includes Target 11.5, which seeks to reduce the impacts (e.g. death and economic losses) caused by catastrophes and to protect the vulnerable poor. SDG 13 on climate change is also important because climate variability can lead to more extreme and severe droughts. SDG 15, on ecosystem restoration, protection of biodiversity, and the recuperation of degraded and desert land is also critical to drought policies. Target 15.3 aspires to a world with land degradation neutrality by 2030. Finally, SDG 17, which deals with implementation, is fundamental to all aspects of the SDGs, including those related to drought impacts and responses.

ELEMENTS OF A NATIONAL DROUGHT POLICY

Drought policies are needed in all regions and countries, but especially in developing countries whose populations are particularly vulnerable. Policy-makers have much to learn from extensive experience in dealing with droughts in Africa, Asia, Latin America, and Eastern Europe, and the Mediterranean. This experience was taken into consideration by the HMNDP when it met in 2013 and decided to encourage countries to design and implement national drought policies.

Each country policy will have its own characteristics based on local conditions. It is not enough to simply adopt another country's policy wholesale. The HMNDP proposal emphasized that drought policies should not simply be a post facto response to disaster, but should be a permanent concern of governments and society. Drought policies should be put in place during non-drought years, when there is more time to plan and address challenges. During drought years, efforts will logically be directed to the implementation of drought response programmes. There are some elements however will be common to country policies.

In the first place, a drought policy should be based on three pillars:

- drought monitoring, forecast, and early warning systems;
- vulnerability, and impact assessment;
- drought preparedness, mitigation and response.

These three pillars should be supported by cross-cutting policies involving, at least, the following elements:

- coordination and institutional development;
- capacity building;
- financing;
- knowledge management, science, technology and research, and awareness;
- regional and international cooperation;
- stakeholder participation and inclusiveness;
- evaluation.

Pillar 1 - Drought monitoring, forecast, and early warning

Monitoring

Regions or countries should develop drought monitoring systems to track the progress and state of a drought. The drought monitoring systems of the USA, North America, Mexico and northeast Brazil, for example, periodically issue maps, where information on drought indicators and local knowledge are combined to show the current drought situation in the area. The map can be issued on a weekly, two-weekly, or monthly basis. Drought monitoring provides useful information for policy-makers and others tasked with making decisions regarding the drought. Recognizing a state of emergency is easier, for example, when there is reliable information available about the state and severity of the drought. The international community should aim to support the establishment of drought monitoring maps and reports for all regions, sub-regions and countries. We have adequate knowledge and information to do so. It is simply a matter of ensuring that adequate financial resources and institutional and technical capacities – including satellite imagery – are available to each country.

Forecast

While monitoring focuses on the state of drought, a forecast shows the probability that a state of dryness will develop. Usually, a forecast map will predict the probability above average, below average or average precipitation. In Northeast Brazil, for example, drought forecasting considers the surface temperatures of the Pacific and of the Atlantic to predict the probability of rains occurring during the next four months. Forecasting the next rainy season has become more common as the technology has continued to improve. Armed with information about the probability of a wet or dry period during the coming months, decision-makers can better plan for the possibility of a drought.

Early warning

Communicating the right scientific information to users and policy-makers is of the utmost importance. It allows for better drought planning and adaptation. However,, false or incomplete information can be dangerous and lead to the wrong decisions. For example, anticipating a drought, farmers may decide not to plant, and this decision may cause immediate unemployment. If, in the end, the drought does not occur, society will lose out in terms of employment and income. For these reasons, early warning systems need to be based on the very best monitoring and predictive data, back by other relevant information on regional coping and response capabilities.

Examples of Pillar 1 in action have been compiled by the IDMP and can be found at: <http://www.droughtmanagement.info/pillars/monitoring-early-warning/>

Pillar 2 - Vulnerability and impact analysis

The risk of drought impacts in a particular area depends on the extent of the hazard, and the vulnerability and exposure of the area, its population, and environment. An in-depth and current knowledge of vulnerability and impacts is thus fundamental to understanding drought impacts and designing mitigation measures. This calls for continuous development and updating of knowledge and information. While there is much knowledge currently available at international, national and local levels, the data is scattered among different research groups and institutions and there is little effort at coordination. As a result, the information only rarely reaches the desks of policy-makers.

