WMO OMM

World Meteorological Organization

Working together in weather, climate and water

Overview of WMO Drought Activities

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Outline

- Drought Early Warning Systems
- Overview of WMO Drought Activities
- Outcomes of Lincoln Workshop
- Proposed Integrated Drought Management Programme

Early Warning Systems Essential Component of Drought Management

Drought management has three major components:

- **Monitoring and early warning**
- **Risk and impact assessment**
- **Mitigation and response**

What is an Early Warning System for Drought ?

- Early Warning System (EWS) practical tool for implementing timely and appropriate responses to droughts and famine via food aid and other mitigation strategies

- Early warning involves developing regional drought histories, monitoring current weather, using climate projections and determining possible outcomes of developing drought events, and answering questions on drought duration and severity.

- Effective EWSs should involve both technology and all interested parties in drought planning and response.

Examples of Early Warning Systems

- FAO's Global Information and Early Warning System on Food and Agriculture (GIEWS)
- USAID's Famine Early Warning System (FEWS)
- Southern African Development Community (SADC) Regional and National Early Warning System
- US and North American Drought Monitors
- Australian Climate and Agricultural Monthly Update

WMO Supports Developing Countries Through National and Regional Projects

- Modernization of NMHSs and observing networks.
- Implementation of national operational multi-hazard early warning systems.
- Strengthening of hazard analysis and hydro-meteorological risk assessment tools.
- Strengthening NMHSs cooperation with civil protection and disaster risk management agencies.
- Coordinated training and public outreach programmes.

Drought Monitoring Centres (DMCs) for Eastern and Southern Africa

- 24 participating countries

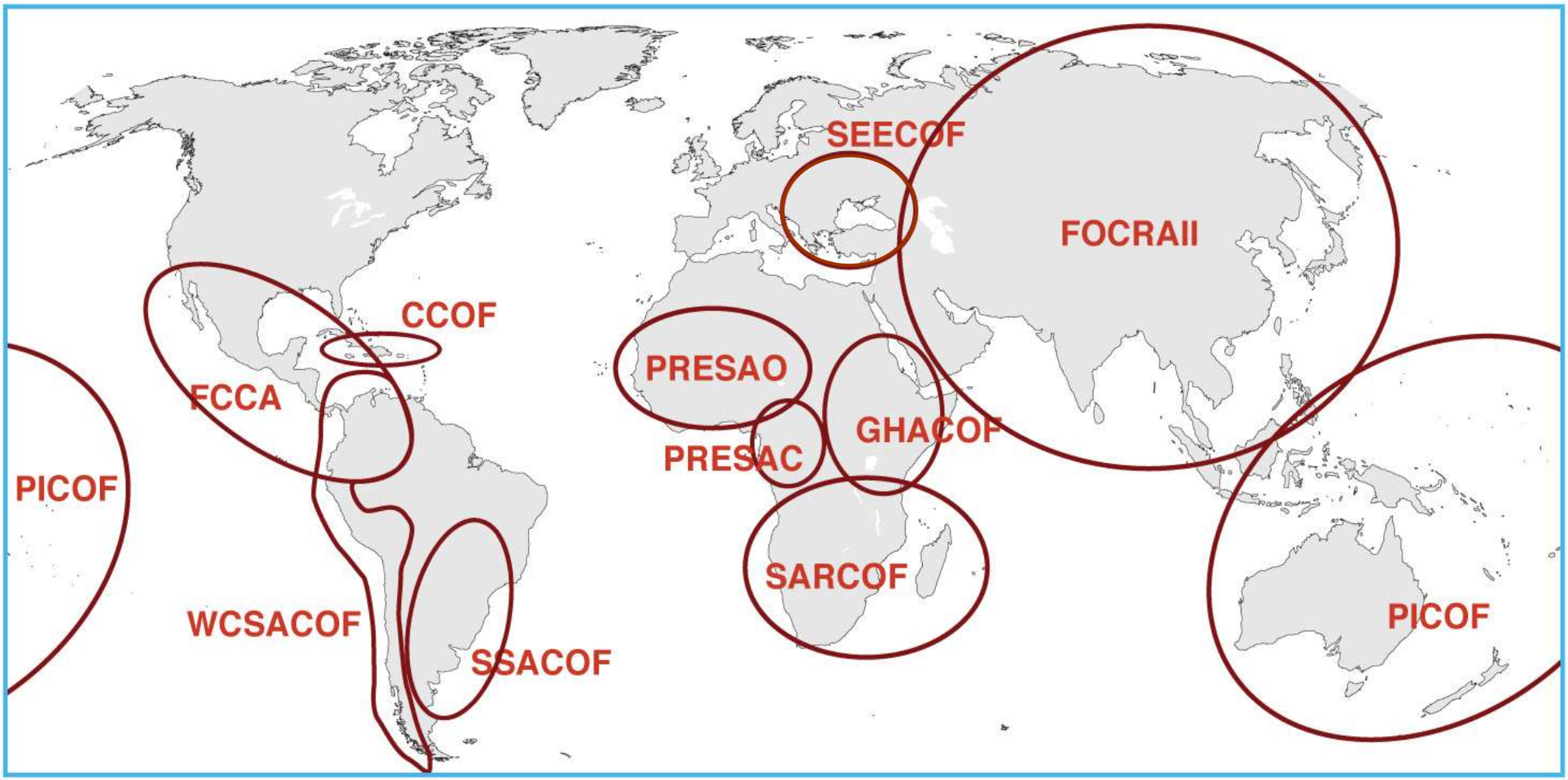
- Two operational centres in Nairobi, Kenya and Gaborone, Botswana charged with timely monitoring of drought intensity, geographical extent, duration and impact on agricultural production; and issuing early warnings

