



From national to regional plans – the Integrated Drought Management Programme of the Global Water Partnership for Central and Eastern Europe



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ABSTRACT

In the past few decades it has become evident that the countries of Central and Eastern Europe (CEE) are affected by droughts which are becoming more and more lasting and severe. The region's vulnerability to this natural hazard alerted the public, governments, and operational agencies to the many socio-economic problems accompanying water shortage and to the need for drought mitigation measures. In addition, climate change amplifies the frequency and severity of droughts in the region. In this context, the CEE region of the Global Water Partnership (GWP) recently launched the regional Integrated Drought Management Programme (IDMP) as part of the global joint World Meteorological Organization (WMO)/GWP IDMP. The purpose of this paper is to present the work plan of the GWP CEE IDM Programme which is being implemented in the years 2013–2015. The planning process for this Programme carried out in 2012 included national and regional reviews of existing drought risks, policies and strategies. The programme inception phase was summarized in October 2012 by a regional workshop organized jointly by GWP and WMO, with the participation of representatives of the United Nations Convention to Combat Desertification (UNCCD) Secretariat, the Drought Management Centre for Southeastern Europe (DMCSEE), the EU Joint Research Centre, the United Nations Economic Commission for Europe (UNECE) and the European Drought Centre. The Programme was launched in February 2013 and involves more than 40 organizations from 9 CEE countries. The basic four elements of the Programme include policy advice, demonstration projects, capacity building knowledge management and regional cooperation (from national to regional plans). The major output, building upon national initiatives, shall be a coordinated regional framework for drought monitoring, early warning, prediction and management, accompanied by a set of guidelines and tools for the development of regional, national and local drought policies and plans. The proposed integrated approach will place emphasis on working with a range of stakeholders from various sectors, such as government officials, municipal and local officers, farmers, water supply operators, and others. Work will fully observe the Integrated Water Resources Management (IWRM) principles which are the cornerstone of all GWP activities.

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1. Introduction

Drought events are widely recognized as being a major contribution to natural disasters. They have large adverse

consequences on the socio-economic condition of people living in drought-prone areas through their impact on water availability and quality, agricultural and energy production and ecosystem health. Whether due to natural climate variability or climate change, there is an urgent need to develop better drought monitoring and management systems, as well as broader proactive social response to manage drought risks.

This paper is concerned with the Integrated Drought Management Programme (IDMP) undertaken by the Central and Eastern Europe (CEE) Region of the Global Water Partnership (GWP) within the framework of the joint WMO/GWP Integrated Drought Management Programme. The scope of this Programme (WMO/GWP, 2011) is “to support stakeholders at all levels by

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providing them with policy and management guidance through globally coordinated generation of scientific information and sharing best practices and knowledge for integrated drought management”.

While the spatial scope of the WMO/GWP Programme is global, the results are expected to be policy relevant and tailored to specific regional and national needs and requirements. The intent is to facilitate partners in various sectors, disciplines, and institutions to provide better drought monitoring and prediction on a regional and national basis, and to use it effectively in the development of short-term and long-term drought management plans and actions. The overarching approach proposed for the Programme centers around four key principles (WMO/GWP, 2011):

1. To shift the focus from reactive to proactive and programmatic measures through mitigation, vulnerability reduction and preparedness;
2. To integrate vertical planning and decision making processes at regional, national and community levels into a framework of horizontally integrated sectors and disciplines (such as water, agriculture, ecosystems and energy);
3. To promote the evolution of a knowledge base and establish mechanisms for sharing it with stakeholders across sectors at all levels; and
4. To build capacity of various stakeholders at different levels.

It has been decided (WMO/GWP, 2011) that the Programme should be undertaken in two phases: an Inception Phase, followed by an Implementation Phase.

The Regional Council of the GWP CEE initiated the Inception Phase of the GWP IDM Programme in 2011 by establishing the IDMP Task Force charged with preparation of the Inception Report (mapping study), to provide a review of existing drought risks, policies and strategies in the CEE region. The IDMP Task Force and eight GWP Country Water Partnerships (CWPs) worked together for about 10 months on addressing national and regional drought management challenges. Going from South to North, these countries are Slovenia, Bulgaria, Romania, Hungary, Ukraine, Slovakia, Poland and Lithuania. Two of the remaining GWP CEE countries, Moldova and the Czech Republic, joined preparations for the CEE IDMP at the later date. The inception phase was very critical to map current institutional and legal arrangements regarding drought management. Although most of the countries involved in the IDMP Programme are members of the EU, it was found that these countries do not share and exchange relevant information regarding policies and institutional settings and there is no cooperation among neighbouring countries regarding drought management. Cooperation on the application of legal and institutional instruments at regional level is significantly behind the work of researchers and monitoring agencies which are well advanced in monitoring and sharing monitoring results.

The Inception Report completed in 2012, consists of three main sections: (1) drought situation and the related risks, (2) mapping current policies regarding drought monitoring and management, and (3) national and regional GWP CEE initiatives proposed for IDM Programme. The report also focused on the identification of appropriate experts from “out-of-water” sectors to contribute to the work of GWP CEE. It should be underlined that the Inception Report was based on information obtained directly from the GWP CEE Country Water Partnerships experts and represents the situations in these specific countries. Based on the Inception Report, the following four categories of national and regional GWP CEE initiatives were proposed for CEE IDMP:

- Drought preparedness measures (investment and non-investment measures, like for example drought insurance systems);
- Enhancement (and/or development) of drought monitoring and early warning systems;
- Development of capacity building programs for water managers and farmers; and
- Development of case studies to document good practices in application of integrated drought management as an integral part of water and land management (including transboundary basins).

