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Title: Drought Conditions and Management Strategies in Republic of Macedonia

Background: Describe briefly the general state of drought in the country focusing on recent years (the last 10 years) and covering statistics, duration, magnitude, impacts; vulnerable sectors and layers of the population, etc. **(Maximum 350 words)**

Regarding UNCCD Convention and National Drought Management Policies, which is a part of it, in Republic of Macedonia, on National level we are counting several activities, like:

- During 2005 year, in Republic of Macedonia was established a National Board, responsible for obligations and activities connected with UNCCD

- For 2006, 2010 and 2012 years, responsible institutions for implementation of UNCCD Convention, had prepared and presented National reports for realized activities in the Republic of Macedonia

- Through the established Strategy for implementation of the UNCCD all NAP-s should be revised and adapted with obligations from it.

- In present period of the 2013 year, to the next September, in Republic of Macedonia are going process of preparation of the National Activities Program for implementation of the UNCCD, supporting by UNEP.

There is another similar activities, during 2006, supported by UNDP, like first opportunities to develop needed Program, but without concrete results.

- We are planning to realize more important obligations from our National Activities Program (NAP), through Project STAR 5, for multi focal areas, biodiversity and land degradation

- In Republic of Macedonia there are different on going Projects (environment, climate changes, agriculture, hydrology, forestry etc.), directly or indirectly connected with activities for implementation of the UNCCD Convention, which are developing from responsible national institutions or ministries and international programs and society.

Meteorological and hydrological drought occurs frequently in South East Europe. Widespread meteorological drought with trans-boundary or regional impacts occurs every four to five years. Drought has become increasingly prevalent in the past decades, probably owing to a progressive aridization of the Western Balkans.

Macedonia is among the most arid areas in Europe. Drought is very frequent and can occur with various duration and severity, causing frequent damages to agricultural sector, mostly expressed as reduced yield. Drought is one of the most adverse phenomena which regularly occur on our territory and it may appear in any season. For example, a prolonged drought in 1993 damaged most of the crop yields and in many cases resulted in total crop damage. At the countrywide level, the damage caused by this drought amounted to 7.6 % of the total national income (1).

Drought monitoring and early warning systems: Describe the available drought monitoring systems, including temperature, water, soil and socioeconomic indicators that are used to characterize drought magnitude; evaluate the capacity and adequacy of meteorological and hydrological institutions and networks and describe their role and their linkage to drought management. **(Maximum 350 words)**

In Macedonia there is not an adequate operational monitoring or early warning system to support the agricultural sector in order to cope with drought phenomena. The Hydro meteorological Service (HMS) has the responsibility to operate the Observation monitoring network and produce meteorological and climatologically services (Alcinova, 2006) Agro meteorological stations are manned and measure also the basic meteorological parameters.

HMS receives crop condition data from the local units of Ministry of agriculture, forestry and water supply, for information of HMS agro meteorological Division. Historical

hydro meteorological data is critical for hazard analyses and planning and design within various economic sectors. In this regard, hydro meteorological data must be properly quality ensured and stored in historical user-friendly digital databases.

Collected Meteorological parameters are: Air temperature, precipitation, relative humidity, atmospheric pressure, sunshine duration, wind speed and direction, soil temperature and soil moisture, evaporation. HMS performs meteorological and agro meteorological analysis, including dry period, heat waves, temporal distribution of precipitation, measurement and calculation of soil moisture, calculation of potential evapotranspiration (Penman-Monteith, Thornthwaite), calculation of De Martonne aridity index, Lang's rainfall index, drought index by Gracanic, Standardized Precipitation Index.

- The available data on issues relevant to CCD are scattered among numerous governmental and scientific institutions.
- Coherent and comprehensive databases do not exist.
- Systematic monitoring of important parameters (soil, land use change, pollution, etc) is not established, except hydro meteorological data.

Agencies involved in early warning systems for DRR are the following:

- Crisis Management Centre (CMC)
- Protection and Rescue Directorate
- Hydro meteorological Service of Republic of Macedonia (HMS)
 - Ministry for Agriculture Forestry and Water Management
- Ministry of Environment and Physical Planning

The CMC organizes information and alerting for early warning, situation monitoring, timely identification of phenomena and processes, which threaten state security and/or may lead to crisis, to inform the entities of the crisis management system and the population.

Vulnerability assessment: Indicate the most vulnerable sectors of the economy, if possible in the order of most to least vulnerable, focusing on water resources shortage and their impacts on various uses (drinking water supply, industry, agriculture and food production, fisheries, environment, etc.) as well as on the society at large. Describe the most vulnerable groups of the society, such as small farmers, the youth, women, or other special. **(Maximum 400 words)**

Water scarcity and drought in Macedonia should not be viewed only as a physical phenomenon or natural event, as it has also negative impact on the economy, environment and the society in general (EEA, 2009). The recent drought events in Macedonia, in particular in years 2003, 2006-2007, highlighted the vulnerability of the society to these natural hazards by reducing not only primary production of crops, grass and fodder, but also by affecting the constant supply of good quality water (IPCC), 2007. Major droughts in Macedonia have caused greater economic losses, particularly in the agriculture, energy, and municipal water sectors. Drought is very frequent and can occur with various duration and severity, causing frequent damages to agricultural sector, as a

key sector in the Macedonian economy which contributes an estimated 12% to GDP. Frequent and intensive droughts have negative social and economic impact in the rural parts of Southern and Eastern Macedonia. Due to this Macedonia developed irrigation schemes that cover almost one fourth of the arable land in the country (120 000 ha under irrigation) but only 20-30.000 ha are actually irrigated and most of Macedonian agriculture depends on rains and is very vulnerable to drought. Drought conditions could also affect lake water levels and water supply.