- Improved applications of meteorological and hydrological data and products

- 10-day weather advisories, decadal climatological summaries, decadal agromet conditions and impacts, decadal synoptic review and weather outlook

- Monthly drought monitoring bulletins for the sub-regions

Regional Climate Outlook Forums (RCOFs)



http://www.wmo.int/pages/prog/wcp/wcasp/clips/outlooks/climate_forecasts.html

GHACOF Products & Applications

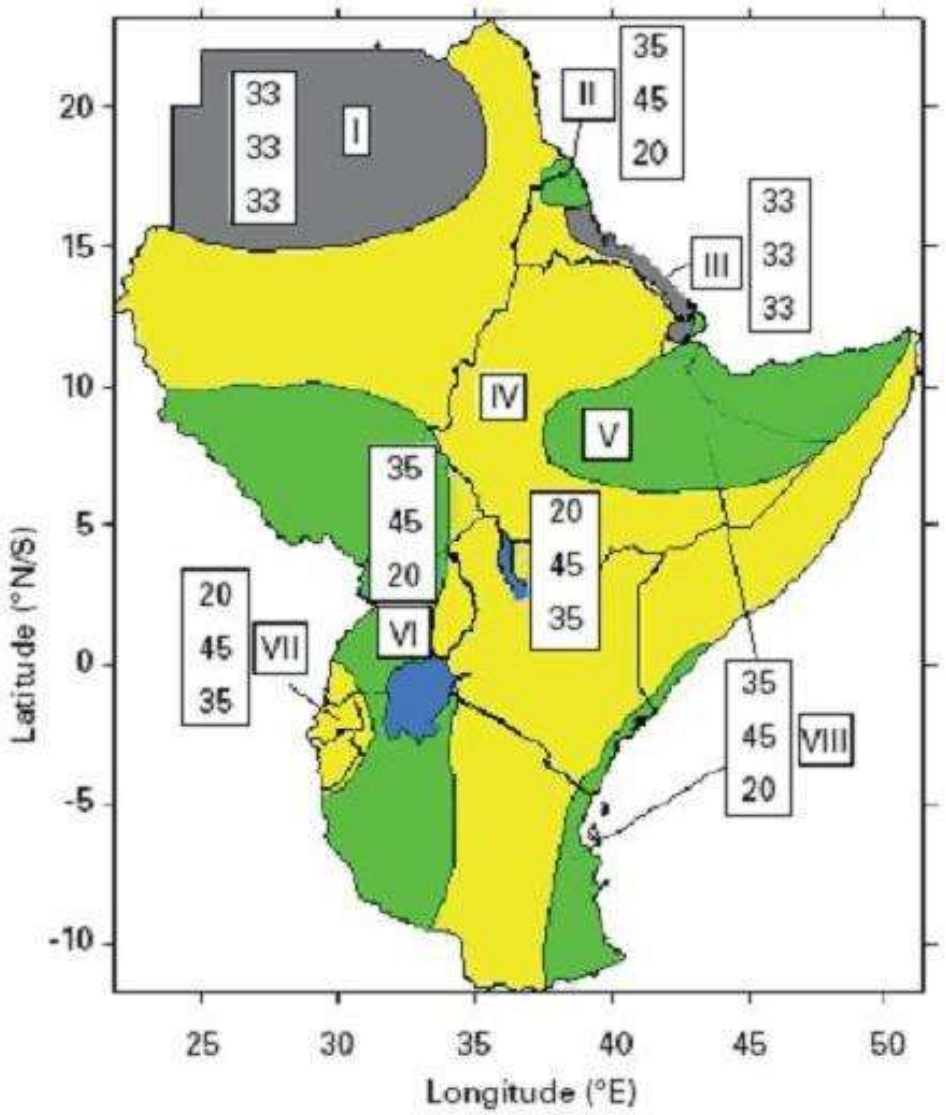


Figure 2(a) — Greater Horn of Africa Consensus Climate Outlook for March to May 2008 by ICPAC and partners including WMO and IRI.

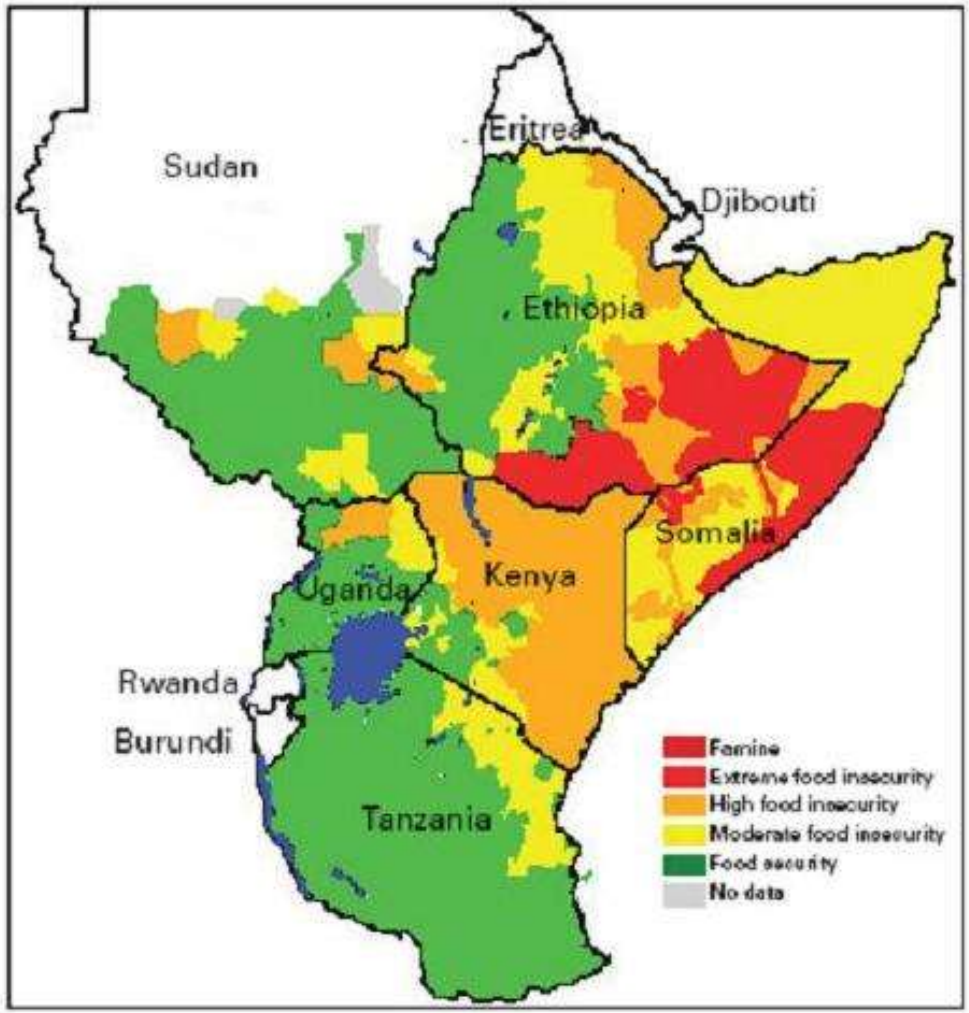


Figure 2(b) — Food Security Outlook for March to July 2008 by Famine Early Warning Systems Network (FEWSNET)