The Inception Report has proposed that the principal objective of the CEE IDMP should be to define and develop practical tools for improving preparedness and reducing drought impacts. This involves an integrated approach combining outputs of meteorological and hydrological services and information from agricultural institutions. A key tool is to establish a Drought HelpDesk, a web-based Integrated Drought Management Platform that will include:

- commonly agreed products (e.g. objectively measurable drought indices covering as many contributing parameters as possible);
- joint comparison and analysis of information;
- mutual exchange of knowledge and methodologies;
- roadmap to implement regional approaches and action plans – general principles and elements; and
- support to national level drought policy and planning.

It was agreed also, that the ultimate output of the GWP CEE IDMP shall be recommendations for CEE countries on coordination of drought monitoring and assessment activities, the terminology used by individual national weather services, the methods used for prediction and early warning of stakeholders involved in drought management, and the respective interface as a basis for the integrated drought management (IDM) at the regional level.

In the Inception phase it was agreed that the following four components of the WMO/GWP initiative will be specially emphasized through the GWP CEE IDMP:

- **Knowledge base:** compilation of information and knowledge on recorded practices in drought planning and management.
- **Guidance** on technical and institutional aspects – tools and methodologies developed to support increased drought risk responses.
- **Advocacy** and increased stakeholder buy-in for the integrated drought management approach through regional and country dialogues.
- **Improved drought early warning services**, including monitoring and prediction and application of drought prediction products, building upon existing regional initiatives.

The outcome should be that institutions in the CEE countries dealing with drought monitoring, assessment and prediction, together with stakeholders involved, recognize the need of IDM coordination at regional level. The policy and decision makers in these countries will have tools to manage droughts in an integrated manner.

As a joint initiative of GWP and WMO, the Inception Phase of the GWP CEE IDMP was closed by the Regional Workshop hosted by the Slovak Hydrometeorological Institute in Bratislava, Slovakia, on October 5–6, 2012.

The main objective of the workshop was to formulate and commit to the IDMP initiative. This kick off workshop allowed to:

- Join the expertise and intellectual capacities of the GWP Technical Committee, GWP CEE and WMO in addressing drought management applying an integrated approach;

- bring together key stakeholders from targeted sectors: meteorology, water management and agriculture and identify concrete institutions to contribute to the IDM Programme;
- inform important organizations at regional and national levels on matters that are or may be drought affected;
- define a roadmap for IDM Programme in CEE in the years of 2013–2015; and
- identify possible sources of funding.

Most important, it was underlined at the Workshop that there is an adequate human capacity specialized in drought management, to launch the proposed Programme. The GWP CEE strongly recommended to collaborate with WMO on drafting the work plan for GWP CEE IDMP (2013–2015). It is envisaged that the IDMP Programme will be complementary to the on-going initiative of the EU regarding the development of the second cycle of the River Basin Management Plan according to the EU Water Framework Directive. The EC Communication 2007 “Addressing the challenge of water scarcity and droughts in the European Union” requires EU member states to set up specific drought management plans to supplement WFD river basin management plans. However, this requirement was implemented only in countries that are traditionally faced with drought episodes that significantly impact the agriculture sector (arid zones).

The GWP CEE also invited the UNCCD Secretariat to be involved in a planning process in order to coordinate obligations of CEE countries under the UN Convention to Combat Desertification.

In addition to GWP and WMO, the following key participants have attended the workshop:

- the DMCSEE, EU Joint Research Center and the European Drought Center (research think-tank of the EU) to conduct the proposed activities and seek synergies;
- national secretariats of UNCCD of CEE countries to contribute to specific case studies dealing with degradation of land caused by desertification;
- appropriate organizations representing the agriculture sector at national levels; and
- UNECE and its Task Force on Climate Change Adaptation.

Taking into account the Inception Report and the results of the Bratislava workshop, at the end of January 2013, the objectives of the GWP CEE IDMP have been formulated as follows:

- Develop understanding and knowledge and promote state-of-the-art technology, through documentation, consultative workshops, dialogues and networking, for integrated drought management.
- Map and assess the impact of droughts, promote adaptation of best practices, incorporate risk mitigation/reduction and develop drought policies based on scientific knowledge.
- Initiate case studies of pilot basins involving local communities.
- Support and facilitate national governments to incorporate assessments on drought management in their national programs and policies.
- Synthesize country findings and develop regional drought policy, including drought declaration, monitoring framework, regional drought management platform.
- Raise awareness about severe drought conditions through efficient dissemination mechanisms, such as learning platforms, training and workshops/seminars.

The proposed activities, including policy advice, aim to increase the resilience of CEE societies to water scarcity and drought events. Consequently, population in drought prone areas and all stakeholders vulnerable to drought are the ultimate target groups

for the project. On the planning and implementation level, the primary beneficiaries of the project are government institutions and agencies responsible for developing drought management policies and/or implementing systems for drought monitoring and prediction, drought risk mitigation and response at multiple time and regional, national and local spatial scales. The secondary beneficiaries are decision-makers and managers whose task is to implement these policies, including drought mitigation and adaptation. These beneficiaries include also non-governmental institutions involved in regional and national drought advocacy, awareness and response efforts.

The project outputs shall be recommendations for CEE countries on coordination of drought monitoring, its assessment, the terminology used by national weather services, the methods used for prediction and early warning for stakeholders involved in drought management, and the respective interface as basis for integrated drought management (IDM) at the regional level.

