SECOND NATIONAL CONSULTATION DIALOUGE
in Bulgaria

1. General Data

Country:	**Bulgaria**
Organizer:	**Association „GWP-Bulgaria“**
Date & Place:	**November 26, 2014, Scientific / Technical House in Sofia city**
Participants: (name & institution & email)	49 participants from ministries, agencies, municipalities, institutes, universities, water supply&sanitation companies, private firms, NGOs, media, water experts in pension
Attachments: (attendance list, photos, etc.)	List of participants, photos, Water Affairs magazine 5/6, 2014

2. Agenda

Objective : Presentation and discussion about the draft of the Guidelines for Drought Management Plans with the aim to contribute to its completion – elaboration of comments to the Guidelines and provide national experience according to the templates in Annexes I – VI

Special objectives:

Contribution to the development of the national drought management plan and proposal for establishment of Drought Committee

Agenda:

9.30 - 10.00 Registration
10.00 – 10.30 Presentation of Integrated Drought Management Programme
10.30 – 11.00 Presentation of the Guidelines for Drought Management Plans
11.00 – 12.00 Discussion on indicators for the historical data assessment and indicators included into drought warning system
12.00 – 12.45 Lunch
12.45 – 13.30 Discussion on organizational structure for drought management and organizational, operational and preventive measures for preventing and mitigating drought. National research program supporting drought management
13.30-14.00 Demonstration projects and 2 movies of IDMP
14.00 – 14.45 Climate change maps for current climate 1951-2000 and 2050/2070 according to IPCC AR5
14.45– 15.30 Climate change impact on forests – determination of vulnerability zones
15.30 – 16.00 Coffee break
16.00 – 17.00 Discussion and closing

Main points of discussion:
draft Guidelines for Drought Management Plans of IDMP, national situation regarding drought risk and strategic documents of adaptation measures, temperature/precipitation scenarios according to IPCC AR5 in 2050 and 2070 and vulnerability zones, possiblity for establishment of Drought Committee, follow-up projects etc.

3. Report (max 3000 characters)

The article „Practical Guidelines for Drought Measures in River Basin Management Plans“ on behalf of GWP CEE and IDMP CEE poster have been published in Water Affairs magazine 5/6, 2014. This is the reason that participants at the 2nd NCD were ready to discuss the topics in Annexes I – VI. The summary of their information, comments and proposals are marked below.
Most of the audience had interest of the practical results of IDMP CEE demonstration projects. The presentation about temperature and precipitation maps of climate change scenarios RCP2.6, RCP4.5, RCP6.0 and RCP8.5 according to IPCC AR5 and forests zones of vulnerability in 2050 and 2070 confirmed that Bulgaria is situated in one of the regions that are vulnerable to droughts (mainly through temperature increase and precipitation decrease of some areas).
Additionally, the movie about small water retention ponds raised big interest and one of the follow-up activities of IDMP CEE is to implement this approach step by step in Bulgaria.

4. Conclusions

Outcome of the public consultation:
The practical results of theIDMP CEE could be implemented locally and first approach is to start with publications and later with pilot projects.

Brief information about actual status of production of DMP:
There is no actual drought management plan separately but adaptataion/mitigation measures against drought are part of several strategic documents (National strategy for water sector, National forestry strategy, River Basin Management Plans, Master plans of water supply&sanitation companies etc.)

*Proposals for further steps focused on elaboration of the national experiences included into Annexes of the Guidelines (comments to the draft of the Guidelines and national experience according to the templates in Annexes I – VI)**:***
The IDMP Guidelines can be useful for RBMPs but participants interest was much more oriented towards pilot drought investigation projects in the field of water saving and conservation, agriculture, forests etc. Bulgarian-Romanian team works on drought guidelines also. The main conclusion was that there are many official documents with measures against drought but its implementation is a problem.
There is a need for establishment of a Drought Committee (DC) as a part of existing Consultative Council with Council of Ministers. DC will be charged with elaboration of comprehensive drought adaptation strategy, covering all vulnerable sectors.