Drought Management Centre for Southeastern Europe - DMCSEE

Drought is a normal part of climate in virtually all regions of the world. South Eastern Europe is no exception; in past decades the drought-related damages have had large impact on the economy and welfare. Therefore the need to establish a Drought Center for SE Europe to alleviate the problems caused by drought in the area became evident at the end of the past century. The idea was further elaborated by International Commission on Irrigation and Drainage (ICID) and UN Convention to Combat Desertification (UNCCD). The UNCCD national focal points and national permanent representatives with the World Meteorological Organization have agreed upon the core tasks of the Drought Management Center for South Eastern Europe (DMCSEE) and the proposed project document.

The mission of the proposed DMCSEE is **to coordinate and facilitate the development, assessment, and application of drought risk management tools and policies in South-Eastern Europe with the goal of improving drought preparedness and reducing drought impacts**. Therefore DMCSEE will focus its work on monitoring and assessing drought and assessing risks and vulnerability connected to drought.

www.dmcsee.org

Founding countries:

- → Albania
- → Bosnia and Herzegovina
- → Bulgaria
- → Croatia
- → FYROM
- → Greece
- → Hungary
- → Moldova
- → Romania
- → Slovenia
- → Turkey
- → Montenegro
- → Serbia

Founding agencies:

- → WMO
- → UNCCD

WMO working on establishing Drought Management Center for Central Asia (DMCCA)

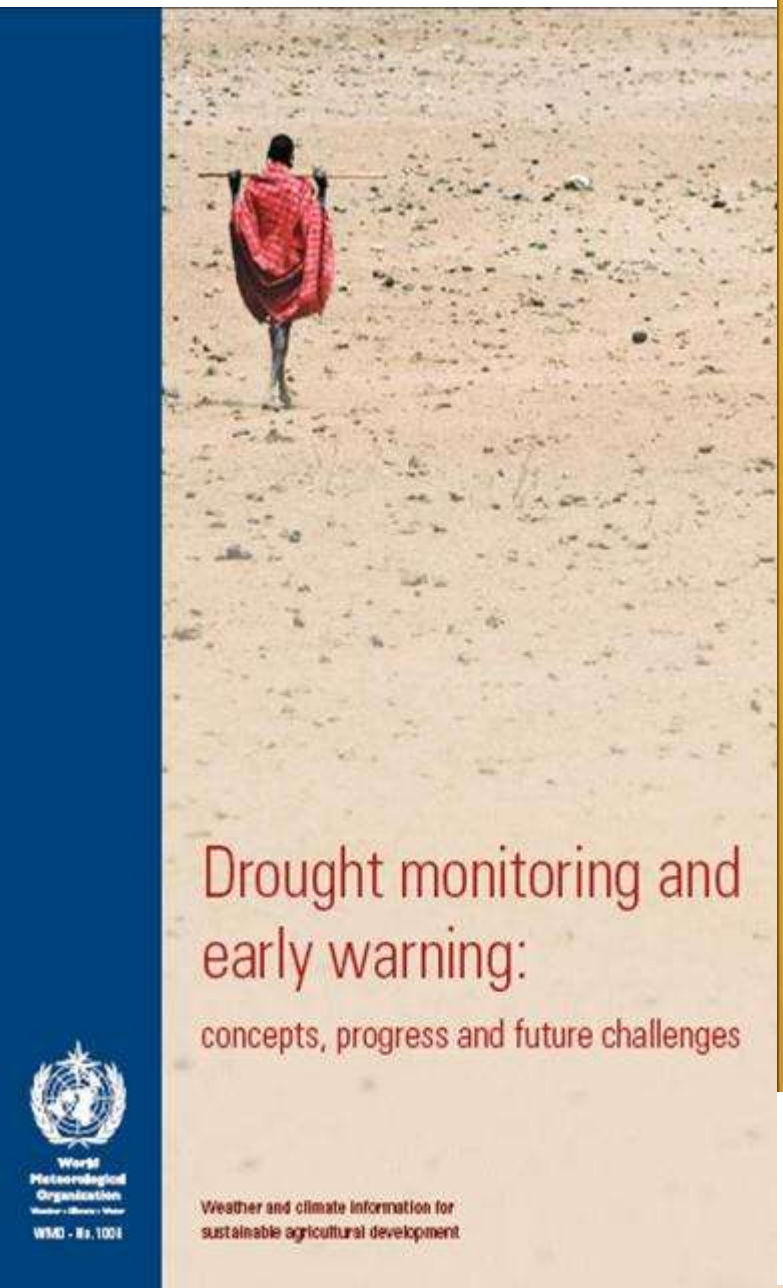
- WMO, United Nations Convention to Combat Desertification (UNCCD) and the Organization for Security and Cooperation in Europe (OSCE) working together to establish the DMCCA.