2. Rationale for the GWP CEE IDM Programme

The IDMP programme covers a region comprising both EU member states and non-EU countries. The region also lies in two hydrogeographical areas of the Baltic Sea and Danube River basins. In the past, these two regions were considered as independent areas, but in 2009, the Baltic Sea Strategy shaped the region into a regional cooperation model for the whole EU. Following that, the Danube Regional Strategy was adopted in 2011. The adoption of this strategy on Development was a significant outcome of the involvement of GWP CEE in activities in years 2008–2010. The main focus of the CEE GWP interventions was to persuade and finally get the inclusion of water issues into regional economic development strategies as a prerequisite of economic and sustainable development.

GWP CEE also has an observer status in both the International Commission for the Protection of the Danube River (ICPDR) and the Helsinki Commission (HELCOM). GWP CEE was also recognized by UNECE to have a key role in the mobilization of stakeholders for Integrated Water Resources Management, including flood and drought management.

All countries are actively involved in the implementation of the EU water directives, foremost the Water Framework Directive and the Flood Risk Management Directive. Moreover, five countries of the GWP CEE region (Bulgaria, Hungary, Moldova, Romania and Slovenia) are founding members of the Drought Management Centre for South-Eastern Europe (DMCSEE) established in 2006 by WMO and UNCCD (Fig. 1).

In the past few decades it has become evident that the CEE region is affected by droughts which are becoming more and more lasting and severe. The region's vulnerability to this natural hazard alerted the public, governments, and operational agencies to the many socio-economic problems accompanying water shortage and to the need for drought mitigation measures.

As shown in Fig. 2 reduced precipitation, being one of the key phenomena leading to drought, is a recurrent feature of European climate that is not restricted to the Mediterranean. Droughts can occur as well in high and low rainfall areas and in any season (European Environment Agency, 2001).

In addition, climate change amplifies the frequency and severity of droughts in the region. The most probable future climate development in the CEE region is directed towards warm and slightly drier summers, warm winters with a rather unchanged average level of annual rainfall and increased frequency of extreme weather events. If these changes persist, they will clearly result in the increase of drought hazards (Figs. 3 and 4).

The GWP CEE region



Fig. 1. The GWP Central and Eastern Region. (Slashed GWP countries are covered also by Drought Management Centre for Southeastern Europe.)

The common feature across the CEE countries is that all of them are especially sensitive in respect to both variability and change in precipitation. Another common feature of CEE countries is that in all of them, the sector most vulnerable to drought is agriculture. However, in the more severe drought situation shortages, water supply to population and industry (including energy) may also be affected.

Water scarcity and droughts are not just a matter for water managers. They have a direct impact on citizens and economic sectors which use and depend on water, such as agriculture, tourism, industry, energy and transport. In particular, hydropower which is a carbon neutral source of energy, heavily depends on water availability. Water scarcity and droughts also have broader impacts on natural resources at large through negative side-effects on biodiversity, water quality, increased risks of forest fires and soil impoverishment. To illustrate how complex and severe drought risks can be, several impacts the current droughts are creating in the CEE countries can be mentioned. The drought's most apparent, immediate impact is a reduction of crop yields across the affected areas. Reduced yields and the threat of outright

crop failure have immediate impacts that stretch far beyond farmers and the communities that rely on crops for their livelihoods. The threat of reduced crop yields has an immediate impact on agricultural commodity prices. These rising prices often have far-reaching implications across today's inter-connected markets. For example, increases in grain price are correlated with increases in the price of essential fertilizers such as potash – demand for fertilizers grows as farmers try to meet the increased demand for grains. While the threat that drought poses to agriculture is often the one most discussed, no rain can contribute to devastating wild forest fires and seriously hinders power generation. The drought risks facing governments, businesses, investors, communities, and others are undeniably severe.

Concerning current policies regarding drought monitoring and management in the CEE countries, in the past few decades it has become evident that in all of them there is a clear need to improve national drought monitoring and management policies with the goal of improving preparedness and reducing drought impacts. Better coordination of national policies is also needed due to the regional character of drought processes, as shown by experience of the Drought

