Global Water Partnership
Central and Eastern Europe

Integrated Drought Management

Programme in Central and Eastern Europe

Quarterly Report No. 1

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Peer Review Group

Integrated Drought Management Programme

Global Water Partnership Central and Eastern Europe

Peer Review Group

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General observations

The Peer Review Group was impressed by the comprehensive outcome of the activities that was produced by the participants in the various activities, in particular when we consider that the project started in the course of 2013. However the outcome also has the characteristic nature of a just started project. Terminology is not always consistent across the activities and even not within a certain activity when different partners report. Milestone reports duplicate information, in particular about drought occurrence in a certain country or region. Information on a country or region sometimes is not consistent. Not all milestone reports are fully completed (some miss conclusions and recommendations).

More important is that the different activities seem to have been developed more or less independently. In the future a more concerted action of all partners is needed, i.e. more work needs to be done jointly by all partners, especially in Work Package 5 Demonstration Projects. It is important to develop a conceptual approach in which all activities fit. In principle, the CEE-IDMP activities aim at characterizing and monitoring drought as a natural hazard, predict the future hazard, assess the manifold impacts, develop drought management strategies that reduce impacts of future drought, build vulnerability and resilience and to reduce future risk at drought. We propose to use part of the 2nd project workshop in Ljubljana (8-9 April 2014) to discuss the conceptual approach and to put the activities in context. A clear conceptual approach will allow to put the outcome of the different activities in a context and it also enables to come up with generic messages for drought management across the CEE region and beyond. Clearly, national reports with specific experiences have to be compiled, but these need to support identifying more generic outcome.

The Peer Review Group (PRG) observed the following:

1. in a conventional scientific report, authors are supposed to start with what is already known on the topic (reference to the literature). We spotted that in some activities there is hardly any literature mentioned, whereas there is already scientific literature on these topics for more than half a century. After having briefly described the existing experience on these, one can identify gaps or opportunities for the CEE region. Then you start doing your analyses or experiments. This applies especially to the WP5 demonstration projects;
2. the references (literature) are mostly based on the national publications. From one side, it is beneficial, because it is not easy to read the different languages, but we miss a lot of information from well-known sources. For, example is the ESPON project, which shows the vulnerability of EU-27 and Norway and Switzerland. Other examples are various recent EEA reports on water, climate, drought and water scarcity The present work should explain what are the differences, improvements according to these reports;
3. most of the milestone reports focus on agriculture and to a smaller extent to forestry, whereas there are more stakes at risk during a drought. Some are mentioned in the reports, e.g. health, tourism, water resources, ecosystem services, but not elaborated;
4. since climatic background information referring to different countries of the CEE region is given in several reports (especially in WP5), it is worth considering some harmonization of the contents of similar information across the Programme.
5. not all milestone reports deal with drought, but cover a much broader content, which make it hard to use the information for further development of drought management specifically in the region;
6. many different drought indicators are described in the Milestone reports. A suite of drought indicators is required that addressing different drought types (meteorological, soil moisture, hydrological) and different sectors (e.g. agriculture, navigation, ecosystem service). Some of these will have an awareness nature, others a more operational nature. However, the suite of indicators should be kept as small as possible and an appropriate justification is required if an indicator is included;
7. we miss a more thorough treatment of approaches for drought risk management strategies. Actually, it should go along the lines of an iterative risk management strategy approach (e.g. IPCC SREX, 2012). It is a loop that start with: (i) monitoring the drought hazard, i.e. the appropriate set of drought indicators for the area considering

the environmental conditions and the possibly impacted sectors (ground measurements and RS), followed by:(ii) forecasting of the hazard (probabilistic; week, month, season), (iii) assessment of all kind of current impacts and forecasted impacts (probabilistic) and (iv) identification of impacted sectors and identification of potential measures to reduce impacts (here DSS, stakeholder dialogue, hydrological modeling, impact modeling, e.g. crop yields, are key elements). In a pro-active mode, steps iii and iv are repeated several times (iteration until acceptable solution is achieved). The pro-active mode can be applied to an ongoing drought, which implies that a Drought Committee (water managers, policy makers, stakeholders) meet regularly (say every week after they have received the monitoring products). The pro-active mode certainly should be applied to be better prepared for future drought that considers global change, i.e. to identify robust measures (win-win, no-regret, preferably low cost). Then step (i) does not exist and step (ii) forecasting is replaced by prediction projections. This could also bring end-user and scientific communities needs together.

8. some milestone reports are based on a well-prepared template developed by the activity leader together with key partners that has been sent out to collect information. Other reports are not based on such clear request, which make these report inconsistent in type and length of information that is provided per country;
9. we believe it is a good idea to integrate the CEE Information system in the EC-JRC European Drought Observatory (EDO), but it should be clear for how long JRC will run such a system;
10. some of the milestone reports do not agree with the activity lists. Since the activity lists have been written and agreed by the activity leaders, we think, they have to keep them up. In case the activity leader found it necessary to modify the initially agreed activity list, all changes must be agreed with the Programme Manager and reflected in the updated activity list;
11. we would like to draw the attention of the activity leaders to the reporting quality of their reports. Some of them are full with mistyping, not finished sentences, etc. A report has to be a good quality scientific product. There are examples, which contain many comments in the national languages, and they are not translated. Some of the reports contain practically the same text twice. The other example is the De Martonne formula, which is consistently mentioned as De Marton (probably taken from the cirillic script);
12. we also would like to draw the attention of the activity leaders to use widely accepted international glossaries of terms (e.g. based on IPCC). Example is the Polish “drought susceptibility”, which is not clear whether this is sensitivity or vulnerability? The Programme should establish a glossary of terms, where each activity leader would have the option to add new terms. We should avoid, that one country has meteorological, hydrological and agricultural droughts, another one atmospheric (there are more problems with it), and soil droughts. A common English glossary would be beneficial also for the future (one of the IDMP CEE outputs);
13. unfortunately, the contents of different activities are not always consistent. We can find different values for hydroclimatic variables in different activitity reports referring to the same country;
14. most of the reports are merged national reports, but not an assimilation of them (this is a very basic observation). In this way, the project won’t be transboundary, does not give any international additional value. Furthermore, it does not support the comparability and any harmonisation. For example: the Polish vulnerability is the simplified (and quite questionable nowadays) vulnerability concept from Wilhite in 2002. The Romanian one is more similar to the IPCC method. How can be comparable results from two different methods (approaches)? The project should strive for more synthesis;
15. we believe that one of the basic roles of activity leaders is to organize integration of national contributions, to cooperate with other activity leaders involved in associated tasks and to generate reports that are consistent and contain sufficient synthesized information obtained from participating organizations. There are some examples that require improvement , where milestone report is a bit more than half a page, and only raw national reports are attached without any attempt of integration;
16. the length of milestone reports should be no more than about 30 pages. At the moment, milestone reports of some activities are definitely too long. The authors should wonder how much information given in those reports will really be used in the final activity reports;
17. in the milestone reports sometimes it is difficult to understand what was done within the IDMP CEE and what is the related research done in the past, what might be a very useful base for the current effort. Whenever possible it is necessary to stress what is the “added value” generated thanks to our Programme.

18. The program of capacity training should be presented and explained. What do we expect from that training? It should not only be a series of presentations (it should not be just a workshop), nor discussions (it should not be a seminar), but something more pragmatic. All capacity training activities proposed within the framework of IDMP CEE should be adequately explained.
19. it was a very good idea of Programme Manager, that she collected the reports in one file for the review. Unfortunately, some files were still difficult to find. For example, we had some problems with the national consultations dialogue, Lithuania, where the whole minutes were in the attachments, which we could not find.

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Work package 1 Regional and Transboundary Cooperation

Act. 1.1 Cooperation with international basin commissions and regional organizations

Progress Report for this activity by Sabina Bokal (Project Manager) describes her participation in the 2nd Pan-EU Drought Dialogue Forum (Brussels, November 2023), participation of Richard Muller (CEE GWP Regional Coordinator) and Liviu Popescu (GWP Romania Chair) in EUROPE-INBO 2013: 11th European Conference on the WFD (Plovdiv, November 2013) and possibilities of establishing some working contacts with the new project "Natural Water Retention Measures (NWRM) Initiative, launched by DG Environment (EC). The NWRM has four regional networks – Danube, Mediterranean, Northern Europe and Western Europe. The idea of approaching the NRWM with the proposal of the 5th regional network "Central and Eastern Europe" based on CEE IDMP, represented operationally by our Activity 5.3 "Natural small water retention measures", is fully supported by the PRG. Martina Zupan (GWP CEE Chair) and Richard Müller participated in the 16th Ordinary Meeting of International Commission for the Protection of the Danube River (ICPDR) on 10-11 December 2013 in Vienna, Austria. Contacts were made with REC with regard to Natural Water Retention Measures Project and participation in upcoming regional workshops in 2014. Under Activity 1.1, also members for the PRG were invited and the group was established. The Activity 1.1 is developing satisfactorily and its further expansion is highly recommended. Seek wider co-operation through EDC, the FRIEND-Water 2014 Conference, Montpellier, October 2014, the HYPER Drought Conference (EGU Leonardo Conference Series on the Hydrological Cycle), Prague, November 2014, and the 2nd European Drought Conference, Valencia, March 2015.

