Lincoln Declaration on Drought Indices

An Inter-Regional Workshop on Indices and Early Warning Systems for Drought was held at the University of Nebraska-Lincoln from 8 to 11 December, 2009. It was jointly sponsored by the School of Natural Resources of the University of Nebraska, the U.S. National Drought Mitigation Center, the World Meteorological Organization (WMO), the U.S. National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of Agriculture (USDA), and the United Nations Convention to Combat Desertification (UNCCD). The workshop brought together 54 participants from 22 countries from all the different regions of the world.

The workshop reviewed the drought indices currently in use in different regions of the world to explain meteorological, agricultural and hydrological droughts, assessed the capacity for collecting information on the impacts of drought, reviewed the current and emerging technologies for drought monitoring and discussed the need for consensus standard indices for describing different types of droughts.

Given the current concerns with the increasing frequency and magnitude of droughts in many regions of the world, especially in the light of the projected climate change, the Workshop recognizes the importance of drought monitoring, and dissemination of early warning systems information, in a timely fashion and strongly encourages countries that have not already done so, to take the first steps in implementing such a process. The Workshop emphasized on the need for coordination between data monitoring agencies to facilitate effective decision making.

The workshop came to a consensus that the Standardized Precipitation Index (SPI) be used to characterize the meteorological droughts around the world.

A number of agricultural and hydrological drought indices are currently in use around the world. The workshop recognized that hydrological drought is complex and is not often well understood since it is basin specific.

The workshop stressed on the need for undertaking a comprehensive review of all agricultural and hydrological drought indices documented at this workshop to help identify the prime drought indices for early warning systems most suited for use in the agricultural and water sectors.

The workshop recognized the capability of satellite-based monitoring to supplement *in situ* observations in a global drought early warning system.

The workshop recognized that the same level of drought severity can cause a wide variety of drought impacts due to a variety of factors related to the underlying vulnerability of a region. The workshop noted that drought impacts are a key indicator of vulnerability and illustrate why an effective interaction needs to be established between the providers of early warning systems and the end-users. There are very few examples of systematic attempts to gather information on drought impacts in different sectors.

The principal recommendations are as follows:

- 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.

- The National Meteorological and Hydrological Services (NMHSs) around the world are encouraged to use the SPI to characterize meteorological droughts and provide this information on their websites, in addition to the indices currently in use. WMO was requested to take the necessary steps to implement this recommendation.

- A comprehensive user manual for the SPI should be developed that will provide a description of the index, the computation methods, specific examples of where it is currently being used, the strengths and limitations, mapping capabilities, and how it can be used.

- Two working groups with representatives from different regions around the world and observers from UN Agencies and Research Institutions (and water resource management agencies for hydrological droughts) be established to further discuss and recommend, by the end of 2010, the most comprehensive indices to characterize the agricultural and hydrological droughts.

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

- 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.

The workshop urges WMO and other UN agencies and the relevant governmental institutions to take into consideration these workshop conclusions and recommendations. The participants thank the University of Nebraska-Lincoln for hosting the workshop and providing all the necessary facilities.

11 December 2009, Lincoln, USA