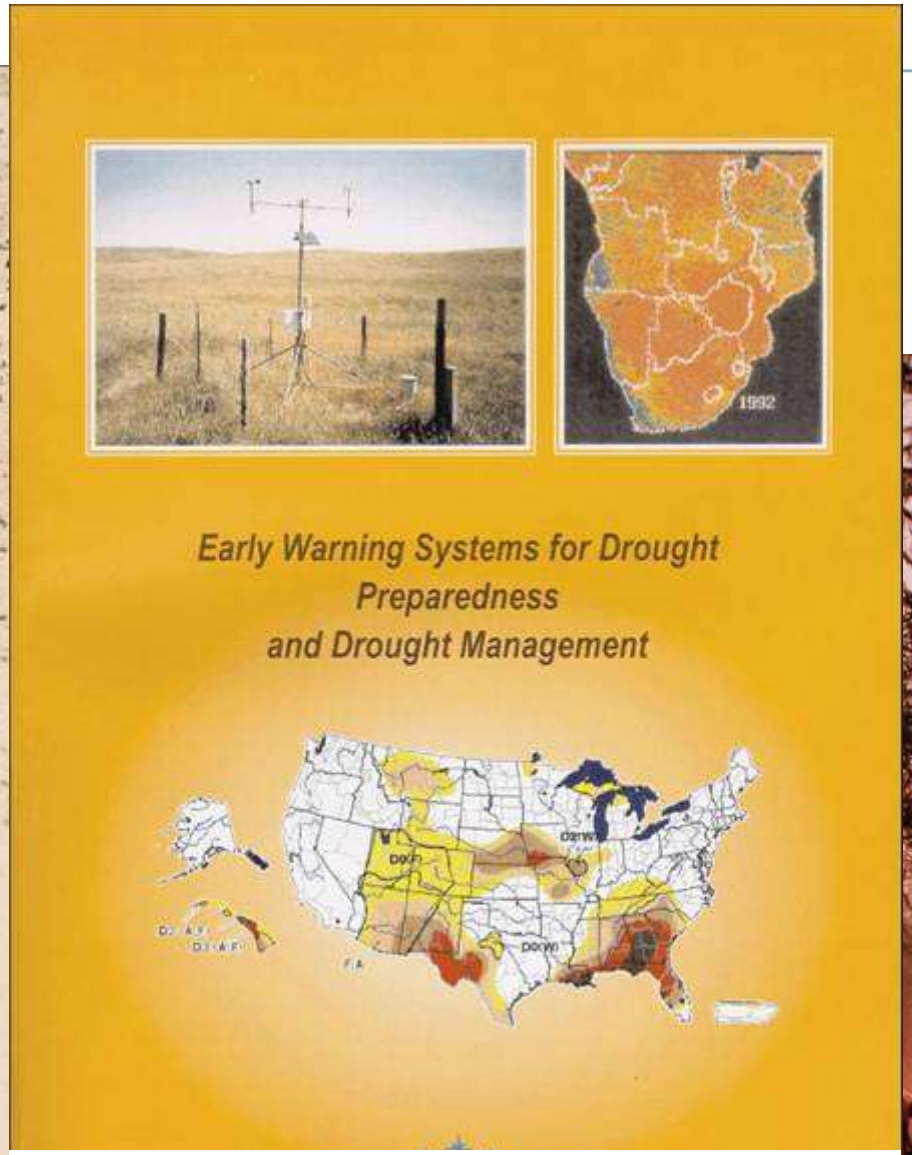
- Technical Seminar on preparation towards Terms of Reference for a Regional Drought Centre in Central Asia (20-21 November, 2007, Tashkent, Uzbekistan)