Act. 1.2 Review of the current status of the implementation of DM plans and measures within RBMP according to EU WFD

The aim of Activity 1.2 is to gather information from all participating CEE IDMP countries on the current status/development and implementation of the drought management plans and/or drought control measures as provided by the River Basin Management Plans (see EU WFD) and by other national drought-related planning documents. In case of Ukraine and Moldova (non-EU member states), the review deals with the National Water Resources Management Programs (NWRMPs) and other national drought-related plans and measures.

To accomplish that aim, all 10 countries involved in the activity have been working in the reporting period on the completion of the Questionnaire developed and distributed by Elena Fatulova (Activity Leader) on October 30, 2013. The countries involved had a possibility to comment on the draft Questionnaire. The national information and data needed for the Questionnaire are collected through the process of National Consultation Dialogues (see Activity 2.2 of CEE IDMP). The Questionnaires will be summarized in the Regional Report to be ready by the end of March 2014. That report will be the principal source of information on the current drought management situation in the region to be used as a foundation of the Guidelines for the national DMPs (Activity 2.1).

The Questionnaire has been prepared in line with the Communication from the Commission to the European Parliament and the Council "Addressing the challenge of water scarcity and droughts in the European Union (COM (2007) 414 final, 18 July 2007)", taking into account the above mentioned document "Drought Management Plan Report Including Agricultural, Drought Indicators and Climate Change and the EU Blueprint to Safeguard Europe´s Water Resources (2012). The WMO/GWP Guidelines for National Drought Management Policies and Preparedness Plans of 2013 have also been considered. We wonder if also the follow-up EC Documents on this topics have been consulted: e.g. Communication Report on the Review of the water scarcity & droughts policy in the EU SWD(2012),

[2] This is the first review report of the Programme progress. It covers the whole 2013.

380 final COMMISSION STAFF WORKING DOCUMENT, accompanying the document {COM(2012) 672 final}, Brussels, 14.11.2012. The international co-operation could be more highlighted. Among others the UNECE Water Convention's Guide for Transboundary Waters could also be referenced and used;

In the reporting period, 6 National Consultation Dialogues were held and the remaining 4 are planned to be held early 2014.

Based on examination of few reports from the national consultation dialogues and some of the already filled national Questionnaires, the work being carried out in Activity 1.2 is in good progress and it likely will be completed as planned by the end of first quarter of 2014 (Milestone 3).

Act. 1.3 Drought Information Platform

One of the important tasks of CEE IDMP is development of the drought information platform, understood as an information architecture and an intelligent infrastructure that enables exchange of data relevant for drought analysis as well as for continuous automated sensing, monitoring, and decision support for drought risk management operations. Drought information platforms are used by several drought monitoring centers in different parts of the world – in Europe there are two centers of special interest to CEE IDMP namely the European Drought Observatory (EDO) and Drought Management Centre for Southeastern Europe (DMCSEE) in Ljubljana.

Primary goal of this activity led by Dr. Gregor Gregoric from the Slovenian Environmental Agency/DMCSEE, is to enable all CEE IDMP countries (activity partners) to participate in the exchange of data relevant for detecting drought onset and analyzing the development of the drought severity and eventually the recovery. The aim of the platform is, however, not entirely clear. Either we have to have access to the actual data (and can produce early warnings), or not, but we can produce maps. However, EWS (Early Warning System) cannot be operated based on the maps.

Programme/activity partners are expected to have access to relevant data, have capacity to prepare digital maps of drought-related indicators, have knowledge and expertise in national drought monitoring and should be able to provide national institutions with relevant maps. But most of the partners are not hydro-meteorological services and there might be serious problems with availability of national data. How to secure that they are available? It is also not clear, how the national information will be harmonized (break at the borders).

In the reporting period, the Activity Leader developed the first draft of platform implementation guide, but the draft implementation guide is rather technical (description of EDO, for example). Based on the overview of existing platforms it was proposed to integrate the data provided by activity partners into European Drought Laboratory (EDO). The EDO has been developed by Institute for Environment and Sustainability of the Joint Research Centre (JRC), a Directorate General (DG) of the European Commission providing independent scientific and technological support for EU policy making. The reasons to choose for integration into EDO instead of developing our own platform are listed in the draft implementation guide (Milestone 1 report) – they are well thought-out and convincing. The benefits of joining to EDO are indeed listed in the draft, but the disadvantages are not (for example: how can we add information which is different than the current EDO information?). It could make the decision making not easy.

Of course this proposal still must be discussed in detail by CEE IDMP management and Activity Leader with the JRC. Moreover, the draft implementation guide contains a valuable overview of Geographical Information Systems and web mapping to be used on the platform. Some basic assumptions are formulated on integration of national data and various drought indicators for identification and/or forecasting of drought situations.

The work done so far on drought information platform is very promising and detailed procedure for integration with examples will be available in final version of implementation guide in April 2014. A technical workshop is

foreseen that will demonstrate to all partners how to integrate national data into the platform. We suggest also to follow developments beyond Europe, in particular the US National Drought Mitigation Centre (Nebraska) is world leading (http://drought.unl.edu/). It should also be explained what kind of cooperation has been established/contract has been signed to guarantee that at least for some years the CEE IDMP information system can be part of EDO.

Additional remarks:

- Basic indicators are listed in Table 1. The abbreviations should be explained.
- It is not described, which SPI is/should be used;
- Also some information requested in the Activity List is missing, like "In addition, an analysis will be conducted to explore a possibility to establish a new platform under WMO" – that information should be explained.

Work package 2 National planning processes

Act. 2.1 Guidelines for Drought Management Plan

The main objective of Activity 2.1 is development of the Guidelines for National Drought Management Plans to be developed in all CEE IDMP countries. The road map for development of the Guidelines consists of three following phases:

October 2013 – first draft of the Guidelines prepared for the presentation and discussion during the first CEE IDMP workshop;
June 2014 – draft of the Guidelines and their test application within the framework of the Slovak case study are to be commented upon by all CEE IDMP participating countries;
June 2015 – final version of the Guidelines completed.

The first CEE IDMP workshop concerning the main objectives, tasks and outputs of both Activities 2.1 and 2.2 was held in Slovakia (Hodrusa-Hamre) on 15-16 October 2013. At the workshop, the Program Manager presented to the activity leaders the objectives, tasks and expected outputs of both activities. The first draft of the Guidelines was presented by Elena Fatulova (Activity Leader) and discussed during the workshop in three working groups. The principal aim of the discussion was to identify the main and additional elements of the Guidelines to be elaborated in detail in the further phases of Activity 2.1. The workshop participants were asked to answer three following basic questions: (1) What are the measures that could help in the process of introducing effective drought risk management?; (2) How should public participation be organized to improve drought risk management; and (3) Which elements (components) of the drought management system require special attention in the Guidelines? On the whole, the workshop proved to be a very useful introductory meeting of all activity leaders who discussed informally their tasks and identified several cooperation opportunities and needs.

On the whole the initial phase of work on the Guidelines for the National Drought Management Plans has been carried out in the reporting period well and in accordance with the plan outlined in the activity list. Not too much focus on agriculture only?

Act.2.2 National Consultation Dialogues

The main objective of the National Consultation Dialogues (NCDs) in all CEE IDMP countries is to assemble national experts from the different institutions dealing with different aspects of drought processes and open the expert discussion on the IDMP in the region. Six NCDs were already held in the following countries: Slovakia (26 November, 2013), Czech Republic (3 December, 2013), Hungary (3 December, 2013), Ukraine (10 December, 2013),

Moldova (12 December, 2013) and Lihuania (19 December, 2013). All national GWP offices of these countries elaborated reports from their NCDs providing detailed information concerning the participants, workshop agenda and adopted conclusions (unfortunately, the attachments are missing in the national reports). In each country the participants were also informed about the on-going and future activities within the IDMP. The main item on the NCDs agenda was discussion on the drought management situation in the country following the questions of the Questionnaire (see Activity 1.2). In conclusions the next steps for continuation of the national dialogue were outlined. Moreover, several good ideas and recommendations for further development of the Guidelines were generated (terminology, legislation, risk assessment, etc.). An additional question is whether some support should be offered to identify national partners in the NCDs? How can we be assured that the most important partners were/will be present?

On the whole the experience of the NCDs carried out so far proves them to be very useful for further development of the Program. The start of a well-structured process has been implemented. The national GWP offices of the four remaining countries of Slovenia, Poland, Bulgaria and Romania were not able to organize NCDs in the reporting period because they could not get together key stakeholders in such a short time, but they already set the dates for early 2014. A challenge will remain to synthesize the experiences from the 10 countries to derive more generic information for DMPs.