There is no universally applicable model for assessing drought vulnerability and impact. However, the gaps are well known. It will be necessary to i) conduct additional research; ii) guarantee the currency of information on vulnerability and impacts; iii) ensure appropriate coordination at country levels; and iv) establish mechanisms for linking the knowledge resulting from research and studies to decision-makers. National approaches may vary. In Mexico, for example, there is a national program on drought research that conducts vulnerability and impact analysis. In Brazil, drought research is conducted by the science community, but there is no specific policy to incentivize research and studies nor to synthesize the information for policy makers.

Examples of Pillar 2 in action have been compiled by the IDMP and can be found at: <http://www.droughtmanagement.info/pillars/vulnerability-impact-assessment/>

Pillar 3 – Preparedness, mitigation and response

Drought preparedness, mitigation and response actions are usually undertaken by governments and societies. Nor is the notion that actions to combat the effects of droughts should involve long-term strategies new. What is new – thanks to the HMNDP – is a recognition that effective measures must be taken to establish proactive as well as reactive drought policies at regional, national, and local levels. Addressing drought effects should not be only in reaction to a drought event, as has been the case in the past, but should also occur during non-drought years.

Mitigation actions aim to reduce social, economic and environmental vulnerability to droughts. While there will always be droughts, their impacts will differ depending on the vulnerability of people and the surrounding area. The main impacts of droughts are on: i) water supply and water quality; ii) agriculture, including rainfed and irrigated production and livestock; and iii) hydroenergy production. This points to the need for permanent planning and action to improve the integrated management of water supply and demand, to reduce the vulnerability of agriculture and rural communities and identify sustainable sources of energy production. These are only examples, as the list of local impacts may be long, and each area requires sustainable planning and implementation.

Response actions aim to help people face the impacts of current droughts. Even if actions have been taken to mitigate drought impacts, it will still be

necessary to face drought events. Response strategies are developed mostly within the context of national defense systems and are linked to the disaster reduction strategies of countries and the guidelines of the UNISDR. In developing countries, the most common and significant drought impacts involve: i) loss of income and employment, especially by agricultural workers and small-scale family farmers; ii) reduction in water supply in rural areas and cities; iii) decrease in rainfed and irrigated agricultural production during multi-year droughts; iv) reduction or elimination of supplies for animal feed.

Response actions are generally the responsibility of central governments, sometimes with input from provinces or states and local communities. Response actions tend to be mainly reactive, meaning that actions are defined when a drought strikes. Nevertheless, there has been progress under the UNISDR framework on disaster risk reduction, especially the Hyogo Framework and the Sendai Framework, and efforts by national civil defense systems. In the case of smaller developing countries, the role of international and civil society organizations has been more prominent in supplying relief assistance during droughts.

Several countries have adopted strategies to address lost income and employment, such as the creation of employment in work fronts, the distribution of food baskets, or cash transfers through social protection systems. Brazil, for example, employed about three million rural workers during the 1983 drought. Today, Brazil maintains a system of social protection that provides monthly cash transfers to low income people, benefitting the drought-stricken population. The social protection system has replaced the need for work fronts, which were common in the country previously.

Reductions in water supply due to droughts has a serious impact, especially in the case of a multi-year drought. Relief action can take a variety of forms. Water trucks distribute water to both rural and urban populations. New aqueducts and wells are built, desalting tools are used, and new sources of water are sought. A number of countries maintain crop insurance systems, which guarantee payment to farmers in case of production losses. According to GWP, “risk-transfer solutions, such as climate-risk insurance, can provide liquidity immediately following a disaster (GWP, 2018).” Some countries, like Brazil, support cattle raisers in drought-affected areas through the distribution of animal feed at below market prices.

Proactive response actions require preparedness plans at national, state or provincial, and local levels, as well as territorial (water basins), urban, and sectoral levels. Such planning requires attention to a range of questions: How can we ensure a continuous water supply for a specific community in times of severe drought? How do we manage water supply from a dam that is prone to low water levels? How do we coordinate state actions to meet the needs of local people? How do we link response actions to mitigation actions and to regional and national sustainable development?