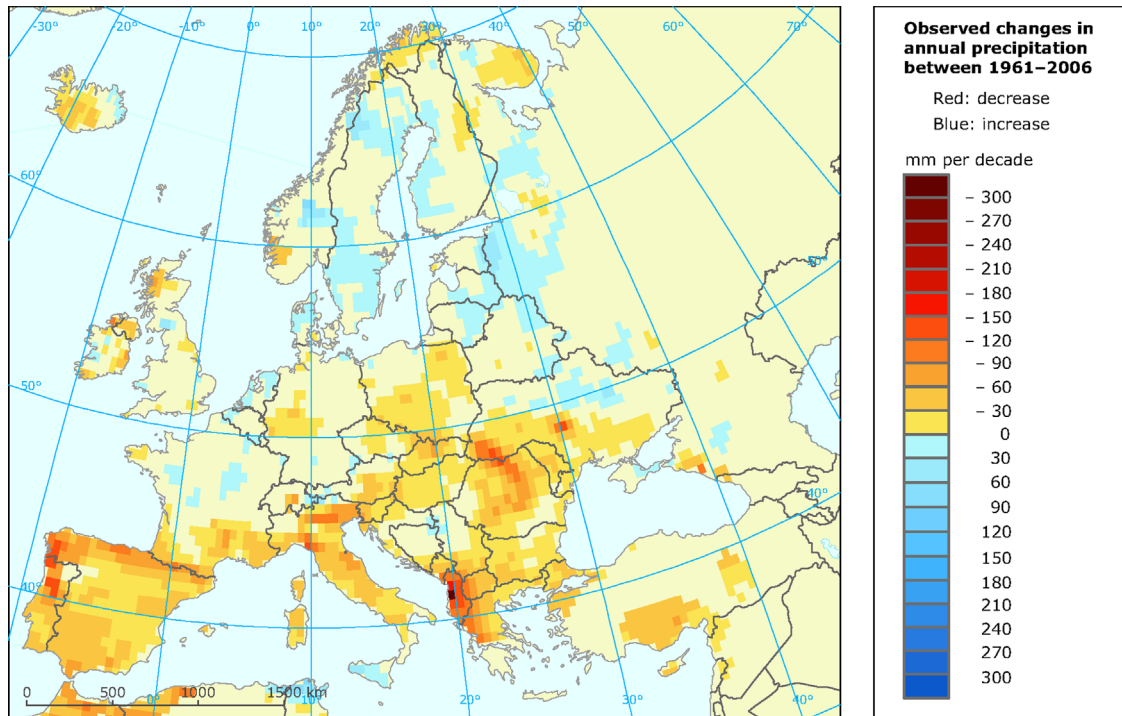


Fig. 2. Observed changes in annual precipitation between 1961 and 2006. Note: Data are in mm per decade, blue means an increase, red a decrease. The observations indicate that large decadal scale variability in precipitation amount is superposed on the long time scale trends described above. This variability is partly related to the decadal scale variability in atmospheric circulation anomalies (see Box 5.1), calculating trends over shorter time periods may therefore lead to different results. Source: The climate dataset is from the EU-FP6 project ENSEMBLES (<http://www.ensembles-eu.org>) and the data providers in the ECA&D project (<http://eca.knmi.nl>).

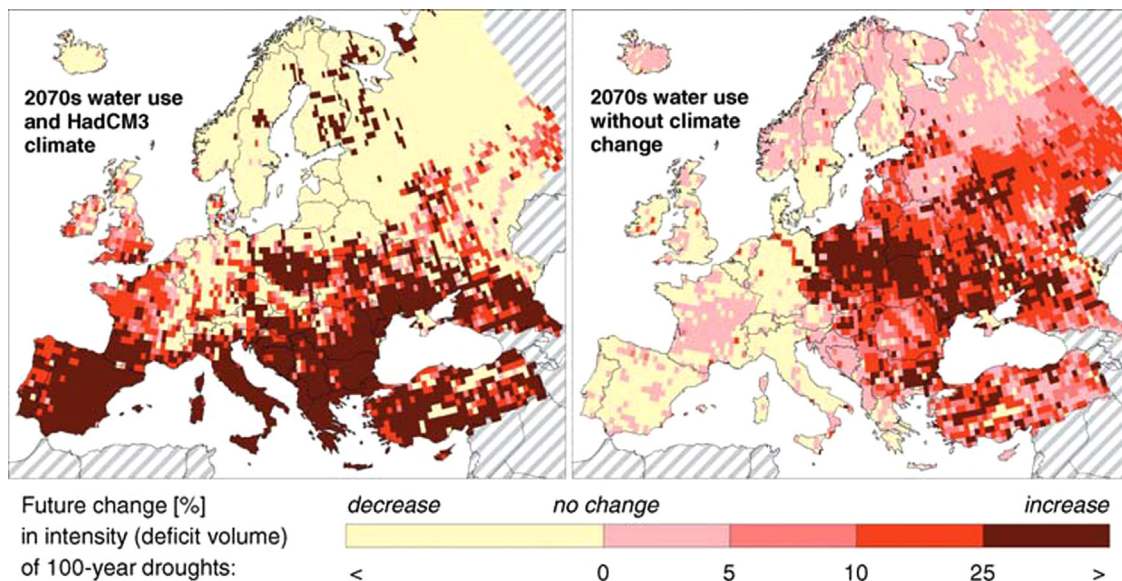


Fig. 3. Change in intensity of 100-year droughts, based on comparison between today's climate and water use (1961–1990) and simulations for the 2070s (left map: HadCM3 climate model and Baseline-A water use scenario; right map: only Baseline-A water use scenario, no climate change) (Lehner et al., 2006).

Management Centre for South-Eastern Europe. Still current definitions and thresholds for drought, as well as monitoring and management arrangements, differ considerably on country levels today.

Although most CEE countries have well developed meteorological and hydrological monitoring systems, these systems are not translated into concerted efforts to support decision makers in various sectors of the national economy (such as agriculture and energy sectors). Some countries (with a strong tradition of

agricultural production) have also developed a sound agrometeorological and drought warning system. It should be confirmed that several countries undertake serious attempts to adopt a more comprehensive and integrated approach towards drought mitigation across various sectors.

Having in mind that drought episodes have local and regional character, there is not a suitable mechanism to share information and knowledge among countries. This is in spite of the fact that

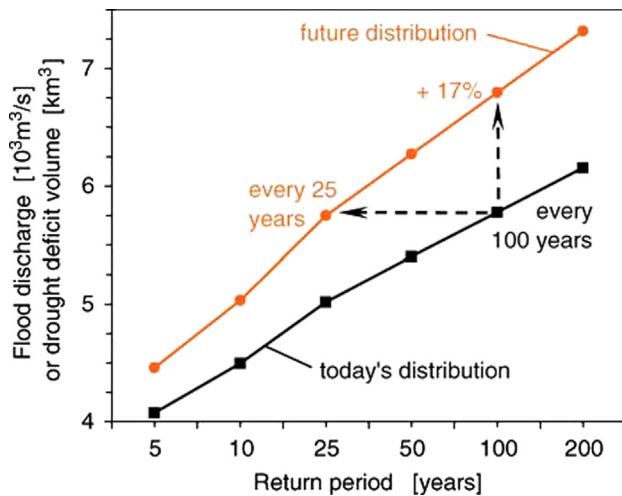


Fig. 4. Characteristic relationship for floods and droughts between a change in return period and the corresponding change in intensity (Lehner et al., 2006).