Work packages 3 and 4 - do not apply to the CEE IDMP

Work package 5 Demonstration Projects

Act. 5.1 Drought management by agricultural practices and measures – increasing soil water holding capacity

The main objective of project 5.1 is to demonstrate concrete practices and measures allowing to increase soil water holding capacity. The project led by Prof. Pavol Bielek from the Slovak University of Agriculture in Nitra is implemented by specialized units of the universities and research institutes from the Czech Republic, Poland, Slovakia and Slovenia. The work program consists of two parts: theoretical and practical. Following the activity list, in the reporting period the first two steps have been accomplished: set up experiments and start of the theoretical study (Milestone 1), and theoretical review of problems, including first results of experiments carried out in the pilot areas (Milestone 2). The theoretical review needs editing. It is not understandable why Slovakia and Czech Republic have the task in the 2nd Milestone the theoretical work, Poland and Slovenia the experimental one. The reports are mixed, containing both parts. For example, the Slovakian report contains less than 3 pages theoretical study, which is the only one topic in the task description for 3000 EUR (Activity list, milestone 2). Despite that, the Polish report should contain experimental study, but it has not - it is a survey of the national literature, which wasn't requested (although it is important). The Activity list is inconsistent, the milestones and the budget explanations are not appropriate. The joint reports are quite symbolic. Such sentences as "many other laboratory tests will be carried out in the nearest days" do not contain any information and should not belong to the report.

Moreover, in the reporting period the project organized the first capacity building training under project 5.1 (December 4-5, 2013, Prague, the Czech Republic). The work done under each Milestone is summarized and reported briefly by the Activity Leader, and both reports are accompanied by four national reports.

Summary Report (Set up of experiments. Start of the theoretical study) - Milestone 1. Following brief introductory comments, the summary report by Activity Leader provides a list of set up's of field experiments carried out in each of the four countries and the type of the first analyses performed. The following statements presented in the report are not clear to the reviewers: "preliminary yield evaluations of field experiments" (SK). Is it a yield estimation? Another questionable statement is: "Soil samples taken for later laboratory experiments" (PL) – the aim should be given. It is stressed that the results available are of a preliminary character only, although they

indicate advantages of sub-soiling, positive effects of the organic fertilizers application, and advantages of other farming practices, including composting tillage recommended by the Slovenian partner. It is stressed that research undertaken by this activity brings up "some real proposals for several possible approaches for land water regime regulation by agricultural practices". Since this is a summary report concerned with the very first stage of the activity it is acceptable, however, summary reports corresponding to the next milestones should describe better integration of effort by all cooperating partners and generic conclusions from their work for the CEE region. The following brief comments refer to the national reports appended to the Summary Report – Milestone 1.

The **Czech partners** have carried out field experiments on comparison of cultivation effects (site Prachov) and organic fertilizer use (site Trebsin) on soil infiltration and retention abilities. In the Introduction the "main European Watershed" is mentioned – what is it? The differences of the saturated hydraulic conductivity values (one of the measures of soil water holding capacity) determined in the field by the double ring infiltrometer and the values determined in the laboratory are quite substantial. The hypothesis that incorporation of organic matters into soil increases its infiltration ability is not rejected. It's all fine but some information on physical characteristics of the investigated soil could be added. In the discussion of experiment results it is mentioned: „Thus while using double ring method, water probably infiltrated into deeper layers – not to those from which the samples were taken for laboratory determination." How to improve it? The additional costs are missing (extra costs for subsoiling). In this way, the cost/benefit calculation is not possible although it would be a valuable part of the analysis. The **Polish partners** have chosen two crop fields to compare the impact of two different tillage systems on the retention capacity of the soils. Two crop fields have been selected: one cultivated traditionally, and one cultivated by no-tillage system. They make a point that "the process of changing the physical parameters of the soil under the influence of tillage system is a slow process which requires a long time, at least over a dozen of years. Based on a few years of experiment is not possible to draw proper conclusions". This is very much true, but this is why selection of experimental fields is so important. They must be under specific tillage for a sufficiently long time[3]. The soil system must be in equilibrium state reflecting a complex physical and biological processes. Set up of field experiments undertaken by the **Slovak partners** in April 2013 is explained. The observations performed included the penetrometric study, field water infiltration experiment and determination of the growth of maize. The field water infiltraton experiment allowed to conclude the differences of soil moisture between sub-soiled and non-sub-soiled soils. But the Slovak report raises few questions:

- Growth of maize (p.2): - „No subsoiled plot: 0.70, 0.68, 0.69, 0.70, 0.60, 0.70, 0.70, 0.65, 0.60, and 0.65 m (66.7 m in average),: 0.73, 0.77, 0. 0, 0.80, 0.82, 0.77, 0.82, 0.82, 0.77, and 0.72 m (78.2m in average)". We assume, the averages are in cm.
- The growth of maize costs 100 Euro (according to the budgetary chapter), but it is 20 lines all together. It seems to be quite expensive.
- The Excel file MAGA is not fully clear fo us. For example: „number of plots 100" (MAGA penetrometria A5 and AB)". Why there is a break in row 13 between the 26 and 27 cm?
- Unfortunately, the Excel file texts are in Slovak language, therefore, some information is not understandable. MAGA file, Harok1 - why there is a big jump between cells M73 and N73?

Finally the **Slovenian partner** reported three field experiments set up in the flat cropland area in the NE Slovenia, where summer droughts are quite frequent and soil improvement to hold more plant available water is of utmost importance. On two of the selected fields, comparative tillage experiments were conducted continuously for the last 14 years - among others on the new composing tillage system. Examples are given of some long-term field trials carried out in 2011. The changes of soil water holding capacity under influence by different soil tillage systems will be continued in 2014.

[3] By the way, we guess that this applies also to the Czech experiments. We couldn't find in the Czech report for how long the fields are already under different treatment.

Summary Report (Theoretical review of problems and first results of experiments) - Milestone 2. The summary report is very short (half a page) listing main common conclusions on theoretical and experimental levels only. General comments made about Milestone 1 summary report are also valid in case of Milestone 2 report. The original purpose of the theoretical study is not clear. Well edited, theoretical survey would be very useful but it is missing. The Czech and Slovak 2nd milestone reports include the theoretical studies, the Polish and Slovenian reports are not (see the Activity list). Unfortunately, the reports are not appropriate to that. For example, the Slovak report contains a short theoretical part, and the Polish report contains also theoretical study, although related task description in the Activity list is entirely different.

The following brief comments refer to the national reports enclosed to the Milestone 2 summary report. We wonder where we can find the outcome of the theoretical analysis in a joint report. There must be a lot of literature about increasing the water holding capacity through sub-soiling and management of the organic matter content of soils. There is an extensive literature analysis (e.g. CZ report), but not a coherent, concerted action of the group. We would expect that based upon the gaps identified in such a literature analysis common gaps would have been identified and consequently experimental research / field experiments would have been designed and carried out targeted to the CEE region. The focus is still from a national point of view.

Following a brief introduction, the **Czech partners** presented a very complete theoretical review of soil water issues with special concern given to various anthropogenic impacts (soil cultivation, impact of the amount of organic matter, etc.). List of 79 references is impressive, but a pity that this is not a concerted action of participating countries and subsequently targeted field experiments to address specific gaps in the CEE countries. The results of field experiments carried out at two sites set up as described in the Milestone 1 report, indicate that cultivation of soil in different ways is of great significance for water infiltration and storage in soils. There is some ambiguity, however, in comparison of an impact by different cultivation methods. It is foreseen that field experiments will be continued in 2014 and the third site for ecological farming will be added (we hope this is already a long-lasting site). It is noted that the same sentences are repeated in the report. The soil compaction part should be given more attention in this demo project; at present it is too short.
The important part of the report "Theoretical review of drought problems and the role of the soil in controlling water cycling" by **Polish partners** includes two sections on the role of soil in the drought problem and on improving soil water retention and hydraulic properties. The task is: "Evaluation of the results of the first year experiments. Impact of soil cultivation system on infiltration rate and organic matter content"(see Activity list) – this is missing in the report. The title page has to be changed to Poland (and not Slovakia!). Results of broad investigations indicate that until now, the climate changes have not been responsible for deterioration of water conditions at all (Ryszkowski 2002, Ryszkowski, Kędziora 2007). While in the Czech report: „Proceeding climate change causes increasing extremities in weather patterns, both floods and droughts." These statements are not consistent. In the appendices, investigations carried out in tillage (conventional) and non-tillage experimental fields mentioned in Milestone 1 report are described. First results of these investigations, still rather limited, are presented.
The report by **Slovak partners** opens with a short section on "Drought as a driving force of the project" including some interesting information on the soil water holding capacity. There is a statement that "using all well-known definitions of drought, we can define the drought as a lack of water in the Nature", but this is not true. Drought has a well-known definition, and it is not the lack of water in the Nature. „Soil water holding capacity is the portion of water that can be absorbed by plant roots." That is the available water (disponible). „Simply, more water saved by soils means better conditions for nature and people." What is the difference between the maximal (full) water capacity (two phases only, no gases in the soil) and soil water capacity (three phases: solid, liquid and gas in the soil)? The maximal water content is worse usually. Tab. 2. The background of the measurement is not given (how many plants, etc.) Significance? Publication in newspapers. The first article belongs to the first report (as it was reported already). Section on experimental results provides final interpretation of the results of the penetrometric study and water infiltration experiment reported in the Milestone 1 report. An additional water filtration field experiment was carried out in October 2013. Earlier growth of maize data were supplemented with the final yield information which confirmed that the sub-soiling has significantly positive effect on these yields. The maize experiments will be continued in 2014; similar experiments will be undertaken for winter wheat.