Examples of Pillar 3 in action have been compiled by the IDMP and can be found at: <http://www.droughtmanagement.info/pillars/mitigation-preparedness-response/>

Cross-cutting policies

Planning and implementation of the three pillars of national drought policy require well-defined coordination and institutional development. Effective implementation is decentralized and involves both vertical and horizontal integration of activities. It is recommended to establish a high-level coordination body, with access to decision-makers at the highest level, such as an inter-ministerial commission, together with a clear definition of institutional responsibilities for implementing the various elements of the response plan. Capacity building is necessary at all levels. Funding for drought policies should be considered as a priority, both by national governments and international institutions. Response planning requires knowledge management and continuing research, ensuring the transfer of new knowledge to policy-makers and decision-leaders. It is also necessary to raise public awareness around the impacts of droughts and the steps available to respond to them.

Regional, south-south, north-south, tripartite and international cooperation should be enhanced to support drought policies and to promote the adoption of the three drought policy pillars at national and regional levels. International organizations, such as FAO, should focus on supporting the development of drought policies, especially for monitoring and early warning systems, implementing studies and research on vulnerability and impacts, and evaluating mitigation and response strategies.

Stakeholder participation is very important. It is recommended that the planning and implementation of each response action involve stakeholders to the extent possible. There should be special efforts to include minorities, especially women, children, elders, and indigenous peoples, who are in general more affected by the negative impacts of droughts. Finally, there should be a routine evaluation of drought-response projects with the objectives of learning and applying lessons about efficacy and efficiency.

SOME COUNTRY EXPERIENCES

Introduction

The IDMP analysed how far the key elements of national drought policies, which the High-Level Meeting on National Drought Policies (HMNDP) put forward in 2013, are actually included in national drought policies. The study used as a starting point information provided by the National Meteorological and Hydrological Services (NMHS) of the different countries collected through a survey on national progress reports for the period 2010-2014 in agricultural meteorology organized by the Commission of Agricultural Meteorology (CAgM) of the WMO. According to the countries responding to the survey by 2014, 18 countries have national drought policies along the lines recommended by the HMNDP. The IDMP analysis showed that six of these countries are showing a high level of alignment with the key elements of national drought policies of the HMNDP; another ten countries' drought policies are somewhat reflecting these key elements, while two countries' drought policies show few of them (GWP/WMO IDMP Internal Analysis).

Countries do not yet have much experience in implementing the three pillars of national drought policy, but some results can already be observed. The WMO and the GWP, through the IDMP, have compiled information on implementation and this is available on the IDMP website (IDMP, 2019 a, b, c). The IDMP also provides links to country webpages on national drought policies (IDMP 2019, d). Some examples of national drought policies can be found below.

Brazil

Brazil participated in the HMNDP and was one of the first countries to respond to the recommendations of the meeting under the auspices of the Ministry of National Integration. With technical and financial support from the World Bank, Brazil developed a monitoring protocol for the drought-stricken northeastern region (De Nys *et al.*, 2016). The objective was to advance not only on technological innovations, capacity building and financing, but also on an adequate institutional setting. The Brazilian Drought Monitor is coordinated by ANA – the National Water Agency—with the active participation of other climate and research institutions in Brazil, particularly state water and meteorological services, such as the Foundation on Meteorology and Water Resources of Ceará (Funceme), the Pernambuco Agency for Water and Climate (APAC), and the Bahia Institute of Environment and Water Resources (INEMA). The Brazilian Drought Monitor issues a map and a report every month, which is prepared by climate and water research institutions and validated by local experts (ANA, 2019). The Monitor uses SPI – standard precipitation index – and SPEI – standard precipitation and evapotranspiration index – data, as well as information on the state of the reservoirs. Brazil also has considerable experience on Pillar 2 (vulnerability and impact studies) and 3 (mitigation and response), but has not yet come up with an approach to these actions that defines institutional responsibilities and coordination mechanisms.

Mexico

Mexico was one of the first countries to define a national drought policy based on the three pillars of the HMNDP. Much of the work was carried out by the Mexican National Water Commission (CONAGUA), with support from the National Meteorological Service of Mexico (SMN). The Mexican Drought Monitor is part of the North American Drought Monitor (NADM). The North American Drought Monitor (NADM) is a cooperative effort between drought experts in Canada, Mexico and the United States to monitor drought across the continent on an ongoing basis. Mexico has established a drought preparedness system to implement drought prevention and mitigation in each water basin.

China

As reported to the WMO, the National Drought Policy of China is already fully functional. It includes early warning systems, intergovernmental communication, and funding. The Ministry of Water Resources is responsible for disaster risk reduction, including response actions and projects in all provinces. The legal and regulatory system includes a water law and norms for combatting droughts. Every year, each province must prepare a plan for drought emergency under the general coordination of the Ministry of Water Resources.