several basins in the region are of transboundary character, regional integration of drought monitoring and early warning is not at the level desired. A transnational integrated approach is needed for successful tracking of drought, comparing its impacts using common methodology and assessing vulnerability of different sectors to drought occurrence. At present, all countries of the CEE region need to improve both their short-term and long-term responses across sectors to meteorological, agricultural and hydrological droughts. To answer drought management questions a wide variety of factors must be taken into consideration. Whilst the lack of water is the primary cause of drought, there are a large number of factors which exacerbate and intensify its effects. If these factors, many of which have little to do with water per se, are adequately managed, the consequences of the lack of water can be greatly reduced. Several of these factors are listed in the UNCCD regional implementation Annex for the CEE region. They include:

- Specific problems and challenges related to the current process of economic transition, including macroeconomic and financial problems and the need for strengthening the social and political framework for economic and market reforms;
- the variety of forms of land degradation in the different ecosystems of the region, including the effects of drought and the risks of desertification in regions prone to soil erosion caused by water and wind;
- crisis conditions in agriculture due, inter alia, to depletion of arable land, problems related to inappropriate irrigation systems and gradual deterioration of soil and water conservation structures;
- unsustainable exploitation of water resources leading to serious environmental damage, including chemical pollution, salinization and exhaustion of aquifers;
- forest coverage losses due to climatic factors, consequences of air pollution and frequent wildfires;
- the use of unsustainable development practices in affected areas as a result of complex interactions among physical, biological, political, social and economic factors;
- the risks of growing economic hardships and deteriorating social conditions in areas affected by land degradation, desertification and drought;
- the need to review research objectives and the policy and legislative framework for the sustainable management of natural resources; and

- the opening up of the region to wider international cooperation and the pursuit of broad objectives of sustainable development.

The GWP CEE IDM Programme will advocate and facilitate integration of responses by various agencies from various sectors such as water, land, agriculture, ecosystems, and energy on one hand and drought-affected sectors on the other. At the same time it will strive for parallel and interactive vertical integration of science, policy and society through drought monitoring, risk assessment prediction and management through mitigation, community preparedness and response; and regional, national, provincial and local level strategies.

Work on the GWP CEE IDM Programme will fully observe the IWRM principles which are the corner stone of all GWP activities. It will strive for horizontal integration of efforts by water specialists working together with those representing meteorological and hydrological services, agriculture and energy sectors, forestry services and others. This is the only way to avoid work fragmentation. At the same time vertical integration of drought management is needed. The management actions have to be coordinated at all scales – regional, national and local. The subsidiary principle that decisions are taken at the lowest level where impact occurs must be respected, but when it comes to drought policy and finance they must be taken at the appropriate higher levels.

3. The GWP CEE Integrated Drought Management Programme

The GWP CEE IDMP programme was launched in February 2013 and involves more than 40 organizations from 9 CEE countries. The Programme is structured to provide both policy advice and practical experiences in drought management. The value added of this programme is that it focuses on integrated approaches rather than fragmented solutions. The elements of the IDMP programme are as follows:

- Policy advice: assessment and development of Guidelines for IDM.
- Demonstration projects: four demonstration projects will be conducted focused on different aspects of drought management. These include increasing soil-water holding capacity in agriculture; assessment of drought impacts on forest ecosystems; natural small water retention measures; Drought Risk Management System: a decision support system.
- Capacity building knowledge management: organization of regional and national workshops, publishing policy briefs, working with social media and activities focused on increased awareness among water managers and farmers.
- Regional cooperation: the involvement of national organizations and regional agencies.

The work plan of the GWP CEE IDM Programme provides for 4 outputs divided into 8 work packages, composed of 16 specific activities, corresponding to the Programme objectives presented in Section 1.

OUTPUT 1: Countries and regions supported development of “no/low regret” investments and non-investment measures to increase drought resilience and integrate these measures into river basin management plans, other national plans/programmes and related budgets.

Output 1 and its three work packages (WPs) are designed to facilitate national governments to incorporate drought management issues into their national programs, policies and plans. In case of the EU Member States, these are above all the River Basin Management Plans being developed in accordance with the EU Water Framework Directive. The essential component of Output

1 is to enhance regional and transboundary cooperation in the field of drought management. The CEE region is well equipped and has a tradition of transboundary cooperation in the water management sector, but has limited experiences in cooperation in other sectors or areas that call for cross-sectoral coordination.

Thus, the general objective of WP1 on “Regional and Transboundary Cooperation” is to support regional and transboundary organizations, including the international basin commissions for Danube, Odra, Elbe and Sava rivers, to advance integrated drought management and climate change adaptation in transboundary waters for regional and economic development. The current status of implementation of drought management plans within the framework of river basin management plans and other planning documents will be reviewed. Cooperation with/among several regional organizations, such as UNECE, DMCSEE, European Drought Observatory and European Drought Center, will be enhanced. The last and one of the most important activities within WP1 will be the establishment of a regional Drought Management Platform and Drought Helpdesk. First, the existing platforms will be reviewed (e.g. the European Drought Observatory developed by the JRC of European Commission or DMCSEE information services) to define the most feasible one for inclusion of the CEE IDMP products. In addition the platform shall provide consulting and systems integration services, including innovation workshops on drought risk management tools and drought assessments.

