Integrated Drought Management in Central and Eastern Europe

ACTIVITY LIST

1. BASIC INFORMATION

Number of Activity:	**Activity 5.4**
Title of the activity:	**Drought Risk Management Scheme: a decision support system**
Duration of the activity:	**June 2013 – March 2015**
Activity leader:	**Tamara TOKARCZYK (PL)** Tamara.Tokarczyk@imgw.pl
Chairman of the CWP:	**Tomasz OKRUSZKO** (t.okruszko@levis.sggw.pl) **LIVIU N. POPESCU** (lipopesc@gmail.com)

Description of the activity:

Due to the complex nature of drought as well as its large spatial and temporal extent, drought phenomenon is closely related to many aspects of the natural and anthropogenic environment: climatology, geophysical features, hydrology, population and economy. Effective and adequate excavation of the information from the existing large volume of data concerning these aspects is the primary function for drought risk management. Drought risk management is aimed towards:

- visualization and communication the probability of occurrence of different phases of droughts,
- providing information on possible impacts of drought including socio-economic and environmental aspects,
- generating functional risk maps that can be used by various end-users and decision makers,

There can be several diverse approaches in attempt to evaluate drought risk that differ in terms of hazard and vulnerability concepts and their classification. The methodologies may also varying depending on the characteristics of the river basin, regional and national specification and the degree of certainty to be achieved with the analysis. On the other hand risk maps should be practical management tools and should permit drought early warning as well as long-term forecasting basing on climate change scenarios.

Drought risk mapping should be therefore developed on the multisectoral and international level in order to identify local, regional and national measures and method to assess drought hazards and mitigate drought impacts. This demonstration project aims at developing a framework for an integrated

drought risk mapping that can be adjusted for a given drought context and provide application for particular scope. Drought context will be provided by three project partners and will include purpose of the drought assessment, implementation scope and addressed end-user.

The activity is consequently oriented to look for measures and methods that constitute a comprehensive, multipurpose and flexible approach that can be detailed and addressed for specific regional purposes. The framework will define the structure of the mapping scheme embodying drought monitoring and forecasting methods, drought assessment and risk analysis procedures as well as drought management strategies to support decision making. The defined regional task modifies the elements of the scheme: data requirements, information derived drought response measures and drought mitigation rules.

The demonstration project will be piloted in Poland (Institute of Meteorology Hydrology and Water Management National Research Institute). The prototype framework will be developed in cooperation with Lithuanian and Romanian Partners in order to cover different sector and national requirements for drought risk mapping scheme.

The final output will contain proposition of measures and methods for building maps of susceptibility to drought including different levels of drought hazard, building maps of drought vulnerability including different drought impacts as well as drought risk mapping framework adjustable for various drought risk context. The latter will be demonstrated for the case study in Poland for the area of upper and middle Odra River basin. Different drought risk context will include hydrometeorological drought risk mapping for the need of drought early warning (Polish Partner), agricultural drought risk mapping in order to evaluate economic profitability under various management practice (Romanian Partner) and for mapping hazard of water scarcity for water management (Lithuanian Partner).

The case study will be documented in a report with practical evidence and incorporated into a compendium of good practices (act. 7.1).

2. CONTRIBUTING ORGANIZATIONS / EXPERTS

Country	Organization	Contact
Poland	- Institute of Meteorology and Water Management, National Research Institute, Wrovlaw Branch(IMGW-PIB), - Institute of Technology and Life Sciences (**ITP**)	Tamara Tokarczyk – leader *(Tamara.Tokarczyk@imgw.pl)* Wiwiana Szalińska (IMGW-PIB) *(Wiwiana.Szalinska@imgw.pl)* Leszek Labedzki (ITP) *(l.labedzki@itp.edu.pl)*
Lithuania	- Vilnius University, Department of Hydrology and Climatology (**VU**)	Gintautas Stankūnavičius – main national contact person (VU) *(gintas.stankunavicius@gf.vu.lt)* Edvinas Stonevičius (VU)
Romania	- National Meteorological Administration (**NMA**) - National Research and Development Institute for Soil Science-Agrochemistry and Environment (**ICPA –Bucuresti**)	E. Mateescu (NMA) Catalin Simota (ICPA)