Finally **Slovenian partners** concentrated their theoretical review to the discussion of composting tillage as a system especially oriented to the improvement of soil water regime. The field experiments were continued in the cropland area already discussed in Milestone 1 report and workplan for 2014 was outlined. Fig. 2-4, pic 3 in the Milestone 2 are the same as in Milestone 1. What is the difference between Fig and pic?

In conclusion it must be stressed that final edition of the theoretical review of the soil water problems based on the contributions presented in the Milestone 2's national reports, remains still to be done. It would be good to have some information on how and when this important task will be accomplished. Regarding field experiments, it is understood that at the moment we still have only first results based on the work done in 2013. The complete results and generic conclusions from both 2013 and 2014 experiments, together with the plans for their practical application, are to be included by the end of November 2014 (Milestone 3).

Additional remarks about Activity 5.1 are the following:

- Important if the water holding capacity is refilled. Does not happen during dry winters in dry climates (e.g. Mediterranean). Then large WHC (Water Holding Capacity) does not help in a subsequent dry summer. Analysis of long time series, which usually are supported by simulation modeling can help to understand if this happens in the dryer parts of the CEE region.
- Fundamental question: sub-soiling leads to improved WHC, but observed positive plant responses can these all be attributed to increased WHC or is it also better aeration, improved soil temperature regime (e.g. Slovak, M2 National Report).
- We believe that "National Reports" are a wrong mechanism for this type of activities. We need a coherent, concerted view for the CEE region on how soil improvement can support adaptation to agricultural drought. The joint reports M1 and M2 are (too) short;
- Reduction of agricultural drought, usually goes together with increased evapotranspiration, which means lower groundwater recharge and more severe hydrological drought. This mechanism needs to be addressed somewhere.

Act. 5.2 Assessment of drought impact on forest ecosystems

The main objective of this demonstration project is identification of measures for the forest ecosystems to adapt to negative effects of drought, based on the expert investigations in four GWP CEE countries: Bulgaria, Lithuania, Slovenia and Ukraine. The total forested area in those countries is about 35% of forest areas in the GWP CEE region. The vulnerability zones of the forest vegetation are to be defined for the present climate (1961-1990), as well as for the year 2050 (realistic climate scenario) and the year 2100 (optimistic, realistic and pessimistic climate scenarios). The project is to define good drought management practices for application to the forested areas of the GWP CEE region.

The project led by Ms. Galia Bardarska from GWP Bulgaria / Scientific Technical Union for Water Affairs of Bulgaria and Prof. Vesselin Alexandrov from the Bulgarian Academy of Sciences and National Scientific Center for Global Changes is implemented by specialized units of the universities and research institutes from the four countries mentioned above. Following the activity list, in the reporting period work corresponding to the first two milestones have been accomplished: **Milestone 1** – Joint report on Topics 1 (Kick-off-meeting) and 2 (Forest policy at UN, EU and national level; General information about forest ecosystems – comparative analysis for 4 GWP CEE countries), and **Milestone 2** – Topic 3 (Establishment of methodology for assessment of drought impact on forest ecosystems in 2050 and 2070). The year 2070 is mentioned in the Milestone 2 report, but why? The Activity 5.2 is about 2050 and 2100. There are many unnecessary repetitions in both reports.

Milestone 1 – Concerning **Topic 1,** this was a short meeting during the GWP CEE Council meeting held in April 2013 in Kiev and the following communication of project partners through Skype,emails, etc. when they have agreed on

project responsibilities and the workplan. Concerning **Topic 2** discussed in the joint report, it provides wealth of information on forest policies in Europe, with special emphasis on four countries participating in the project (forest sector, governance, policy, research and education). The first part of the joint report is a good job. The purpose of using the name "De Marton" instead of "De Martonne" is not clear. Following discussion of main forest problems and SWOT analysis of the forestry sector done for each country, three main conclusions are given for all four countries. : (1) There is a tradition of planned management of the forests, (2) multi-purpose use of the forests is related to production of material assets, ecological, social and recreational functions, and (3) most significant threats, challenges and opportunities for development of forestry sector depend on climate changes which influence "on forest living conditions" (whatever it means). Unfortunately these conclusions are not very precise because it is clear from the text that in spite of the tradition all four countries have several serious institutional, social and economic problems with sustainable management of their forest sectors. The first 40 pages on Topic 2 contains a lot of interesting information but still some selection of the material presented and solid editing are required in the final stage of the project. Probably at the same time, the last 34 pages of the Joint Report (Annex on forests in Bulgaria, Lithuania, Slovenia and Ukraine) could also be combined with the first 40 pages of this report to avoid a lot of unnecessary repetitions. The report is very general and not focused on drought (e.g. lower wood production, reduced limited ecosystem service, increased associated other risks, like fires and heat waves, (see Teuling et al, Nature).

The vulnerability assessment is simplified. If we use the affecting factor only, it means that the suffering environment is the same, with other words, the suffering environment has the same adaptive capacity. But it is not valid for example for Bulgaria and Lithuania. Most probably, they have different ecosystems, different forest types. (Even if not, the genetic adaptation differs the treespecies already.) Therefore, we assume, that the same effect has different results at different ecosystems. If it is valid, the use the Holdridge and De Martonne is not enough for the vulnerability assessment. (Vulnerability and drought impact are different).
The Bulgarian part of the report is very detailed and large, but the climate and climate change are missing in Slovenia and Lithuania and slightly mentioned in Ukraine.

Ch. 7. What does it mean 'Updated information'? In comparison to which documents is it updated?

At the SWOT analysis: do we used to speak about challenges or threats? SWOT means strengths, weaknesses opportunities and threats – challenges can be used as similar word, but not in the title. The conclusions of two countries and the general ones are inconsistent. If a country says "no threat", than it cannot be stated that it is generally a threat in the region.

As far as climate is not a threat on the forests in Lithuania and Slovenia, therefore, the conclusions are not consistent: it is written in the national report, that climate change is not a threat, but it is a threat among the conclusions of the common report.

Milestone 2 report is concerned with establishment of methodology for assessment of drought impact on forest ecosystems in 2050 (average for 2041-2060) and 2070 (average for 2061-2080)[4]. That is a bit strange because the Activity 5.2 mentions two projection horizons, i.e. 2050 and 2100. The proposed methodology [5]is discussed on the first 15 pages of this report, using Bulgaria as an example (the projection windows are now: 2020 and 2080, in addition to present and 2050). In addition to De Martonne index, the other method proposed is the Holdridge model that is climatic classification scheme which connects the distribution of the main ecosystem complexes to the climate indexes as bio temperature, annual precipitation and the relation between the potential

[4] We do not understand why a RCP3 scenario is mentioned in the M2 report. We have the RCP2.6 and RCP4.5, but we are not aware of RCP3 (pages 2-3).

[5] De Martonne dryness index that relates annual precipitation to temperature is being proposed as a climatic drought index. Does this hold for all tree species or different forest ecosystems and forest functions? What about the temporal resolution?

evapotranspiration to the precipitation. This might be useful for climate change, but what is the link with future drought? The same holds for the Vorobjov climate classification. The remaining part of the report provides an interesting overview of the climate change modeling work carried out in the past in Slovenia, Lithuania and Ukraine. Lots of references (Slovenia) but hard to intercompare all findings against the methodology demonstrated for Bulgaria. Different scenarios, different models (e.g. Slovenia, climate info from 2007 reference. Of course this past work is of great importance for Activity 5.2 of CEE IDMP (for example the correspondence of Vorobjov climate classification used in Ukraine and the Holdridge model), but it would be good to indicate what and how it will be used in the current effort.

Going back to the first 15 pages concerned with methodology, the following three-step procedure is proposed in page 4: (1) Establishment of recent climate dataset, (2) Development of climate change scenarios, and (3) Assessment of vulnerability zones of forest ecosystems under climate change by applying the De Martonne index as well as the Holdridge classification. In Step (1) observed data should be used, but in case they are not available the WorldClim dataset can be used. In step (2) it is recommended to use the HadGEM2-AO (HD) climate scenario for 2050 and 2070 by applying 4 greenhouse gas concentration trajectories (What is the justification? We believe that it is proven that a multi-GCM, multi-impact, multi-emission scenario is needed with clear expert judgement of climatologists and in this case forest scientists to choose the right ensemble members), and for step (3) both the two above mentioned drought indices are used and the possibility of applying some other indices, better known in other countries than Bulgaria, is mentioned. The examples given for Bulgaria are sufficient for similar application of the three-step procedure in other countries. Some small differences comparing to the most recent activity list are noticed, but this is a minor issue. The main problem is, however, that the approach proposed is applicable to investigate the impact of climate change on forests, but we wonder if this also holds for the impact of future droughts on forests.