Templates for elaboration of the national experiences included into Annexes of the Guidelines

Annex I: Examples of the national methodologies for assessment of historical drought
STEP 4 (section 3.4.2 of the Guidelines)
Country: Bulgaria
Indicators used for the historical data assessment:

- Drought is a climate extreme that occurs in Bulgaria, with historical records of its effects dating back as far as the Thracian period. Three significant prolonged droughts occurred during the 20th century: from 1902 to 1913, from 1942 to 1953, and from 1982 to 1994 (Figures 1 and 2).
- There has been a tendency towards warming up in Bulgaria since the late 1970s, the winters were milder in the second half of the 20th century.
- 20 of the last 23 years since 1989 have positive anomalies of the average annual air temperature compared to the climate standard (1961–1990).
- The average annual temperature in 2011 was by 0,4°C higher than the climate standard. This is 14th year in a row with temperatures higher than typical temperatures for the country.
- The longest periods of drought occurred in 1940s and during the last two decades of the 20th century, while the most significant droughts - in 1945 and in 2000.
- There are more and longer periods of drought followed by severe storms and heavy floods incurring damage and casualties.
- The annual amplitude between the maximum and the minimum air temperature decreases – the minimum temperature rises faster than the maximum.
- The snowy months in the mountains decrease and the thickness of the snow cover shows a steady trend towards thinning.
- The upper forest limit of deciduous forests shifted to higher elevations.
- Data from the phenological observations indicate advanced development by 7-15 days in different climatic regions, which represents clear evidence of the warming up process over the past 30 years compared to previous periods.

The results from the studies of water resources in Bulgaria, based on current trends of air temperature and precipitation as well as on simulation models and climate scenarios show that the annual river runoff is likely to decrease during this century. The main reasons for this - the observed trends of warming and rainfall deficit - are expected to persist over the coming decades as well. The expected global warming will be accompanied by an increase in the frequency of the hot air waves combined with increased humidity and urban air pollution. The result will probably lead to a large number of heat strokes. Besides the risk of further limitation of water resources, more forest fires, landslides and floods, the global warming means also a possible outbreak of infectious diseases (including diseases, such as malaria, that are not typical for Bulgarian latitudes). Since approximately 61% of forests in Bulgaria are in the zone below 800 m altitude, the majority of Bulgarian forests would be affected by drastic climate changes. Economic losses due to 3010 fires is 1 437 000 BGN (734 726 euro) in 2012.

Short methodology of assessment of long-term series of meteorological data or picture illustrating evaluation of the historical data for the chosen parameters/indicators

Drought in Bulgaria usually is a result of long periods with low precipitation under anticyclone weather conditions. It can occur in any month of the year. The weather conditions during drought are characterized by decreased precipitation, high air temperatures, low humidity, and warm, strong winds. Long-term drought can negatively impact the water balance of plants, causing unstable crop physiological conditions and low crop yields, as well as threaten natural ecosystems and water supplies.

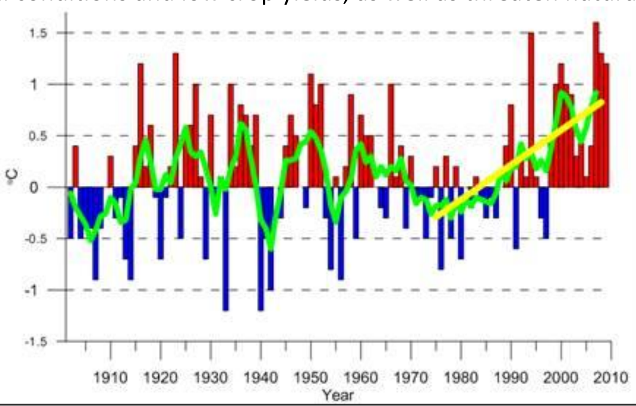

Figure 1. Annomalies of temperatures in the period of 1900-2100 according to current climate 1961-1990