Spain

Much of Spain is subject to recurrent droughts, which were traditionally managed in a reactive manner until the severe drought of 1991-95; this had strong negative socio-economic consequences, which triggered a change in approach. Spain developed a proactive drought management strategy focused on the establishment of an early warning system, and the definition of drought indicators to help inform decision-making. The Ministry of Environment carries out drought monitoring on a monthly basis and publishes a report, including drought indicator maps. Spain has also developed special drought management plans for hydrological planning and emergency plans for urban water supply systems.

Morocco

Most of Morocco is comprised of drylands, including deserts and semi-arid lands. Droughts are recurrent in the country. Following the severe drought episodes of the 1980s, the government established a strategic approach in order to move away from the prevailing approach to drought crisis management. In 1995, preliminary guidelines for a more proactive approach based on risk management principles (FAO, 2018a). The overall coordination of drought management is the responsibility of the Permanent Interministerial Council for Rural Development (PICRD), which has the ability to officially declare the onset of drought. The technical secretariat of PICRD is under the Ministry of Agriculture and Rural Development, which chairs meetings of the Interministerial Technical Commission once a drought episode has been declared. In 2001, the National Drought Observatory was created within the Ministry of Agriculture and Rural Development with the goal of building institutional capacity to cope with drought. The National Meteorology Office publishes a monthly newsletter on drought trends.

CHALLENGES IN ADOPTING NATIONAL DROUGHT POLICIES (NDP)

An analysis of experiences and the recommendations of the HMNDP process show that a good conceptual framework and technical methods exist for developing national policies, based on the three-pillar structure and cross-cutting dimensions. There are reasonable experiences, both at the international and national levels, and an established capacity among international specialized organizations to give support to national initiatives. However, there are challenges that need to be overcome by national and local governments.

1. *Political will.* Authorities must be convinced that it is important to have a drought policy, that the economic, social and environmental costs of doing nothing are excessively high, and that planning and executing a drought policy requires key decisions around institutions, coordination and resource allocation. Governments and society alike must be fully convinced that developing and implementing a drought policy will bring benefits to society, with few negative impacts.
2. *Institutions.* It is necessary to define the institutional framework for managing the national drought policy. This could require giving new responsibilities to existing institutions or creating new ones.
3. *Coordination.* Managing droughts calls for joint actions at different levels of government. While the responsibility for sectoral implementation will fall upon specific institutions, success will require that decisions are coordinated intergovernmentally and intersectorally. An effective national policy requires, for example, leadership from a high level collective body, with participation by all ministries and organizations with a responsibility for drought planning and implementation.
4. *Adequate resources.* The availability of adequate resources, in terms of institutions, human and technical capacity and budget, is critically important. Usually, middle-income countries have some resources and only need technical and methodological assistance. Less developed countries, however, usually lack sufficient resources to define and implement a national drought policy and these will need to be procured internally or from external donors.
5. *Capacity building.* Training should be a component of every drought policy. All three pillars require people with the capacity to plan and implement the required actions. Capacity building should extend not only to government staff, but also include people and organizations responsible for tasks such as monitoring, early warning, vulnerability and impact studies and policy evaluation.

6. *International cooperation.* Cooperation with international and regional organizations and civil society promotes the exchange of experience and information, knowledge and technology. It avoids the waste of resources and increases the effectiveness of the overall effort.
7. *Linking science-to policy.* A major challenge is how to transmit information to policy-makers. Often, the information generated by scientists does not find its way into the decision-making process. A possible solution is to 'translate' technical information into a language that can be understood by decision-makers. It is also necessary to create adequate channels for information dissemination.
8. *Policy integration.* A national drought policy is likely to complement or even to overlap with other national development and risk reduction strategies. The NDP is likely to be more effective if it is formulated in line with national development policies and international agreements, particularly those related to the SDG process.
9. *Communication.* A national drought policy should be communicated to the general public and, particularly, to the people that are most affected by drought. An appropriate communication strategy should be prepared to bring the drought policy information to different publics.
10. *Evaluation.* It will be necessary to evaluate the national policy on a regular basis to ensure that it is meeting its goals and that the resources at its disposal are being used in the most effective way.