It should be added that Milestone 2 work on “Methodology for assessment, etc. …” was discussed at the **workshop** held within Activity 6.2 capacity building trainings, held in Ljubljana on November 14-15, 2013. The information available to the PRG includes workshop agenda, attendance list and workshop minutes. The minutes indicate all project partners introduced themselves at the meeting and discussed the project, including the project methodology. Deadline for submission of work to be done by the national groups for Milestone 2 summary report was agreed upon (16 December 2013).

Act. 5.3 Natural small water retention measures

The “small retention” belongs to the adaptive measures serving extreme water situations, specifically retaining water in the catchment from wet periods for its use during subsequent dry periods and slowing down water outflow during floods. The principle is save water during wet periods to be used in the following droughts. But what about the situation that the drought does not come and a wet period follows. Damage by excess water. How to manage?

Main objective of project 5.3 is development of Guidelines to address the value of natural small water retention as well as cooperation with the stakeholders (especially farmers) to show it not only as a new approach to drought adaptation and management but also as an opportunity for rural development, nature restoration, recreation, and enrichment of habitat.

The project led by Prof. Tomasz Okruszko from GWP Poland and the Warsaw University of Life Sciences is implemented by specialized units of the universities and research institutes from Hungary, Poland, Slovakia and Slovenia. Following the activity list, in the reporting period work corresponding to the first two milestones have been accomplished: **Milestone 1** – Reports on countries – practical and legal experiences, and **Milestone 2** – Workshop in Warsaw.

Based on the template (excel file – is the XLS file a report?) for gathering experience from all participating countries, the **Milestone 1** reports included information on land use, climatic conditions, water balance, hydrology,

annual water demand, water retention methods, legal and financial issues, evaluation of development of small water retention, answering also the question how is it possible to incorporate the natural landscape retention in the RBMPs, FPMPs and DMPs. Unfortunately part of the information is in the local language.

A kick-off workshop held in Warsaw on 28-29 October 2013 **(Milestone 2)** gathered representatives of all participating countries and after presentation of the project by the Activity Leader, the tables of national data were presented. There was a good discussion after each presentation concerning basic terms, definitions and the overall concept of the Guidelines. The presence of the Programme Manager was very useful to clarify many questions raised by the workshop participants. On the second day of the workshop a presentation was made by Dr Ignacy Kardel from GWP Poland on the GIS based tool for small retention planning (the requested GIS methodology was presented at the meeting, but it cannot be found in material submitted – its deadline was November 2013). Moreover, several case studies and demonstration projects for natural small retention measures were proposed. The first chapters of the Guidelines are being drafted to be presented as a next milestone by the end of April 2014. A group meeting will be organized during the 2nd IDMP workshop in Ljubljana.

The additional remarks concerning the material submitted are the following: (1) The Slovak data are missing; (2) Probably not valid data: M46, Slovenia, 59 floods per year?; (3) Not all information translated into English; (4) Where are the Hungarian Annexes (7.1, 7.2, etc.); (5) Hungary has more than 2 Mha forest already; (6) The XLS file needs a review.

Act. 5.4 Drought risk management scheme: a decision support system

Following the activity list, "this demonstration project aims at developing a framework for integrated drought risk mapping that can be adjusted to a given drought context and provide application for particular scope". The proposed framework is generic in nature. The framework is oriented to look for methods and measures that constitute a comprehensive, multipurpose and flexible approach that can be detailed and addressed for specific regional purposes. Drought contexts will be provided by three project partners from Lithuania, Poland and Romania. They will be concerned with drought risk mapping for the needs of early warning systems (Polish partner), agricultural drought risk mapping in order to evaluate economic profitability under different management practices (Romanian partner), and mapping risk of water scarcity in the context of integrated water resources management (Lithuanian partner)[6].

The project led by Dr Tamara Tokarczyk from the Institute of Meteorology and Water Management , National Research Institute in Warsaw, Poland is implemented by specialized units of the universities and research institutes from the three countries mentioned above (see activity list). During the reporting period the following work corresponding to the three milestones have been accomplished: **Milestone 1 (Task 1.1)** – Identification of the national measures for drought susceptibility (drought hazard)[7] assessment, and **Milestone 2 (Task 1.2)** - Identification of the national measures for drought vulnerability assessment (these two milestones together correspond to Output 1 of the project); and **Milestone 3 (Task 3.1)** – Drought risk management scheme for the Odra River (this is the first milestone corresponding to Output 3 of the project).

On October 27-29, 2013 a **training meeting** of all project partners was held in Wroclaw, Poland. During the meeting the project overview was presented by the Project Leader. The Romanian partners presented the

[6] We wonder how drought will be included (result of climate variability). Water scarcity is a situation created by people that use more water than it is available.

[7] In the Activity List „susceptibility" and „drought hazard" are used as the same term. We would advise the project to use the term "hazard" – the term "susceptibility" is not correct according to common definitions. To avoid any misunderstanding, the Authors should provide definitions of the terms used. The usual definition of risk is: RISK = HAZARD x VULNERABILITY, where HAZARD is expected frequency of occurrence of drought (natural hazard) of different intensity (deficit volume/duration) and type in a specific area caused by climate variability, VULNERABILIY are exposure losses like crops, people, assets, ecosystem service etc. should a drought event of a specific type and severity occur in the hazard area.

proposed structure and contents of the reports for milestones 1.1 and 1.2, while Polish partners presented work done for milestone 3.1 Drought Risk Management Scheme for the Odra River[8]. In addition, presentation on agricultural drought hazard assessment in Poland was made. Moreover, invited Activity Leader for activities 1.2, 2.1 and 2.2 informed participants on the progress of the related work on drought management planning. The meeting helped the Activity 5.4 partners to develop better understanding of their joint task, and to agree on the final work plan.

Following brief introduction *(Section 1)*, **Milestone 1 (Task 1.1)** report "Identification of the national measures for drought susceptibility (drought hazard)[9] assessment"), begins with an overview of climatic conditions in each of the three participating countries in the context of drought *(Section 2)*. It's a pity that very little references are made to the wealth of literature on the drought hazard (Monacelli (2009) is just a report). The next section of the report *(Section 3)* on drought monitoring and early warning systems illustrates another challenge for this activity. There is 1 page long description of such systems from Lithuania (where there are no permanent drought monitoring and early warning systems), 18 pages – from Poland (there are several national, regional, and local systems), and 2 pages from Romania (there is the National Meteorological Administration (NMA) with 7 Regional Meteorological Centers and Agrometeorological Service of NMA monitoring daily agro-meteorological parameters). The differences are not surprising because natural environmental conditions of those countries are not the same and their area is different. At this moment the PRG can only suggest, that the project participants should enter a discussion led by the Activity Leader how to treat the issue of drought monitoring and early warning systems in specific countries in the next stages of the project in a consistent way that considers that the conditions and demands are different. If similar observation are made by the PRG further in this review, they will be marked by "**discussion is needed**"[10].

Next *Section 4* is concerned with measures for the "assessment of susceptibility to drought" what is a very confusing description for the drought community. It would be better to call them simply "drought indicators" (see footnote 2). Drought indicators used in each of the three participating countries are presented in *Section 4.1.* All together 24 indicators are indicated (1 + 10 in Lithuania, 7 in Poland, and 7 Romania), with only one being used in all countries - SPI (Standardized Precipitation Index), and two indices being used in two countries EDI (Effective Drought Index) and PDSI (Palmer Drought Severity Index). Strictly spoken, these are no all drought indicators. Some of them are water balance components with a link to dry conditions.

Final selection of drought indices for the Programme (whole CEE IDMP?, which we support) should be discussed and agreed with other activities, especially 1.3, 5.4, 5.5 and 5.6. Clearly, a suite of drought indicators addressing different drought types (meteorological, soil moisture, hydrological) and different sectors (e.g. agriculture, navigation, ecosystem service). Some of these will have an awareness nature, others a more operational nature. However, the suite should be kept as small as possible and good justification is required. Next *Section 4.2* is concerned with drought monitoring and assessment using remote sensing and GIS methods. This is an interesting overview of the state-of-the-art in remote sensing for drought monitoring and assessment, but again it should be discussed across the CEE IDMP activities interested in remote sensing (5.5, 5.6) and drought platform (1.3). *Section 4.3* provides general description of the agro-climatic ROIMPEL simulation model as an instrument for drought assessment, but some comments should be made on the possibilities and the purpose of model application in the context of the 5.4 project (this is an impact model which should be not under natural hazard, but rather in the Milestone 2 report). The last *Section 5* of this Milestone 1 summary report is concerned with end-users and dissemination products. The section provides information on each of the three participating countries, mostly concerned with internal (within the country) information needs of various social and economic sectors and activities affected by droughts. Concerning dissemination of the project products, more attention should be given

[8] The group has to be a bit more careful when using definitions. For instance, the FDC (Flow Duration Curve) is not a drought indicator.
[9] Shouldn't be „drought intensity" instead of "drought susceptibility (drought hazard)"?
[10] These discussions among activity leaders could be initiated via e-mails and Skype right now and be finalized during the next CEE IDMP workshop to be held in April 2014, in Ljubljana.

to the needs of research community and regional end-users. Again this section should be commented upon by the leader of Activity 1.3 – Drought Platform[11].