The most vulnerable agricultural zone is Povardarie region, especially the area of the confluence of the Crna and Bregalnica rivers with the River Vardar (Kavadarci as a corresponding meteorological station). Other highly vulnerable zones are: (I) the South-eastern part of the country (Strumica); (ii) the Southern Vardar Valley (Gevgelija); (iii) the Skopje-Kumanovo Valley (Skopje); and (iv) Ovce Pole (Stip).

Emergency relief and drought response: indicate the types and forms of emergency provided (food, feed, cash/food for work, compensation in cash), the beneficiary sectors and layers of the population as well as the criteria for selection, the response costs, institution(s) managing response; response effectiveness; impact evaluation after drought waves; other as relevant. **(Maximum 350 words)**

Drought risk management (DRM) is the concept and practice to avoid, lessen or transfer the adverse effects of drought hazards and the potential impacts of disaster through activities and measures for prevention, mitigation and preparedness. It is a systematic process of using administrative directives, organizations and operational skills and capacities to implement strategies, policies and improving coping capacities.

One step forward in improvement of the capacity and adequacy of meteorological and hydrological institutions and networks and was the realization of the Regional project (Drought Management Centre for South East Europe)", (DMCSEE. 2012; Alcinova and Stevkova 2011). The main targets of the project was to improve DMCSEE preparedness for drought (the establishment of early warning systems and preparation of risk assessment) and reduce its impact, which will be achieved through a number of specific objectives. These are:

- Improving the monitoring of drought in countries is the establishment of a regional system for monitoring, analysis and mapping of different drought indices;
- Developing DMCSEE Internet platform with the internal part of the communication between the partners and in part to inform the public about the results achieved;
- The development and adoption of a uniform methodology for assessing the risk of drought, based on available meteorological and climatologic data archives. The impact of drought will be analyzed on the basis of historical records. Drought risk maps will be produced for the region using GIS techniques;
- Organizing training for capacity building, as well as national seminars for users;
- Preparation of guidelines, recommendations, and plans for an extension of institutionalized cooperation between the countries in this area after the 2012th year.

Practices to alleviate drought impacts: List the main measures and practices applied by governments and other supporting institutions, including NGOs, private sector, etc. prior to or during drought in view of reducing drought impacts. **(Maximum 200 words)**

Since the ratification of UN Convention to combat desertification and mitigation of adverse drought effects (UNCCD) in 2002, the strengthening of the capacities of competent government bodies, including HMS, is necessary for the purpose carrying out of the obligations stemming from this Convention. In this context and with international financial support, the following is planned:

- Further upgrading of the drought monitoring system and early warning as well as the system of dissemination of meteorological, agro meteorological and agro climatic analyses, forecasts and warnings
- adoption and application of national protection program against drought within the UNCCD implantation program and national legislation on the protection against natural disasters;
- adoption and application of multidisciplinary program of investigation of drought causes and effects, desertification, climate changes; transfer of knowledge and technologies; and
- strengthening of capacities of competent institutions for carrying out of relevant tasks related to drought, desertification and climate as well as education and raising of public awareness.

The need for knowledge and skills on drought management: Specific capacity gaps on the drought management by individuals or institutions dealing with drought management; level of knowledge and skills urgently needed (prioritize the needs). **(Maximum 200 words)**

In general, the country has difficulties in coping with extreme droughts, due to a lack of financial, technical and institutional capacity and legal instruments. Currently the country does not have adequate technical, human and financial resources to fully support risk assessment and early warning systems UN/ISDR, 2007. It is critical to upgrade and modernize the national hydro-meteorological monitoring and information exchange network and the forecasting system and to provide sustainable organizational resources, human and technical resources and increase the budget available to HMS for efficient meteorological and hydrological disaster risk monitoring, forecasting and warning.

The following technical recommendations:

- There are needs to further improve the legal and institutional drought management framework;

- There are needs to further improvement of operational relationships with governmental agencies;
- Needs for further improvement of drought monitoring and observations networks and data exchange;
- Needs for further improvement of Hydro meteorological data management systems with special emphasize on data rescue programme to digitise and quality ensure the historical data;
- There is a need to define standard methodologies for hazard characterization and mapping, and for hazard risk assessment;
- There is a need to develop hazard analysis and mapping based on historical data and climate change projections to support risk assessment;
- There is a need to strengthen the systematic collection of drought impact information on a state level with standardized procedure and long-lasting approach;
- There is a need to strengthen GIS, spatial analysis and remote sensing capacities for hazard analysis and mapping, including GIS software and training, access to an officially agreed DEM;
- There is a need to strengthen the agro meteorology capacities of HMS to support drought risk assessment (calculation of drought indices, water balance model, crop coefficients, use of remote sensing information in agro meteorology).

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