The second work package (WP2) is concerned with the “National Planning Processes”. Three principal activities are foreseen. Following identification of the most vulnerable areas to drought in the region and the set of most appropriate drought indices, a drought mapping exercise will be undertaken with the application of GIS techniques. The regional map will be developed on the basis of separately constructed national drought maps. The objective is to develop Guidelines which will also serve as a support tool for preparation of the above mentioned drought maps. But the drought management plans must be prepared with the participation of those who are going to use and apply them – this is the only way to be sure of their practical value. Therefore, a separate activity in WP2 is the organization of national consultation dialogues. It is envisaged that the consultation dialogues will be coordinated by national coordination bodies to ensure government ownership. Over the 2 years, 18 national consultation dialogues are planned in 9 countries. A list of key stakeholders will be developed and regular information and output documents will be disseminated to them. National consultation dialogues will start after the draft version of the Guidelines is developed and presented to the GWP coordinators at the first workshop. These coordinators will be responsible for keeping consultation at national level involving the key stakeholders. Experience gained in consultation dialogues will provide additional feedback for the Guidelines. Work on the Guidelines shall last almost for the entire duration of the Programme. In production of the Guidelines the “bottom-up” approach will be used with the participation of different sectors at different levels and several stakeholders. The main users of the Guidelines will primarily be regional and national entities and individuals who are involved in drought management in each country or river basin, who also participated in the national consultation dialogues. The Guidelines will be the most important product of GWP CEE IDMP. They will also be used as a training material for training the trainees from all countries involved in the Programme, as foreseen in Output 3, WP6.

The third work package (WP3) is concerned with “Investment projects preparation” to support the governments of the countries involved in the CEE IDMP. The governments will be supported in the preparation of no/low regret specific proposals for implementation of IDM policies and strategies. The demonstration projects (WP5) will result in feasibility studies and/or concrete investment

projects. Ultimately, these proposals shall be incorporated in the plans being developed under the second River Basin Management planning cycle, as required by the EU Water Framework Directive. According to the WFD, the deadline for development of the draft RBMPs within the second planning cycle is December 22, 2014.

OUTPUT 2: Innovative solutions in place for addressing critical water security challenges to enhance drought resilience of countries and communities.

As vulnerability to drought has increased globally, greater attention is directed to reduce the related risks through better planning and improvement of drought related operational capabilities (i.e. climate and water supply monitoring, building institutional capacity) and mitigation measures that are aimed at reducing drought impacts. In addition, soil characteristics and water management practices in the catchment areas may be affected by drought impacts. Collecting and analysing data in the form of case studies is the most effective approach and contribute to enhancing knowledge and capacity development. Output 2 includes only one activity (WP5) “Demonstration projects”, including few case studies focusing on different aspects of drought management. Case studies were carefully selected to cover different sectors (water, agriculture, forestry, meteorology, etc.). In accordance with the Programme objectives, all case studies involve local communities.

The following case studies are to be elaborated in WP5:

- Experimental field research on increasing soil–water holding capacity in agriculture;
- assessment of drought impacts on forest ecosystems; and
- natural small water retention measures;
- Drought Risk Management System: a decision support system.

3.1. Experimental field research on increasing of soil–water holding capacity in agriculture

The main target of this experimental project is to demonstrate concrete measures to increase soil water holding capacity. The methods to be explored include application of farming technologies/techniques for better water infiltration into the soil profile. The case study will include field experiments with currently available machineries and technologies for sub-soiling and simultaneously some farming practices. This case study will consist of two parts: theoretical and practical. The inventory and computerized algorithms of soil ability for identification of water retention capacity will be developed. This first phase will also include the identification of pilot areas in Slovakia, Poland and Czech Republic where compacted soils are present. The second part will be to conduct field experiments with sub-soiling technology and other farming measures (deep root plants cultivation, organic fertilizers use). These practices can be utilized on very large areas (a subject of agreement from national ministries of agriculture). Before implementations, experimental verification must be done in selected areas.

3.2. Assessment of drought impacts on forest ecosystems

Water management in the forest watersheds in the conditions of climate change requires specific choice of tree species. Considering that geographical vegetation distribution is determined mainly by climatic conditions, the distribution of forest types correlates with the biologically considerable climate models. The primary approach for evaluating the potential impacts of drought on forest ecosystems will include the use of the Holdridge life zone classification model. For the quantitative assessment of drought impacts, the values of the drought index after De Marton will be

implemented. After determination of vulnerability zones of the forest ecosystems and forest life zones in drought, mitigation and adaptation measures will be developed for each zone. The case study will result in good forestry management practices in different parts of the GWP CEE region. One key objective of this case study is to define the vulnerability zones of the forest ecosystems in Bulgaria, Lithuania and Ukraine.

3.3. Natural small water retention measures

The so called “small retention” belongs to adaptive measures as it serves to extreme climate variability; specifically to retain water in the land during dry season, to preserve ecosystems that are sensitive to water losses and to slow down flood waves during the flood periods. Small retention also increases the buffering capacity of landscape during the drought period due to increased water retention. The main objective is to address nature and landscape values and co-operation with the population (especially farmers) to get prepared for drought situations. The measures protecting against drought effects include both small scale hydraulic structures and non-technical activities such as reforestation, restoration of wetlands, re-meandering of rivers, and soil structure improvement. The case study will summarize experiences from already implemented projects in Poland, Slovakia, and Slovenia. Based on critical analysis, tools for systematic application of non-traditional measures will be developed. These will include the use of GIS tools for optimization of a system of small water retention measures in the landscape (choice of catchments for investments), recommendations for legislation, integration of these measures into national river basin management plans, recommendations for financing and role of local communities in application of these measures.