Additional comments to Milestone 1 (Task 1.1) are the following:

(1) In terms of drought vulnerability the most important things in drought monitoring are: approximate time of the onset of the drought, predictability of its severity and duration as well as identification of the approximate end time of the drought.' I do not agree. What is predictability here? Where is the effect of the drought measured? (p. 4, Introduction, para 4.)
(2) In general droughts in Lithuania are highly irregular for various scales: decadal, interannual and intraseasonal. So they differ from their counterparts in Mediterranean and Central European regions.' What is the difference exactly? (p.5, para 2.)
(3) The climate data are not consistent: for example. Poland in 5.2 and 5.4.
(4) What is atmospheric drought? If it is the relative humidity defined event, then the statement about the duration of the atmospheric drought is not valid, probably. (p. 10, last para)
(5) Missing comparison of different indices. The use of the individual indices is not enough, complex approach is requested (like the Drought Monitor in US).
(6) Scientifically, probability and empirical distribution are different, but mixed in the reports.
(7) Early warning system is not equal with the forecast. I prefer the ISDR EWS description, where the forecast is only one column from the 4 other ones.
(8) Problem with the water balance: if you calculate it as the difference between the precipitation and evapotranspiration, then it is inhomogeneous in time, therefore, its use on long term time series is questionable. Precipitation intensity is increasing, therefore, the runoff ratio is changing and the time series are not homogeneous. Individual use of water balance is not suggested for long-term series.
(9) Groundwater drought: the values are not clear: the measuring method should be given (the distance is altitude <above sea level> or from the surface, they have different directions) (on p. 31, the groundwater drought index)

Milestone 2 (Task 1.2) summary report on "Identification of the national measures for drought vulnerability assessment", begins with an overview of the Water Framework Directive, the 2013 Blueprint to Safeguard Europe's Water Resources as well as two EC and WMO Guidelines on drought management planning. That information is not directly related to the subject of Milestone 2 (there is more targeted and easily available background literature on vulnerability – e.g. IPCC SREX, 2012, which gives a good overview). *Section 2* of the report is on identification of national sectors vulnerable to drought. It is a pity that not the same template/format is used. Poland provides much more details than the other two countries. More guidance at the start would have been helpful.

In a short discussion (no quantitative data), the Lithuanian partner is describing the following problems: water supply in rural area (including water quality), flow reduction in small rivers, increased contamination of surface waters, deterioration of biodiversity, loss of hydropower production, loss of productivity and quality of timber, increase probability of forest and peat bog fires, fall in crop productivity. The cost of drought impacts in 2006 (the last intensive drought event) was 200 million Euro. This is the only and very general information given on drought losses in Lithuania – it might be useful for the first step of DSS only. Next step is loss functions, dose-effect relations per sector, etc. Polish partner provides several data on main water users and water withdrawals in the country. Based on the past records, the agriculture and forestry are the sectors most vulnerable to drought losses. In Romania, the agricultural sector (about 5.9 million ha) is most vulnerable to drought losses – in 2012 (severe drought) yield declines were: corn – 46%, wheat – 18%, barley – 23%, Rape – 80%, etc. The Ministry of Agriculture and Rural Development has developed a drought and climate change adaptation strategy, providing among others for rehabilitation of irrigation infrastructure in about 820 thousands ha and developing new irrigation systems in

[11] See our general comment made earlier on a iterative drought management strategy. This will also bring end-user and scientific needs together.

about 425 thousand ha. The next *Section 3* is concerned with inventory of methodology to characterize drought impact and vulnerability assessment. A brief comment by Lithuania informs, that the only nationwide methodology of drought vulnerability assessment is the one used by German company Vereinigte Hagel. In Poland, vulnerability of agriculture to drought is understood as "the degree to which agricultural systems (crops) are likely to experience harm due to drought stress". There are two factors used for the assessment of agricultural vulnerability to drought: (1) the agroclimatological crop/water factor, and (2) the soil factor. Moreover, taking into account diversity of climate and agro-climatic conditions, the country is divided into five regions. The methodology of computing these factors is well explained and examples of the resulting maps are given. The Romanian part of the Section is quite interesting but it has not much in common with the Section title (Inventory of methodology …). The section does only partly covers the aim, i.e. identifying vulnerability assessment methodologies (except Poland). It is a lot about impacted sectors. A lot of bias to the agricultural sector (Romania also attention for tourism and health). The Polish system deals with the agricultural sector and is rather physically oriented (physical vulnerability) rather than socio-economic.

The final *Section 4* on "Stakeholders on national, regional and local levels and their needs for information on drought risk", for Lithuania provides information already given in Section 5 of the Milestone 1 summary report (page 93, table 25). The Polish part of the section provides a good table with a list of stakeholders (sectors) with their drought information needs at the national, regional and local levels. In Romania, the main stakeholders are similar to those pointed out by two other partner countries. There is a good table listing what actions are needed to inform them better about drought risk and its consequences. We would expect a 1:1 relation between impacted sectors represented by stakeholders that are mentioned in this section and Section 2, but these do not fully correspond. For example in Romania the following impacted sectors are mentioned: water resources, agriculture, environment, forestry, biodiversity, energy, transport, etc). These are not fully covered in Section 2.

The **Milestone 3 (Task 3.1)** summary report is concerned with the "Drought risk management scheme for the Odra River" (Output 3.1). Based on the Activity List for Project 5.4 (Part I), this case study was to be especially concerned with the "drought risk mapping framework adjustable for various drought risk context… different drought context will include hydrometeorological drought risk mapping for the need of drought early warning (Polish Partner)".

While describing this case study, it is useful to remind us the preliminary plans for two other case studies mentioned in the Activity List for Project 5.4 (Part I), namely "agricultural drought risk mapping in order to evaluate economic profitability under various management practice (Romanian Partner)"and "mapping hazard of water scarcity for water management (Lithuanian Partner)". The case studies should be consistent and work towards generic recommendations for an operational support system in drought risk management (aim of Output 3). It would be good to discuss them at the Ljubljana workshop to be held in April 2014.

Referring to the activity list of project 5.4, it should be noted that since now there is only one final Output 3 foreseen. This Output is covered by three milestones 2.1, 2.2, and 3.2 concerned respectively with *drought hazard mapping*, *drought vulnerability assessment* and final *recommendations for operational support system in drought risk management.*

The milestone 3 summary report consists of four sections: Introduction, (1) Objectives for drought risk management, (2) Current status of drought risk management in Odra River *(rather in the region of Middle and Upper Odra River Basin)*, and (3) Recommendation on development of drought risk management in the Odra River. They are here briefly discussed and commented upon.

The *Introduction* provides some information on the Polish Water Act of Law. Moreover, there is an important information that two regional water authorities covering the whole Odra River Basin have just drawn up two projects (drafts) of drought management plans summarizing all needed information to create the proper act of law. These documents are concerned with meteorological and agricultural drought assessment, drought in ecosystems, hydrological drought and groundwater drought (see Section 2.4). The *Section 1* describes main elements of a drought management scheme for operational applications (monitoring, drought indicators ad triggers, etc.). *Section*

2 begins with a brief description of the study area and organizational framework for water management in Poland. The section continues with information about drought management related provisions of the Polish Water Act. Both for surface and groundwater, three classes of drought risk are described only qualitatively as: I. The regions with requirements of strong drought mitigation action, II. The regions with requirements of basic drought mitigation actions or preventive measures, and III. The regions without requirements of drought mitigation action. Concerning drought monitoring and prediction (2.5), the "POSUCH@" System (Operational System for Providing Drought Prediction and Characteristics) operated by the Polish State HydroMet Service (Institute of Meteorology and Water Management) since 2011 is presented. The system provides prediction of meteorological and hydrological drought hazard for 3-days (short-term) and 3-months (long-term). Information is also given on groundwater monitoring and prediction system of the Geological Institute and a nationwide monitoring system for agricultural drought. In addition, the Institute of Technology and Life Sciences provides information on the areas where there is a risk of agricultural drought occurrence – this information is used by the state insurance system for determination of compensation for losses caused by drought events. *Section 3* provides recommendations on development of drought risk management in the Odra River. There is a proposal here to improve drought governance by organizing drought management groups at the national, regional and local levels. The Section closes with some comments on the development of decision-support models to be used for dissemination of drought-related information to end users. Moreover, recommendations are made for improvement of the drought monitoring and building a drought early warning system. Similar recommendations are made for improvement of the drought vulnerability assessment by developing the tools for mapping and assessing the impact of drought.

The concept of the Drought Risk Management Scheme for Odra River is no doubts attractive and should be of interest to other partners in the Activity 5.4 as a step towards the development of iterative drought management strategies for both operational purposes and more long-term drought management planning, including identifying robust measures. A more detailed evaluation of the whole Milestone 3 summary report depends on its further use within the framework of this Activity.

There are the following additional remarks to Milestone 3 (Task .1):

(1) What is Qnn? (p. 15 <10>, formula)
(2) How can you calculate from SPI climatological vulnerability? From SRI streamflow vulnerability? (Fig 3.)