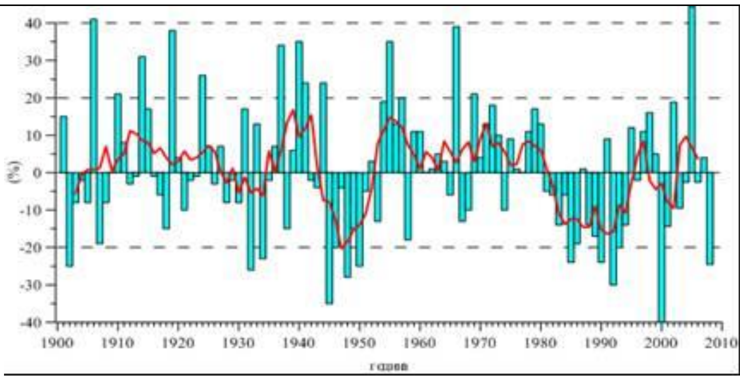

Figure 2. Annomalies of precipitation in the period of 1900-2100 according to current climate 1961-1990

Annex II: Examples of the national drought indicator systems

STEP 4 (section 3.4.3 of the Draft Guidelines)

Country: Bulgaria

Parameter/indicators included or proposed into the national drought indicator system:

Although there are many approaches for drought assessment there is still no uniform approach for evaluation and description of drought. Different indicator sets are applicable regarding management needs, available data information and organization budgets.

Meteorological drought indices

The indices for the drought quantification were conceived for differentiating and deliniating different hydro-climatic regions under the report of the drought periods lenght and its severity. The most frequently used are the diagram type indices or indices calculated on the basis of some meteorological elements or measurable climate.

Aridity index (De Martonne)

Calculation formula and significance: **A =** $\frac{P}{T+10}$ (annual)

0 < A < 5 arid climate; 5 < A < 20 semi – ardid climate; 20 < A < 30 semi – humid climate; 30 < A < 55 humid climate.

The standardized precipitation index (SPI)

Calculation formula and significance: **SPI =** $\frac{Pi - Pm}{Pm} x100 \Big/ s\%$

P_i = current rainfalls in period i; P_m = multiannual average rainfalls in period i; s% = the variation coefficient of the average rainfalls in period i

Some of indicators are appropriate for past and future drought characterization. Some of indicators are appropriate for past and future drought characterization.

No. classes	SPI	Classification
1	≥+2.00	Extremely wet
2	+1.50:+1.99	Very wet
3	+1.00:+1.49	Moderately wet
4	-0.99:+0.99	Normal
5	-1.00:-1.49	Moderate drought
6	-1.50:-1.99	Severe drought
7	≤-2.00	Extreme drought

Agrometeorological drought indexes

The Palfai Index

For the **PAI** calculation there are considered both climatic factors (rainfalls and temperature), and the water share from the phreatic aquifer, to which are applied adequate corrections.

Calculation formula and significance: $P = K_t \times K_p \times K_{gw} \times PAI_0$,

where:

$K_t = \sqrt[6]{\frac{n+1}{n_1+1}}$ = correction applied to temperature values $K_p = \sqrt[4]{\frac{P_{max}}{P_{1\,max}}}$ = correction applied to rainfalls values

$$K_{gw} = \sqrt{\frac{H}{H_1}}$$ = correction applied to the phreatic share values $$PAI_0 = \frac{t_{IV\ \ VIII}}{P_{IV\ \ VIII}} \times 100$$ = PAI uncorrected

- $t_{IV\text{-}VIII}$ – represents the daily average temperature for the interval April – August of every year;
- $P_{IV\text{-}VIII}$- monthly rainfalls quantities for the interval April – August of every year; n – the total number of heat days from the considered interval; n_1 - the average number of heat days from the considered interval and the studied period; P_{max} – the longest period with rainfalls lower or equal to 0.5 mm in the considered interval (no. days);
- P_{max1} – the same parameter in multiannual regime; H – the average depth of the phreatic water in the considered interval (mm); H_1 – the average depth of the phreatic water in the multiannual regime for the considered interval (mm).