3.4. Drought risk management system: a decision support system

The demonstration project aims at developing a framework for an integrated operational drought management system. The structure of the system should be comprehensive and multipurpose, including drought monitoring and forecasting tools, drought assessment and risk analysis procedures and drought management strategies to support decision making. The system will combine the tools for the operational detection and prediction of various stages of drought, including meteorological, agriculture and hydrological drought identification; tracing of temporal variability of drought up to daily time step; mapping of drought spatial distribution; provision of information on drought hazard formation and drought vulnerability; drought impact assessment and decisions on drought resilience strategies. This will be achieved by: (1) assembling drought related data concerning exposure to drought and impacts of droughts, (2) developing a set of drought indices for various applications, (3) elaborating system architecture for operational drought early warning and prediction, (4) building a concept for drought hazard and vulnerability maps generation, (5) identifying direct and indirect impacts of drought within economic, environmental and social contexts, and (6) recognizing technical and nontechnical measures to mitigate drought impacts.

The demonstration project will be first piloted by the Polish Institute of Meteorology Hydrology and Water Management. The prototype applications will be implemented and validated for the area of upper and middle Odra River basin. The case study will be documented in a report with practical evidence and incorporated into a compendium of good practices (Output 3, WP7). The activity will be conducted in Poland. It is anticipated that also Romania, Ukraine and Hungary will be involved.

OUTPUT 3: Knowledge and capacity developed for enhancing water security and drought resilience.

Capacity building and knowledge transfer to water managers as well as to managers from various droughts affected economic sectors, such as agriculture and forestry, are an integral part of IDMP Programme. The WP6 is oriented also towards water managers who need to increase their capacities to deal with other sectors. The most successful method of capacity building in the CEE region is to organize specialized workshops. The main objectives of the workshops will be to support capacity development of institutions and stakeholders implementing IDMP and to use a participatory approach for the involvement of key stakeholders in the development of the Guidelines (Output 2, WP2). The regional workshops will be a good opportunity to inform a broader audience on the progress in the IDM Programme. In addition, each workshop will be supplemented by a special theme that will be derived upon the needs of the Programme.

The second and not less important objective of WP6 is to move from crisis management toward risk management based approach. Preparation of a Drought Management Plan is one of the first steps in this process. The main objective is to build the capacity of key actors (water managers and farmer associations) to implement the process of preparing Drought Management Plans in their own countries. In this activity, cooperation with Cap-Net (international network for capacity building in sustainable water management) and UNEP-DHI will be established. These organizations are now finalizing training materials on drought management in the context of IWRM. To avoid duplicating work, their training manuals will be used for preparation of the GWP CEE IDM Programme trainings. First, two experts from each country involved in implementation of the Programme will be invited to the capacity building training of national trainers. The national trainers will replicate the capacity building at the country level. In 2015, a manual will be developed, using experience from training sessions conducted (Output 3, WP6) and the Guidelines produced (Output 1, WP2).

The WP7 is concerned with knowledge and awareness building. The principal objective of this WP is to develop a Compendium of Good Practices in drought management, including a review of drought management projects implemented across all European countries (not only the GWP CEE). The Compendium shall also include the case studies and demonstration projects carried out under WP5. Cooperation with European Drought Center, European Drought Observatory, DMCSSE, UNECE and other relevant institutions is foreseen. The overall task of WP7 is to share knowledge, show how to package and disseminate information and knowledge on design and implementation of IDM, and to raise awareness about severe drought conditions through efficient dissemination mechanisms. A communication strategy will be elaborated and will include methods and ways of communicating knowledge, public awareness increase and mobilization of political and governmental authorities. This all will be carried out by publishing articles in the local, national and international news papers, radio and TV programmes, and policy briefs.

OUTPUT 4: Operational GWP network working with strategic allies and stakeholders to integrate water security and drought resilience in the development process.

The main objective is to build capacity of GWP network and enhance regional/country level of fund raising. It is also concerned with governance of GWP CWPs, financial management, stakeholder engagement, project management and work monitoring and evaluation.

The work will focus on building capacity of GWP CWPs and RWP to be better prepared for new projects. Emphasis will be especially on the national partner organizations which should be ready to generate funds as a consortium. Also, it is envisaged, that broad cooperation of stakeholders will result in increased number of organizations that apply for partnership with GWP CEE.

4. The role of advocacy in the GWP CEE IDMP

Drought is a slow onset natural hazard the effects of which are experienced gradually. It is one of the key hazards affecting CEE populations and economy and its frequency and intensity are expected to be increased by climate change.

But discussing the role of advocacy in the GWP CEE IDMP and definition of drought risk must also be recalled. That risk depends on two elements: hazard and vulnerability. Hazard can be recognized by scientific analysis, including calculating drought severity, duration, frequency, spatial extent, trend recognition, impacts, and early warning. But drought impacts are not solely defined by changes in weather patterns. Those impacts are very much related to the levels of drought vulnerability in the affected regions and communities which are a subject to human management. "Vulnerability is a multidimensional phenomenon that encompasses a number of factors across sectors at various scales" (UNDP, 2010). These include, among others, the degree of dependence of the economy on rainfall and water resources, availability of institutional framework and governance arrangements for drought management, and the presence of adaptive capacity to mitigate drought impacts. In the context of the GWP CEE IDMP, the primary role of advocacy is to support identification and implementation of various technical and non-technical options for reducing drought vulnerability.

The main purpose of advocacy is to influence people, policies, structures and systems in order to bring about some positive change. It often tackles causes of problems, helps people to see themselves as agents of change in their communities, can change power system and systems of injustice, and sometimes can help to generate more resources for on-going development work. Advocacy efforts can take on many levels and they vary according to the problem and the types of groups involved.

The first step of the advocacy process is always identification and stating the issue, collecting the relevant information and mobilizing interested stakeholders. In case of the GWP CEE IDMP, these steps have been initiated in the inception phase of the Programme. This is when the GWP CEE Country Water Partnerships and the regional IDMP Task Force started examining the drought situation and the related risks in their respective countries. They also initiated mapping current policies regarding drought monitoring and management. One of the most difficult tasks, however, is to understand better the stakeholders: to understand who is involved in drought related monitoring, early warning, planning and making decisions on the management of water and land resources in the specific river basins. It is clear that it is necessary to mobilize the broadest possible support from a range of stakeholders (local, national and regional), including the communities and citizens living in drought prone zones.