Act. 5.4 really is an ambitious activity. It is supposed to integrate the outcome of a number of the other activities, or it should put these in context (e.g. Act. 1.3 information system, Act. 5.1 soils, Act. 5.2 forest, Act. 5.3 small retention). Although participants were already very active (3 Milestone reports), we miss a more thorough treatment of approaches for of drought risk management strategies, where DSS plays a crucial role (Milestone 3 Report points at such an approach, pg. 5). Actually, it should go along the lines of an iterative risk management strategy approach (e.g. IPCC SREX, 2012). It is a loop that start with: (i) monitoring the drought hazard, i.e. the appropriate set of drought indicators for the area considering the environmental conditions and the possibly impacted sectors (ground measurements and RS) (partly covered in Milestone report 1, without a link to Act. 1.3), followed by:(ii) forecasting of the hazard (probabilistic; week, month, season), (iii) assessment of all kind of current impacts and forecasted impacts (probabilistic) (partly covered, bit spread over Milestone reports 1 and 2), and (iv) identification of impacted sectors (vulnerability, partly addressed in Milestone 2, Chapter 2), and identification of potential measures to reduce impacts (here DSS, stakeholder dialogue, hydrological modeling, impact modeling, e.g. crop yields, are key elements). In a pro-active mode, steps iii and iv are repeated several times (iteration until acceptable solution is achieved). The pro-active mode can be applied to an ongoing drought, which implies that a Drought Committee (water managers, policy makers, stakeholders) meet regularly (say every week after they have received the monitoring products. The pro-active mode certainly should be applied to be better prepared for future drought that considers global change, i.e. to identify robust measures (win-win, no-regret, preferably low cost). Then step (i) does not exist and step (ii) forecasting is replaced by prediction projections). This could also bring end-user and scientific communities needs together.

Act. 5.5 Policy oriented study on remote sensing agricultural drought monitoring methods

The project led by Prof. Janos Tamar from the University of Debrecen (Hungary) is implemented by specialized units of the Hungary, Slovakia and Romania. In the reporting period the work on Output 1 "Green and brown water resources on watersheds" (Output/Milestone 1) was completed by the University of Debrecen with contribution of GWP Hungary, the Institute of Hydrology of the Slovak Academy of Sciences, and the University of Oradea (Romania). There are two questions concerning the Activity list: (1) What does it mean: "to predict area-specific yield forecasts?" (2) The name and type of output 3 are inconsistent. We also suggest to use in the report the same titles which are used in the Activity list.

The problem area to be attacked by Activity 5.5 is well and clearly stated in the Activity List, although the "policy orientation" stressed in the project title should be better explained. The primary purpose of the project is to monitor agricultural drought through remote sensing (RS), which is crucial for operational drought management. The main end-users will be stakeholders (primarily agriculture) and water managers. Clearly at the national level there will be interest in the development of a drought and possibly relief actions, but we do not understand how it could lead to short-term policy design.

With good reasons, agricultural drought is more burdened by uncertainty than meteorological and hydrological droughts, because it already includes impacts. A study on agricultural drought is indeed more complex than the investigation of meteorological drought or hydrological drought, because the latter two are more easily to obtain from measurements. However, we should not compare these, because agricultural drought already includes impacts (the impact of soil water drought on crop yields, farmer's income, etc.). Hydrological drought is as complex as agricultural drought if we would analyze the water resources drought, which is associated with below normal river flow and groundwater storage (hydrological drought).

The agricultural drought is influenced by many factors difficult to measure. To mention just a few these are soil water content, stoma resistance, temperature shock and hydraulic conductivity, which all together make forecasting of the forthcoming yield loss, as well as crop degradation due to drought, very difficult. The Activity 5.5 focuses on identification of agricultural drought characteristics and development of a monitoring method, which could result in early warning of drought before irreversible yield loss and/or crop quality degradation occur. The main objective of this demonstration project is to formulate such monitoring method (with application of remote sensing data) to identify intervention levels calibrated for important crops and fruits (wheat, corn and apple), which are representative for the study area (Tisza Basin, Hungary).

The very clear three-step structure of the project is the following: First, green[12] and brown[13] water resources are analyzed in the examined watershed (in all three countries) in order to gather information on water utilization at a site (Output/Milestone 1). These data are necessary for calibration and validation of remote sensing data, which is the second step (Output/Milestone 2). The third step is based on the results of steps 1 and 2 in order to develop drought indicators and integrate them to drought monitoring system (Output/Milestone 3). It would be interesing to know how this output will be linked with Act. 5.4 and Act. 1.3. There might also be a link with Act. 5.1 (role of the soil).

Moreover, in the reporting period the project organized the first capacity building "Training for trainers" meeting under project 5.5 (November 21-23, 2013, University of Szent Istvan, Faculty of Economy, Agricultural and Health Sciences, Szarvas, Hungary). This training was organized for trainers, stakeholders and farmers in order to raise the

[12] Green water means the water content, demand and water consumption, evapotranspiration properties of the cultivated plants.
[13] Brown water refers to water content of soil at different soil layers with different water management properties based on different water holding capacity of soils in certain watersheds.

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awareness of the importance of drought situation, strategy and management. Among others, the drought situation in all three participating countries was discussed focusing especially on three project case sites: the Tisza River Basin, Romanian Korosok (Crisurilor) plain and Eastern Slovakian Plain. The main subject discussed at the meeting was the application of remote sensing methods for agricultural drought monitoring. More details are available in the report of the meeting. The minutes would have been more complete when the agenda and the list of participants (incl. organization, country) was included.

Milestone 1/Output 1 summary report (Green and brown water resources on watersheds). The report begins with presentation of the project structure (Section 1), focusing next on the contents of Output 1. The purpose of this output is to provide information how agricultural practice, crop rotation and land use affect the brown and green water status, which is the basis of converting remote sensing data to water management data system. Pity, very little references to literature on drought hazard monitoring using RS. Descriptions of brown and green water are also provided without any reference. Next (Section 2), there is fairly complete characterization of the three project case study sites in Hungary, Romania and Slovakia (Tisza River basin?). The methodology to estimate the amounts of available brown water resources (Section 3) is based on soil maps. The availability and contents of soil maps in Hungary and Romania are discussed (the Slovak situation in that respect is not commented upon). A more comprehensive analysis is presented for the green water content (Section 4), with maps for Hungary. The development of remote sensing techniques and new generation of satellite airborne scenarios provide advanced tools for analyzing the biomass productivity in different time and space (the use of Moderate Resolution Imaging Spectroradiometer – MODIS data, as a base for evaluation of Normalized Difference Vegetation Index – NDVI). In the project currently discussed , the ArcGIS 10.2 software was used to create models for the data processing of NDVI images. Following discussion of data integration and processing, Section 4 closes with a description of water content and consumption of the concerned cultivated plants (wheat, corn and apple). In summary, the report is appreciated highly as an excellent beginning of the project which takes advantage of the modern drought monitoring technologies (remote sensing), being at the same time of great practical value. The report still lacks conclusions and recommendations, but we expect that these will be provided when the outcome of this part of the study will be used for Output 2 / Milestone 2 (signaling and intervention levels of drought based on remote sensing datasets).

There are 6 specific comments made with reference to the report:

1. The average annual daily temperature is 100 C; Clear mistyping. But why daily temperature is mentioned?
2. For example, looking at figures from Debrecen, the minimum and maximum annual precipitations between years 1900 and 1950 were 342 mm and 874 mm, respectively.' We are in 2014, therefore, it is suggested not to use 100 years old data for characterization the actual situation.
3. The yield gains produced by irrigation were statistically significant every year.' Too strong statement. Hardly believe it for the very wet 2010.
4. Information have to be mentioned with references only (for example figures 4 and 5).
5. NDVI has Agricultural drought means critical decrease in water content of plants, therefore the identification of this critical water loss is essential.' It is for the soil water content, otherways the atmospheric drought would be included also (very low relative humidity).
6. In Hungary information is given with reference to biomass and not to the water content. How was it calculated? (for example fig 4 of the report)

Act. 5.6 Upgrading agricultural drought monitoring and forecasting: the case of Ukraine and Moldova

Ukraine is one of the main producers of grain on the world market (US, Canada, UE27, Australia, Russia, Kazakhstan, Ukraine and Argentina). These countries account for about 50% of the world wheat production and 80% of world wheat export. Annual crop losses due to adverse weather conditions in Ukraine, mostly droughts, are in the range of 200 to 1500 million Euro. Any proposal for upgrading agricultural drought monitoring and forecasting in the country must be preceded by the review of climate zoning and mapping drought risk areas in Ukraine and the joint Moldova-Ukraine Dniester River Basin (the former agro-climatic based on the meteorological observations for the period 1956-1985 is obsolete an cannot be used any longer). In addition, trends in changes of soil water holding capacities as a function of erosion, agricultural crops and slope inclinations must be studied. The Activity List provides also for development of forecasting models for identification of crop yield losses caused by droughts. All possible remedial measures for the agricultural sector to adapt to negative drought effects will be studied. Another important project purpose is raising drought-related awareness of stakeholders and policy makers in water management and agriculture areas.