According to the index values there are assigned the following ratings according to table below:

Drought type	*PAI*
Moderate drought	6-8
Drought	8-10
Serious drought	10-12
Extremely serious drought	>12

The calculation of the drought indices PAI and PaDI (Palfai)

The data necessary to the ardity drought index (PAI) includes a number of variables of climate monitoring such as:
- daily average temperature;
- the total number of heat days from the considered time interval;
- the average number of heat days from the considered interval and studied period;
- the longest period with rainfalls lower or equal to 0.5 mm in the considered interval and multiannual regime (days).

The calculation of the basis values

The difference between the indices calculation *PAI and PaDI* (Palfai Drought Index) consists in weighting the monthly rainfalls from a hydrological year (October – September) with values of the share factor comprised between 0.1 (Oct. and Sept.) -1.6 (Jul.), so that the sum of the factors is equal to 7.5.

$$PaDI_0 = \frac{\sum_{i=apr}^{aug} T_i \ /5 * 100}{c + \sum_{i=oct}^{sept} (P_i * w_i)}$$

$PaDI_0$ - the basis value of the drought index (^{0}C);

T_i - the monthly average temperature from the interval April – August;

P_i - the monthly average sum of rainfalls from the interval October – September (mm);

w_i - share factor;

c - constant = 10 mm.

The calculation of the correction factors of drought index (k_1, k_2, k_3)

The first factor that substitute the correction of the k_t factor that represents the number of heat days:

$$k_1 = \frac{(T_{iun} + T_{iul} + T_{aug})/3}{(\overline{T}_{iun} + \overline{T}_{iul} + \overline{T}_{aug})/3}$$

k_1 - temperature correction factor;

$T_{iun,iul,aug}$ - the annual average temperature in the period June – August (^{0}C);

$\overline{T}_{iun,iul,aug}$ - the multiannual average temperature in the period June – August (^{0}C)

The second factor substitutes the k_p factor that represents the lenght of the rainfalls lack period:

$$k_2 = \sqrt[4]{\frac{2 * P'^{\min}_{\text{var}a}}{MIN(P_{iun}, P_{iul}, P_{aug}) + P'^{\min}_{\text{var}a}}}$$

$\boldsymbol{k_2}$ - the correction factor of rainfalls,

$\boldsymbol{P'^{min}_{var\,a}}$ - the lowest value of the multiannual rainfall sum from the summer months (June – August) (mm),

$\boldsymbol{MIN(P_{iun}, P_{iul}, P_{aug})}$ - the lowest value of the annual rainfall sum from the summer months (June – August) (mm).

The third correction factor replaces k_{gw} that represents the hydrological conditions, the k_3 calculation considering the monthly rainfalls from the last 36 months:

$$k_3 = \sqrt[n]{\overline{P} / \overline{P}_{36luni}}$$

$\boldsymbol{k_3}$ - the correction factor that characterizes the situation of rainfalls from the former period;

$\boldsymbol{n}$ - exponent with the value of 3.0, for plain areas, respectively 5.0, in the case of relative altitudes in hill areas;

$\overline{P}$ - multiannual average rainfalls from the period October–September

$\overline{P}_{36luni}$ - multiannual average rainfalls during 3 years former to the analysis

The calculation of PaDI index

The final result of this index represents the product between the basis value and the three correction factors previously described:

$$PaDI = PaDI_0 * k_1 * k_2 * k_3$$

The classification of PaDI index is shown in the following table:

PaDI (^{0}C/100 mm)	Classification
<4	droughtless year
4÷6	mild drought
6÷8	moderate drought
8÷10	heavy drought
10÷15	serious drought
15÷30	very serious drought
>30	extreme drought

Hydrological drought indices

The Standardized Flow Index (SFI)

Most of drought indices (PDSI, CMI, SWSI and SPI) are derived from meteorological observations (primarily precipitations and sometimes, temperature). Droughts may also and should, wherever possible, be assessed and monitored using other types of data (e.g. river flow). The Standardised Flow Index (SFI) was a simple and useful tool to research, monitor and manage hydrologic drought in a highly regulated river system.This indicator (*Standardized Flow Index – SFI*) is based on the calculation procedure of the standardized precipitation index SPI, using the monthly mean discharge series, in natural conditions, instead of monthly total quantities of precipitation.

Standardised Groundwater level Index (SGI)

The SGI builds on the Standardised Precipitation Index (SPI) to account for differences in the form and characteristics of groundwater level and precipitation time series. The SGI isestimated using a non-parametric normal scores transform of groundwater level data for each calendar month. These monthly estimates are then merged to form a continuous index. The SGI has been calculated for 14 relatively long, up to 103 yr, groundwater level hydrographs from a variety of aquifers and compared with SPI for the same sites. The relationship between SGI and SPI is site specific and the SPI accumulation period which leads to the strongest correlation between SGI and SPI, qmax, varies between sites. However, there is a consistent positive linear correlation between a measure of the range of significant autocorrelation in the SGI series, mmax, and qmax across all sites. Given this correlation between SGI mmax and SPI qmax, and given that periods of low values of SGI can be shown to coincide with previously independently documented droughts, SGI is taken to be a robust and meaningful index of groundwater drought.

Standardized Runoff Index (SRI)

Standardized Runoff Index (SRI) is a tool appropriate for identification and characterization of hydrological drought concerning streamflow. It is a standardized evaluation of flow allowing accounting and grading its abnormal state. It is common to Standardized Precipitation Index (SPI) and has common ground but in the process of evaluation the streamflow specifics are used for the index calculation. Huge investigation about the possibility for its practical implementation in the EU member countries was conducted in the context of the EU Expert group of Water Scarcity and Drought.

CATEGORIES	SRI Value
Extremely wet	SRI > 1.65
Very wet	1.65 ≥ SRI ≥ 1.28
Moderately wet	1.28 ≥ SRI ≥ 0.84
Near normal	0.84 ≥ SRI ≥ - 0.84
Moderate drought	- 0.84 ≥ SRI ≥ - 1.28
Severe drought	- 1.28 ≥ SRI ≥ - 1.65
Extreme drought	SRI < - 1.65

Water Exploatation Index Plus (WEI+)

Best approach is watershed or river basin scale implementation, accounting most vulnerable so called “hot points” that could be determined by implementation of Water Exploatation Index Plus (**WEI+**) for obtaining of index threshold evaluation of most water scarcity stressed zones included as monitoring points in the monitoring system.

Canadian Fire Weather Index (FWI)

The Canadian Fire Weather Index, FWI, is developed in the Canadian Forest Service Research Center. The input elements for FWI calculation are as follows: precipitaion amount for the last 24 hours; air temperature; air relative humidity; wind speed; snow cover presence; day duration. FWI has three sub-indices showing the "dryness" of different types of "fuel". Each of these sub-indices is a complex function of the meteo-elements. Knowing the sub-indices and wind velocity data, two other sub-indices are calculated, which evaluate the initial fire kindling and the available "fuel" for the further unfolding of the fire. On their basis the FWI in calculated and it gives an overall assessment of the intensity of fire unfolding (in energy released per unit time per unit length along the fire front line).