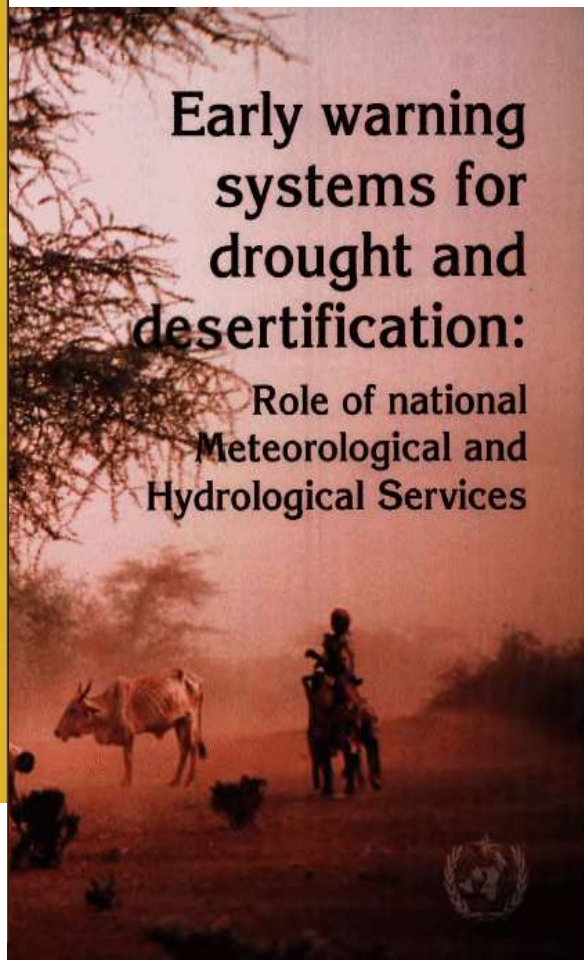
- Second Workshop on establishing a Drought Management Centre in Central Asia (May 2008, Kyrgyzstan)

- WMO Consultant visited the five Central Asian countries ie., Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan in November 2009 to consult with relevant organizations and institutions and prepare project proposal.

WMO Publications







www.wmo.int/agm

Background to Lincoln Workshop

Over the years, the scientific community has been asked if there is a standard drought index for the world.

Some questions that need answered:

- **When is the drought starting? Ending?**
- **Are droughts worldwide increasing or decreasing?**

Drought is a complex issue and is dependent on what the application is and what sector is being impacted

Can scientific community give guidelines or recommended drought indices for certain applications?