The project is led by Ms. Tatiana Adamenko from HydroMetCenter of Ukraine and Dr. Ecaterina Kuharuk from the Soil Research Institute of Moldova. The contributing organizations from Ukraine are HydroMetCenter, the State Agency of Water Resources and GWP Ukraine. From Moldova, the contributing organizations are the Soil Research Institute and GWP Moldova. The work program consists of five outputs, nine steps and five milestones, however they are all mixed in the Activity list. For example: milestone 1 equals step 1, which equals output 1 and 2, but the output 1 is about 1,5 pages in the report with the title 'Existing zoning of Ukraine and Moldova territories: basic approach, description of zones and actual agro-zoning maps', but no words about Moldova, and the drought mapping is fully missing (should be output 2).

In the reporting period work on **Milesone 1 (Step 1)** - "Data Collection and Analysis. Identification of the Climate Change trends (evidences) based on observation data (136 stations of UKR HydroMet and 7 stations in Moldova HydroMet network) and **Milestone 2 (Step 2) –** "Analyses of the trends on water holding capacities of soils under climate change based on long term (1961-2010 period) observations at meteorological stations of Ukraine and Moldova". (Note: according to the Activity List, Milestone 2 includes also Step 3).

Milestone 1 (step 1) report – Data Collection and Analysis. Identification of the Climate Change trends (evidences) based on observation data (136 stations of UKR HydroMet and 7 stations in Moldova HydroMet network).
The report begins with Section 1 providing some background information on the agricultural sector and droughts in Ukraine and in the Dniester River Basin. There is a question here about Table 1: consumption + export is larger than the production – is there any import? In the following Section 2, there are brief comments on climatic peculiarities of the Ukrainian territory and general information on existing agroclimatic zoning of Ukraine and Moldova. That section includes brief information on the organization of the present drought monitoring system in Ukraine, providing a map (Fig. 1) of existing agro-climatic zoning of the country (3 zones) established on the basis of Selyaninov's hydrothermal coefficient (input: precipitation is above a theshold, and temperature above threshold) and meteorological data for the period 1956-1985. Concerning the map presented in Fig. 1, there is a question about South-Crimea and the Carpathians – where do they belong to? The 4th zone? Section 3 provides information on the past trends in air temperature and precipitation (distribution in space and time) in the Ukraine and the Dniester River Basin, which is transboundary river (Ukraine and Moldavia), which fully confirm that the existing agro-zoning is out of date. There is no word, however, about data quality. It is not clear, why Fig. 2 is since 1901, but Fig. 3 since 1961 only. Why? The changes in distribution of precipitation within the year are shown in Fig. 6 (why only a 20 years long period was taken?). In the text it is mentioned that they are significant, but the level of significance is missing – it is suggested to be calculated. Again in the text concerning changes of precipitation (Fig. 6, page 11), it is written that these changes are "especially visible in the winter months, when the monthly precipitation (January, February) decreased on one-fifth. The summer amount of precipitation has increased at the average on 5-15%. However, on Fig. 6): January precipitation decreased by about 12 %, February increased slightly,

the summer months are slightly decreased, but September increased by 10% and October by 20 % (they are not mentioned).
Separate data on climatic trends (air temperature and precipitation) are given for Ukrainian parts of the Dniester River Basin. The remaining part of the report (Section 4 - about 2/3 of the report content) is on trends in the climate change patterns in the Republic of Moldova, and similar data on air temperature and precipitation are presented.
Conclusions presented in Section 5 of the report confirm that there is a tendency for the increasing of the annual temperatures in the region, especially during the summer period. Temperature increase has accelerated in the last 15 years and extreme temperature events were recorded every 2 years during this period. Total precipitation remained at practically the same level, but a number of extreme events has increased in the last 15 years. It can be associated with higher temperatures, especially during the summer period in the physic-geographical conditions of the territory. Trends in temperature and precipitation seem to have been determined without following the usually applied statistical methods and attribution studies that distinguish between different causes for change. Adaptation measures should aim at conservation of soil moisture and development of green carcasses. Climate change has accelerated significantly for the last 15 years and led to the decrease of total precipitation in the lower parts of the Prut and Dniester rivers. Based on these conclusions it can stated, that the work reported in the summary report of Milestone 1 has confirmed the need of modification of the past agro-climatic zoning of the region. However what should be noted that modification remains an open issue for the time being. By the way, also common drought types should be used across the report and phrases like “atmospheric and soil droughts of various intensity (spring-summer, summer, autumn) should not be used.

Milestone 2 (step 2) report - “Analyses of the trends on water holding capacities of soils under climate change based on long term (1961-2010 period) observations at meteorological stations of Ukraine and Moldova” (Note: the report contents is different than the table of contents (8 sections) given in the title page).
The report begins with the *Introduction* divided into two sections on Ukraine and Moldova. Concerning the Ukraine, the report provides some general information on droughts occurring in the country; moreover, it stresses the extremely limited soil data. On Moldova, it is only pointed out that rational use of the soil moisture is the main factor for maintenance of the productivity of agricultural lands, but main target for soil research is soil erosion. Next section is on *Methodology and subjects of research, criteria of droughts.* Concerning Ukraine, definition of drought, criteria for soil drought intensity and map of probability of droughts in different parts of the country are given. The activity should search contact with other activities to come up with a consistent drought characterization, including indices. As far as the soil moisture is concerned, location of 9 observation points in the Dniester Basin are indicated and average moisture content is presented on the basis of Annual Report of the Soil Research Institute of Moldova. Next and the last section of the report is on *Results of analysis of climate-related soil water moisture changes in Ukraine based on long-term observations of the meteorological stations. Results of analysis of the soil moisture in Ukraine and Moldova.* In the beginning, for 9 meteorological stations mentioned above, soil moisture data (in mm) average for five consecutive decades (10 years long periods) are given for different depth soil layers (0-20 cm, 0-100 cm) for two selected days. All further data are of a similar character and they provide a general picture how soil moisture at different depths changes in the vegetation seasons (or months) from year to year. In conclusions concerning Ukraine, it is stated that notwithstanding that some GCMs forecast summer soil drying, a weak trend to increased soil moisture in 1-metre soil layer was observed. Besides that, the study results do not confirm conclusions on growing aridity made on the basis of Palmer indices. But in spite of the fact that observation data for 50 years do not suggest a trend to a substantial decrease of soil moisture levels, the authors acknowledge that drought-related damages in Ukraine end to increase gradually. In principle similar conclusions are drawn concerning the soil moisture changes in Moldova, although uncertainty of the analyses carried out is underlined. Evaluation of the study results is difficult without having access to original data, but generally a study of soil moisture based on the monthly, seasonal, or even 10-years average values raises serious doubts.
Additional remarks concerning **Milestone 2 (step 2) report** are:

- The relative soil moisture content would be a better indicator than the absolute values (it depends strongly on the soil types);

- The length of the soil moisture time series is not known;
- Fig 1 shows not the probability, but the empirical occurrence;
- There is only summer drought in Moldova? (temperature should be higher than 25°C);
- Fig 2.1.1 (without figure's title and numbering): the input data are not known;
- Significance tests are missing also in Milestone 2 report.

Work Package 6 – Capacity Development

Act. 6.1 Workshops

The 1st IDMP CEE workshop was held on 15-16 October, 203, Hodrusa Hamre, Slovakia. Please find more about the workshop in the following links: Article on First IDMP CEE Workshop on GWP CEE webpage. Preparations for the 2nd Workshop to be held on 8-9 April, 2014 in Ljubljana have started.

Act. 6.2 Capacity building trainings

In November and December 2013 four capacity building trainings and/or workshops within demonstration projects (WP5) were organized. More about each training/workshop can be found under the review of demonstration projects: 5.1, 5.2, 5.4 and 5.5.

Work Package 7 – Knowledge and awareness

Act. 7.1 Good practice compendium

Only some discussions about contributions the Good Practice Compendium were held during the capacity building trainings.

Act. 7.2 Rising awareness

On 26-28 November 2013 Regional Secretariat staff and Programme Manager met at the 1st coordination meeting in Graz, Austria. The main focus as on preparation of different promotional materials and actions:

- 1st IDMP CEE informational leaflet was prepared and will be published early 2014
- Structure of the special web page within GWP CEE web page was prepared. Web page will officially go online in February 2014
- Other promotional activities which will take place in 2014 are promotional video, small video/interviews of the demonstration projects, workshop for journalists, photo competition, etc.

Communication officer will prepare "IDMP CEE Communication Strategy" with more detailed plan for all communication activities within IDM CEE.
Thanks to the Programme Manager for these informations.

Work Package 8 – Governance an Fundraising

Act. 8.1 Improving fundraising capacity of CWP and RWP

Contracting to Programme partners was completed as scheduled in 2013. The total of 59 agreements were prepared in 2013 covering Programme until March 2015. IDMP CEE Programme Manager and Regional Secretariat liaised with Country Water Partnerships to coordinate financial reporting of national dialogues, demonstration project workshops and audit in 2013.