Methodologies used for evaluation of the chosen parameters/indicators:

NIMH-BAS developed **Automatic Drought Monitoring System with implementation of SRI**, working following principle of operation of extreme weather alert system METEOALARM (www.meteoalarm.eu). The system is developed in monthly basis for spatial drought identification regarding specifics of the country and allows characterization of the event and its severity when it occurs. On diagnostic maps covering main watershed, including the Danube flood plain, at national level there is presented drought sewerity when it is detected to occure, www.hydro.bg

Annex III: Examples of the national drought classification and early warning systems

STEP 4 (section 3.4.4 of the Draft Guidelines)

Country: Bulgaria

Indicators included into drought warning system:

There is a Law for crisis management, published in the State Gazette No. 19/01.03.2005 with last amendment on November 28, 2008, which explained the administrative obligation and activities at national level (Prime Minister and National Crisis Council), regional level (regional governors) and municipal level (mayors). Example, population suffered by drinking water shortages are fixed by special order of the mayor with special recommendations with a guarantee for alternative minimum water supply. Also, the staff of “Fire Security and Population Protection” could be asked by phone number 112 in the case of fire or other incident as a result of severe drought. As part of disaster risk prevention, Bulgaria is working on the establishment and modernization of monitoring, forecasting, and early warning systems. In 2007, the Minister of Emergency Situations (now the Directorate General Fire Safety and Civil Protection) established a specialized monitoring structure, the Aerospace Monitoring Center (ASMC), within the Communications and Information Systems Directorate to provide support in the process of discovery, monitoring, risk assessment, and management of natural and man-made hazards, and in emergency situations. The system is used for localisation the forest fires mainly.

The National programme for disaster protection is adopted by Resolution № 270 of the Council of Ministers on May 7, 2014. Additionally, the 2014 annaul plan for implementation of the National programme for disaster protection exists. In 2014 plan the prevention or reducing the forest fires damages and limitation of negative effect of climate change on agriculture production are appointed as ones of the 7 main goals. The disaster youth education is also the priority of 2014 annual disaster plan.

The main institution for developing the early warning systems is NIMH-BAS which produces a map of hazardous events dayly with recommendations for each region. The high temperature is the main indicator for drought.

The National Institute of Meteorology and Hydrology-BAS issues its forecasts on the basis of numerical models, measurements, radar and satellite data. The main numerical model for a short-range forecast is ALADIN.
ALADIN is a spectral model for regional forecast of meteorological fields and elements. Its development is being done by a consortium of 16 member countries with Meteo France as a leading partner. The parameters of its operational implementation in NIMH are the following: mesh size 7000 m, 70 vertical levels, time-step 300 s, model integration is performed twice daily - at 06 and 18 h UTC, and the result is a 72-hour forecast for a region centered over Bulgaria
For the medium-range forecasts NIMH-BAS uses the model of the European Centre for Medium-Range Weather Forecasts, of which Bulgaria is a member since 2009.
Also, the weather forecast is available for short, medium and monthly period. Each potential user of drought information can receive any information by Infocentre of NIMH-BAS about: index of comfort/"feels like" temperature, risk of fire, etc.; information about lightning activity over the territory of Bulgaria; fields of mean temperatures, precipitation, etc., for a given past period; snow cover maps; information about temperatures, wind, precipitation, hail (and other meteo-elements) in a point or a region etc.