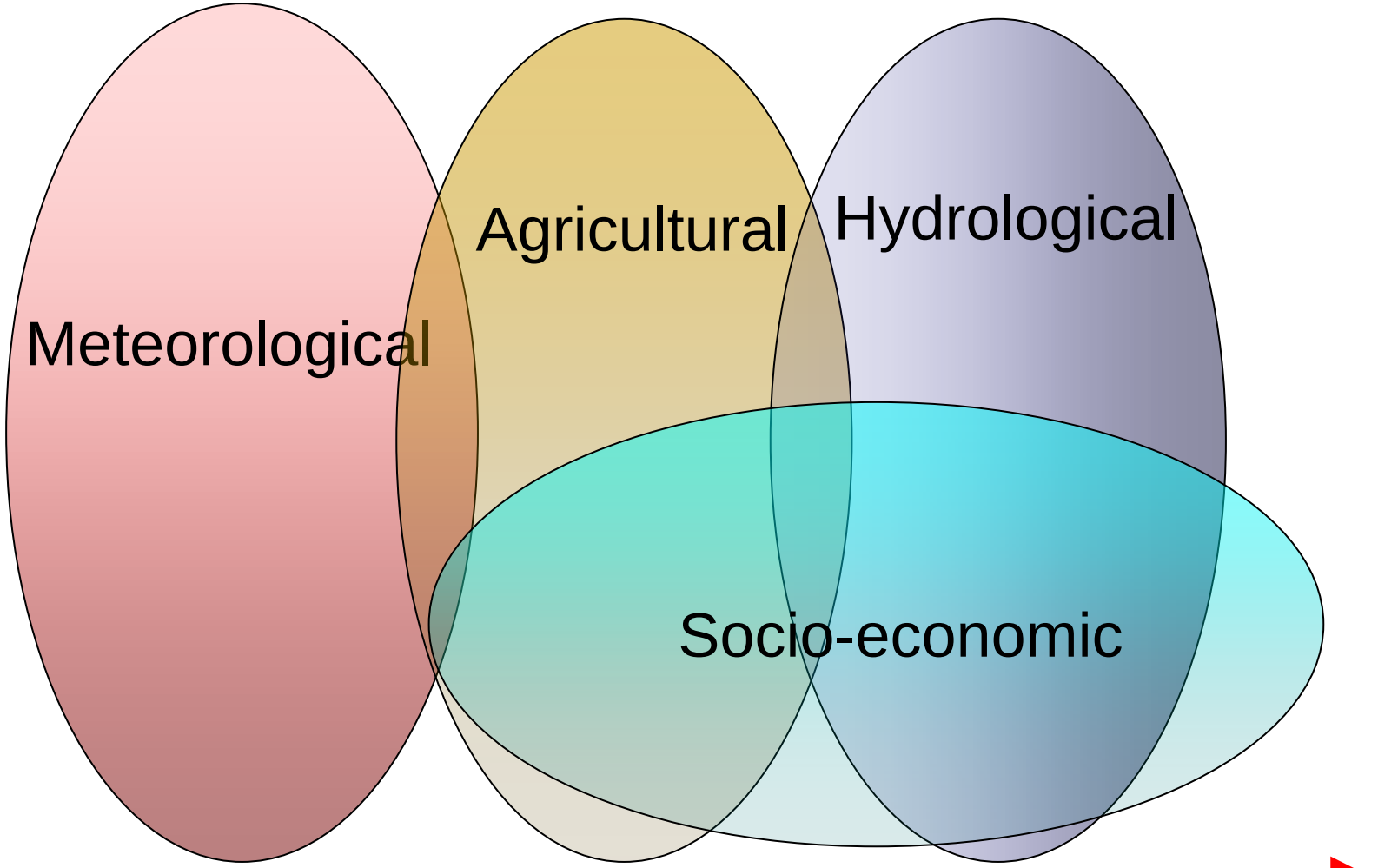
Do we need more or different drought indices?

Natural and Social Dimensions of Drought

Decreasing emphasis on the natural event (precipitation deficiencies)

Increasing emphasis on water/natural resource management

Increasing complexity of impacts and conflicts



Time/Duration of the event

Source: Wilhite 2006

Beijing 2009 Drought Workshop

- **WMO International Workshop on Drought and Extreme Temperatures: Preparedness & Management for Sustainable Agriculture. Organized by WMO and Chinese Meteorological Administration in Beijing February 2009.**
- **Main Recommendations:**
  - **To develop unified and standardized drought index that can be practically applied to a wide-range of agricultural purposes across the world.**
  - **The workshop strongly recommended that WMO make appropriate arrangements to identify the methods and to marshal resources for the development of standards for agricultural drought indices in a timely manner.**

Lincoln Workshop

- **Inter-Regional Workshop on Indices and Early Warning Systems for Drought held in Lincoln, Nebraska, USA from 8 to 11 December 2009**

- **Co-Sponsors:**
  - **National Drought Mitigation Center (NDMC)**
  - **United States Department of Agriculture (USDA)**
  - **United States National Oceanic and Atmospheric Administration (NOAA)**
  - **United Nations Convention to Combat Desertification (UNCCD)**
  - **University of Nebraska-Lincoln, School of Natural Resources**
  - **World Meteorological Organization**

http://www.wmo.int/pages/prog/wcp/agm/meetings/wies09/index_en.html

Workshop Objectives

- To review and assess drought indices currently used around the world for the three types of drought (meteorological, agricultural, and hydrological);
- To review and assess the strengths, weaknesses and limitations of existing drought indices and early warning systems;
- To develop a consensus standard index for each of the three types of drought;
- To develop guidelines for WMO Members in implementing and improving drought early warning systems.