3. PLAN for IMPLEMENTATION of the activity

Name of the output	**1. Measures for the assessment of susceptibility and vulnerability to drought**
Type of the output (analysis, report, guideline, workshop, brochure, etc.):	*report*
Form (website, CD, printed, database, audio-visual, computer software, etc.):	*printed*
Purpose of the output:	Drought risk mapping requires measures of drought susceptibility and vulnerability for drought assessment. Susceptibility to drought (in other words, drought hazard) is connected with the probability of occurrence of the natural phenomena. Drought indices are the common measures for drought assessment. Different types of indicators or triggers are applied worldwide. Choosing best measure for given application requires systematic approach that takes into account advantages and limitations of different indices and

	the ability to be adopted them in the local area or region. Developing integrated approach for drought indices selection and decide on clear criteria to define drought triggers is planned to be done on the international level. Accepting meaningful and reliable set of measures for meteorological, agricultural and hydrological drought assessment will be used to propose methodology for susceptibility to drought mapping. Drought risk mapping requires also establishing the measures for drought impact assessment that enables assessment of the vulnerability to drought. Drought impacts can be related to water consumption, water use and water demand in different socio-economic sectors. Proposing best measures for vulnerability to drought assessment shall reflect the specific requirements of the risk analysis.
Structure and description (contents, requirements for use, chapters, etc.)	The report will contain a proposition of drought measures (indicators) that can be applied to evaluate susceptibility and vulnerability to drought. A set of measures will cover meteorological, agricultural and hydrological drought assessment. Potential drought indicators (including climatic indicators like SPI and Aridity index or agrometeorological indicators such as soil moisture, ETP, heat weaves, etc) will be revised concerning: • indicators developed within the EU Blueprint to Safeguard Europe's Water Resources (2012); • national/local indicators specific for the all partners involved in the Project. The basic criteria to choose the best measures will be the possibility to introduce them in the partnership countries. Adopted drought indicators will be used to provide national examples of the areas of biggest susceptibility to drought as well as the most vulnerable areas to drought and water deficit. It will be done at different spatial and temporal scales. Polish experts will provide maps of suspectiblity to meteorological and hydrological drought based on SPI and SRI indicies. Lithuanianian Partner will perform assessment of meteorological and hydrological drought intensities based on SPI, EDI and SDI indicies with the special emphasis on agricultural and wooded areas. Investigation of the relationships between the individual measures for meteorological, agricultural and hydrological drought will be performed in order to develop combined suspectiblity to drought measure. Drought vulnerability assessment will be performed by

	Romanian Partner while analysing drought impacts to crop production. The Romanian experts will run ROIMPEL simulation model within different crops (wheat, maize, sun-flower, etc) for evaluation of the economic profitability under various management practices. At the end, the results will serve to develop specific measures for adaptation to climate change impacts. Good practices may help to decrease the vulnerability of agriculture with respect to drought and water scarcity. Also, the model can be tested in order to analyse the possibility of its application to the other areas affected by drought in CEE countries. The experts from the Romanian Soil Science Research Institute will make recommendations for adaptation of the methodology to the selected other CEE countries that are affected by drought and water scarcity phenomenon. Milestones: 1.1. Identification of the national measures for drought suspectibility (drought hazard) assessment 1.2. Identification of the national measures for drought vulnerability assessment

Name of the output	**2. Methods for the drought hazard and risk management**
Type of the output (analysis, report, guideline, workshop, brochure, etc.):	*Report*
Form (website, CD, printed, database, audio-visual, computer software, etc.):	*Printed*
Purpose of the output:	Mapping drought risk is still unsolved problem for European scale. Risk means the combination of the hazard of a drought event and of the potential adverse consequences for human health, the environment, cultural heritage and economic activity (i.e. vulnerability). The difficulty arises from the broad range of possible location, duration and intensity of drought occurrence, contributing to the drought uncertainties. Another aspect is that droughts can be depicted using