CONCLUSIONS AND RECOMMENDATIONS

Droughts occur in all regions and climates of the world. They are a particular concern in marginal semi-arid regions, where even minor climate variability may cause significant impacts. Poor rural populations are more vulnerable to droughts, because they have fewer means to adapt to drought impacts. There is much experience, nationally and internationally, in dealing with drought, although drought action has most often been reactive rather than planned in advance.

Since the HMNDP in 2013, international organizations, such as FAO, WMO, UNCCD and others have recommended a proactive approach to drought management. The approach is based on three pillars: monitoring, forecasting and early warning; vulnerability and impact assessment; and preparedness, mitigation and response. Planning for drought should be a continuing task of governments, and should include strategies to reduce future vulnerability, and mechanisms for effective response. Several countries have already adopted policies along these lines and, six years after the HMNDP, it is clear that the approach is not only feasible but effective. Reinforcing these efforts calls for greater support and coordination among international organizations, especially in the United Nations system.

Integrated water resources management is closely linked to drought policy and should be strengthened in all countries. There is a need to optimize water supply, manage water demand and quality, and develop the capacity of institutions to meet the needs of water users. This is closely linked to SDG 6 on water resources.

Science, technology, and innovation are key to improving water use technologies such as irrigation, agriculture and urban water supply. Using science to improve water management will increase the productive use of water and improve the capacity to face water crises in times of drought.

Interventions that preserve ecosystems benefit drought preparedness. For example, sustainable land management helps to increase resilience to droughts. This requires increasing water supply and quality, protecting biodiversity, avoiding and recovering degraded and desert land. Agroforestry and agroforestry-livestock systems contribute to land use sustainability and to increasing drought resilience and are already in place in some areas; these should be applied in a more comprehensive way through a better integration between environmental, agricultural and drought preparedness policies.

Poor rural households are likely to be hit the hardest by droughts. National drought preparedness policies and interventions thus need to focus on the poor, including strengthening their livelihoods. Such policies should be linked to measures to ensure social safety nets. Social protections, such as cash transfers, can improve the resilience of poor people to drought.

Climate change may increase the occurrence and intensity of droughts in many parts of the world, especially in the drylands. Solutions must therefore consider not only present but future needs under climate change. National drought policies should be integrated in climate change adaptation plans and sustainable development strategies and be consistent with the Sustainable Development Goals. Likewise, national climate change and sustainable development policies should include drought actions among their concerns. This would, among other things, promote synergies among international actors, such as the environmental conventions of the United Nations, especially the Rio Conventions on climate change, biodiversity, and desertification.

Several challenges need to be addressed in the formulation of national drought policies: political will, institutional development, coordination mechanisms, availability of adequate resources, capacity building, international cooperation (including south-south, north-south and tripartite), linking science to policy, integration in sustainable development policies and the SDGs, strategic communications and evaluation. Weaknesses in these aspects may impede the success of NDPs, even if the policies are well developed.

Finally, we suggest three issues deserving of further discussion at the intergovernmental level:

1. the need for national drought policies in all regions and countries. It is necessary to keep the momentum going and to continue working with countries to promote and develop national drought policies, taking into consideration the challenges listed above;
2. the need to strengthen coordination among UN organizations and to develop a strategy to assist all countries to improve and solidify their drought policies;
3. the need to convene a new High-Level Meeting on National Drought Policies (HMNDP II) to agree on strategies to support country efforts to establish national and regional drought policies.

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PROACTIVE APPROACHES TO DROUGHT PREPAREDNESS

Where are we now and where do we go from here?

This paper presents current approaches to building proactive policies that support drought-stricken populations and activities, reduce vulnerability, and strengthen resilience to droughts. The paper analyses challenges and options for countries to adopt proactive drought preparedness policies, and addresses opportunities for enhancing the role of international organizations. The first section presents an overview of the regions and countries that are most affected by drought. The following sections present the context for drought, the main approaches to drought management, and the process to build a proactive drought policy that was started by the High-Level Meeting on National Drought Policies (HMNDP), including some country experiences. The paper also discusses challenges and opportunities for adopting national drought policies in developing countries and offer some suggestions of support for current and future policies, including the role of international organizations.

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**Food and Agriculture
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United Nations
Convention to Combat
Desertification



**WORLD
METEOROLOGICAL
ORGANIZATION**



**Global Water
Partnership**

IDMP

Integrated Drought Management Programme