Breakout Groups

- **Mostly followed methodology from Keyantash and Dracup (2002) "The Quanification of Drought: An Evalution of Drought Indices" – Bulletin of AMS - August 2002**

Used following criteria:

- **Robustness**
- **Tractability**
- **Transparency**
- **Sophistication**
- **Extendability**
- **Dimensionality**

Meteorological Drought Outcome

- **SPI and Percentiles were very close, but the SPI had a slightly higher score**

- **Percent of Normal Precipitation was ranked third**

- **PDSI was a distant fourth**

Recommendation: Use drought indices that are based on a sound statistical and historical perspective (SPI and Percentiles). The SPI is the recommended Meteorological drought index.

Agricultural Drought Outcome

- **No consensus (17 indices)**

Conclusions

- **Water Balance models are quite good since they take into account soil and crop growth**

- **NDVI is very useful and is comparable with hydrological balance**

- **For all indices, a temperature component is important**

Hydrological Drought Outcome

- **No consensus (6 indices)**

Recommendations

- **Examine composite indices that take into account streamflow, precipitation, reservoir levels, snowpack, groundwater levels such as:**
  - **Surface Water Supply Index (SWSI)**
  - **Aggregate Dryness Index (ADI)**
  - **Normalised ADI (NADI) (Barua and Perera 2009)**

Also suggested;

- **Streamflow drought Index (SDI) Nalbantis and Tsakiris (2009)**
- **Artificial Neural Networks (Perera et al. 2009)**

Lincoln Declaration - Recommendations

- **The National Meteorological and Hydrological Services (NMHSs) are encouraged to use SPI to characterize meteorological droughts and provide this information in addition to indices currently in use. WMO was requested to take necessary steps for implementation.**

- **A comprehensive user manual for the SPI should be developed that describes the index, computation methods, specific examples of current use, the strengths and limitations, mapping capabilities, and how it can be used.**

Lincoln Declaration - Recommendations

- **Two working groups with global representatives and UN Agencies and Research Institutions to be established to further discuss and recommend, by the end of 2010, most comprehensive indices to characterize agricultural and hydrological droughts.**

- **Recognizes need to develop framework for integrated approach for drought monitoring to address all sectoral needs, a comprehensive study of consensus drought indicators is needed for potential global application.**

Lincoln Declaration - Recommendations

- **A simple, systematic analysis of drought impacts in different sectors should be initiated in all affected countries in order to provide useful decision-making information for policy-makers.**

- **Drought indices and early warning systems must be implemented from the beginning with the end-users in mind. To accomplish this goal, a multi-disciplinary approach incorporating user involvement is absolutely necessary.**

Current Actions

- Recommendation on SPI will be sent to WMO Executive Council June 2010. Upon approval, will be sent to WMO Congress in 2011, along with recommendations from other working groups.

- The UN International Strategy for Disaster Risk Reduction (ISDR) provides funding for meetings of working groups on agricultural (June 2010 - Spain) and hydrological (August 2010 - India) drought indices.

- WMO will assist ISDR in finalizing chapter on drought risks for 2011 UN Global Assessment Report on Disaster Risk Reduction.

Proposed Integrated Drought Management Programme

- **WMO** and the **Global Water Partnership** are proposing an **Integrated Drought Management Programme**. Similar to APFM (**www.apfm.info)**
- **Targeting intergovernmental, governmental and non-governmental organizations** involved in drought monitoring, prediction, drought risk reduction and management.
- Primary beneficiaries are expected to be **governmental institutions, agencies** responsible for developing **drought management policies** and/or implementing systems for **drought monitoring, prediction, preparedness and mitigation.**
- The principal approach to **develop global co-ordination** of efforts to **strengthen drought monitoring, risk identification, drought prediction** and **early warning services** and development of drought management knowledge base.

Proposed Integrated Drought Management Programme (cont)

- **The expected services to be provided are:**
  - Regional coordination of drought monitoring, prediction and early warning activities
  - Inception of pilot projects and coordination of regional projects to showcase best practices
  - Collection and dissemination of information and knowledge on good practices;
  - Guidelines, methodologies, tools and supporting documentation on **policy development and management practices and procedures**; and
  - Capacity building and advice on Integrated Drought Management.

Thank You

World Meteorological Organization
Geneva
Switzerland

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