	different parameters (precipitation, flow, soil moisture, etc.). Recognizing regional and seasonal susceptibility to drought variations can provide an indicator for selecting best parameter for drought risk assessment. Concept for methodology for hazard maps and risk maps generation will be developed with the use of selected drought indices and information derivable from Geographical Information System. Thematic drought maps will illustrate the most vulnerable areas to drought and water deficit at different spatial and temporal scales. In order to choose the best decision it is needed a more detailed description of current situation regarding the current conditions and forecast of boundary conditions (water deficit and drought) in order to elaborate the disaster management plan in timely manner. In this way the farmer may get benefit by the complex analyses (anomalies of air temperature and rainfall, extreme dates of severe conditions occurrence, duration, etc.) and advise how to mitigate the effects of limitative conditions.
Structure and description (contents, requirements for use, chapters, etc.)	Building drought hazard maps will be done with the use of the results from susceptibility to drought assessment in order to indicate the factor that best describes drought hazard over the given area with an assessment of low, medium and high probability. Report will contain proposition of methodology for drought hazard and drought vulnerability maps generation including classification criteria. Combination of these maps will constitute a basis for drought risk assessment in drought management scheme. Milestones: 2.1. Developing methodology for drought hazard mapping with the use of measures for drought susceptibility assessment. 2.2. Framing methodology for vulnerability to drought assessment based on available GIS information including population map, type of economic activity map and protected area to showing the potential adverse consequences. Selected elements of the developed methodology for maps generation will be validated for particular river basin, river stretch and/ or reservoir.

Name of the output	**3. Framework for Drought Risk Management Scheme**
Type of the output (analysis, report, guideline, workshop, brochure, etc.):	*Report*
Form (website, CD, printed, database, audio-visual, computer software, etc.):	*Printed*
Purpose of the output:	Providing integrated guidelines for drought risk mapping within the CEE countries will be a step forward in attempt to establish common drought management policy. The challenge for development of drought risk management scheme is integration of different approaches and concepts arising from different national, regional and sectoral contexts. For that reason proposed framework have to constitute a systematic approach based on the 10-step drought planning process developed by Prof. Donald A. Wilhite, from US National Drought Mitigation Center. This planning process will be incorporate for risk assessment and mitigation tools. Elaborating and accepting the frameworks for drought risk management using drought risk mapping concept on the international level will lead to parallelization and complementarities of the national efforts in developing and detailing particular fields of this holistic approach. This framework should include references to drought communication platforms developed on different levels: regional, national and international to support decision making. The final recommendations for drought risk management will be developed within the cooperation with activity 1.3 and 2.1 with the special emphasis on selecting methods for operational applications.
Structure and description (contents, requirements for use, chapters, etc.)	The developed framework for drought management scheme will contain the following elements : 1) drought related data and information concerning drought formation, exposure to drought and impacts of droughts, 2) a set of drought measures for various applications based on the information that is readily available, 3) methods for drought assessment and prediction, 4) concept for drought hazard and vulnerability to drought maps generation with the use of GIS

	techniques, 5) identification of drought management approach (immediate response or decrease vulnerability) to recover or mitigate direct and indirect impacts of drought within economic, environmental and social contexts. The framework of the drought risk management scheme will be detailed and demonstrated for the particular applications in the study basins including a concept of combining drought hazard and drought vulnerability maps for the need of drought risk assessment. Milestones: 3.1 Drought Risk Management Scheme for Odra River 3.2 Recommendations for operational support system in drought risk management

Steps for implementation of the activity	Till when?	Who is responsible?
Measures for the assessment of susceptibility (drought hazard) and vulnerability to drought	March 2014	National Meteorological Administration (NMA) and ICPA Bucuresti Elena Mateescu and Catalin Simota
Methods for the drought hazard and risk management	Dec 2014	Vilnius university, Department of Hydrology and Climatology Gintautas Stankūnavičius Edvinas Stonevičius
FINAL OUTPUT: **Framework for drought risk management scheme**	June 2015 Report containing the data collection, indicators and risk maps as part of integrated water resource management system	Institute of Meteorology and Water Management, National Research Institute (IMGW-PIB) – Tamara Tokarczyk, Wiwiana Szalińska Institute of Technology and Life Sciences (ITP) - Leszek Labedzki