Already in the inception phase of the Programme, it was realized that advocacy is a complex task. Its objectives cannot be achieved through the use of only one tool or method; rather they require a careful mixture of approaches. It became clear that sharing of information and commonality of purpose are key to the success of advocacy work.

Advocacy will also be of critical importance in the implementation phase of the GWP CEE IDMP Programme. The CEE IDMP will advocate and facilitate integration of responses by various agencies from different sectors such as water, land, agriculture, energy and others. At the same time it will strive to advocate for parallel vertical integration of drought related science, policy and management. The media can significantly help in this process, emphasizing the underlying causes of vulnerability which must be tackled comprehensively while mitigating and responding to reduce drought impacts, saving livelihoods and enhancing resilience of people and economy. Local and regional newspapers, television and radio stations can explain the

major drought management issues and influence changes in attitudes. Other tools of advocacy are also open or restricted websites.

For some of the Programme activities stakeholder advocacy groups may be organized. Such groups can voice local concerns, provide local knowledge, help quantify and prioritize issues, as well as identify options to address these issues. Stakeholder advocacy groups can also design drought mitigating measures for the few who may be disadvantaged for the benefit of many. In addition, such groups can help to conceptualize drought as a cycle that can loosely be divided into four stages: normal, alert, emergency and recovery. Viewing drought as a cyclical process rather than an isolated event preceded and followed by "normal" situation offers several advantages by reducing the prominence of traditional relief activities and emphasizing the need for vulnerability reduction, preparedness activities and disaster mitigation.

5. Conclusions

Although drought has scores of definitions, it originates from a deficiency of precipitation over an extended period of time, usually a season or more, but it is a normal, recurrent feature of climate. Drought impact on society results from the interplay between a natural event and the demand people place on water supply. As shown in this paper, significant part of the CEE region is vulnerable to frequent occurrence of droughts that have adverse consequences through their impact on water scarcity, agricultural production and ecosystems degradation. Climate variability is high in the region both temporally and spatially. In addition, climate change already amplifies the frequency and severity of droughts in the region.

The most probable future climate development in CEE is directed towards increased frequency of extreme weather events. If these changes persist, they will clearly result in the increase of drought hazards. Another common feature of CEE countries is that in all of them, the sector most vulnerable to drought losses is agriculture. However, in the drought situation shortages, water supply to population, industry and the energy sector is also often affected.

Concerning current policies regarding drought monitoring and management in the CEE region, the situation differs considerably in individual countries. The effects of drought are not only due to the physical nature of the hazard, but also to society's ability to manage the associated risks. Drought monitoring, prediction and early warning are not adequate in the region and obviously they need to be improved.

At present, all countries of the CEE region need to improve both their short-term and long-term responses across sectors to meteorological, agricultural and hydrological droughts. Improvements in national and regional frameworks for drought monitoring, early warning and response are needed. In spite of the fact that several basins in the region are of a transboundary character, regional integration of drought monitoring and early warning is not at the level desired. Cooperation on the application of legal and institutional instruments at regional level is significantly behind the work of researchers. A transnational integrated approach is needed for the successful tracking of drought, comparing its impacts using common methodology and assessing vulnerability of various sectors to drought occurrence.

As discussed in this paper, a wide variety of factors must be taken into consideration to address and implement sound drought management. Whilst the lack of water is the primary cause of drought, there are a large number of factors which exacerbate and intensify its effects. If these factors – many of which have little to do with water per se – are adequately managed, the consequences of the lack of water can be greatly reduced. For example, there are several specific problems and challenges related to the current process of economic transition, including macroeconomic and

financial problems. Another problem is the use of unsustainable development practices in some drought affected areas as a result of complex interactions among physical, biological, political, social and economic factors.

The overall objective of the IDM Programme is to provide policy and management guidance and the sharing of best practices and knowledge for drought management. The major output, building upon national initiatives, shall be a coordinated regional framework for drought monitoring, early warning, prediction and management, accompanied by a set of guidelines and tools for the development of regional, national and local drought policies and plans. Capacity building will be an important aspect of the Programme. The proposed integrated approach will place emphasis on working with a range of stakeholders from various sectors, such as government officials, municipal and local officers, farmers, water supply operators, and others.

While drought episodes have local and regional character, currently there is no suitable mechanism for sharing information and knowledge among the CEE countries. In spite of the fact that several basins in the region are of transboundary character, regional integration of drought monitoring and early warning is not at the level desired. A transnational integrated approach is needed for the successful tracking of drought, comparing its impacts using a common methodology and assessing vulnerability of different sectors to drought occurrence. Moreover, all countries of the CEE region need to improve both their short-term and long-term responses across sectors to meteorological, agricultural and

hydrological droughts. Nearly all CEE countries have well developed meteorological and hydrological monitoring, however these systems are not translated into concerted efforts to support decision makers in other sectors of the national economy (such as agriculture and energy).

The GWP CEE IDM Programme will fully observe the IWRM principles which are the cornerstone of all GWP activities. It will strive for the horizontal integration of effort by water specialists working together with those representing meteorological and hydrological services, agriculture and energy sectors, forestry services and others. This is the only way to avoid work fragmentation. At the same time vertical integration of drought management is needed. The management actions have to be coordinated at all scales – regional, national and local. The subsidiary principle that decisions are taken at the lowest level where impact occurs must be respected, but when it comes to drought policy and finance these must be taken at the appropriate higher levels.

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