Annex IV: Examples of national organizational structures to deal with drought
STEP 1 (section 3.1 of the Draft Guidelines)
Country: Bulgaria
Competent authority:
Despite the policy developments, under the existing legal framework, the definition of coordination mechanisms across the institutions responsible for the implementation of climate change strategies is still missing. A national effort toward the development of a comprehensive climate change adaptation strategy, covering all vulnerable sectors, would be needed to provide a more integrated and coordinated approach related to identifying adaptation measures in the respective sectors.
Bulgaria has a number of institutions that are involved in various levels of emergency response, preparedness, and the development of more resilient disaster risk management (DRM) systems. Such agencies include but are not limited to (a) the Consultative Council, established in 2012 and supporting the Council of Ministers in forming the state policy for disaster protection; and (b) the Directorate General Fire Safety and Civil Protection, a structure under the Ministry of Interior, which is in charge of the National Plan for Disaster Protection development, implementation of state policy, data collection on disasters and accidents, advising on prevention activities, and addressing consequences to human life and the environment.
The water management in the country is carried out and directed by the Ministry of Environment and Water (MOEW), as the central institution responsible for the implementation of the Water Framework Directive in Bulgaria. The institutional responsibilities in relation to water basins on the territory of the country are divided between four different ministries—the MOEW, Ministry of Regional Development and Public Works (MRDPW), Ministry of Agriculture and Food (MAF), Ministry of Economy and Energy (MEE) and municipalities.
Climate Change Policy Directorate with Ministry of Environment and Water prepares and coordinates the participation of the Republic of Bulgaria in the international negotiations regarding the UN Framework Convention on Climate Change, coordinated with the Ministry of Foreign Affairs;takes part in the development of national strategies, plans and projects in the area of climate change and reports on their implementation;develops regulations in the area of climate change in reference to the European legislation and the compliance with the international commitments of the Republic of Bulgaria; coordinates the work of other ministries and institutions and of interdepartmental working groups in reference to the national policy on climate change etc.
Framework Convention of Climate Change is the first major international legal instrument affecting climate change globally. In 1995 Bulgaria ratified the UNFCCC.
Schema of organizational structure for drought management is recommended:
It is evident that the establishment of permanent acting Drought Committee (DC) as a part of existing Consultative Council with Council of Ministers is necessary. DC would cover representatives of all sectors damaged by drought as well as high level decision makers, academicians and NGOs. DC will be charged with elaboration of comprehensive drought adaptation strategy, covering all vulnerable sectors.

Annex V: Examples of national program of measures for preventing and mitigating drought
STEP 4 (section 3.4.5 of the Draft of the Guidelines)
Country: Bulgaria
Bulgaria has elaborated several national and sectoral mid-term and long-term programming documents, envisaging measures and activities for the adaptation of specific sectors (for example, water, agriculture, and forestry) to climate change, including drought:National Strategy for Water Sector Development and Management in Bulgaria for the period until 2015; River Basin Management Plans, made by Basin Directorate for Water management – East Aegean Region, Basin Directorate for Water

management – West Aegean Region, Basin Directorate for Water management – Danube Region and Basin Directorate for Water management – Black Sea Region, which are regional water management departments of the Ministry of Environment and Water (MOEW). They have been undertaking measures to tackle climate change as defined in their respective management plans, along with measures 2010-2015; Strategy for the Protection of Forests Against Fire; National Strategy for Sustainable Development of Forestry in Bulgaria for the period 2006–2015; National Strategy for the development of Forestry Sector 2013-2020; Master Plans of 51 Water Supply&Sanitation Companies (short, medium and long term measures for overcoming the water shortages in drought periods), 2013.

The Programme of measures, needed in drought conditions tendency, has been approved by the Council of Ministries in 2001. The main pillars of the measures on legislation, administration and investment are as follows: water resources protection; overcoming of the drinking water shortages; sufficient water for irrigation and public information and awareness about water resources savings. The needed state, municipal, firms and external budget was calculated at 1 149 757 thousands BGN or 587 861 thousands Euro about water resources protection measures in the period 2001-2010. Many of them haven't been performed yet.

In 2011 the new Programme of measures for adaptation of the forests in the Republic of Bulgaria and mitigation the negative effect of climate change on them has been elaborated as an excellent example for successful cooperation between scientists and practitioners. The practially applicable document was prepared which is useful for implementation as by narrow specialists, so by politicians, institutions and the public. The programme of normative, operative and investment measures in current climate (1961-1990) and years of 2020, 2050 and 2080 on the base of local dataset was officially adopted by the Ministry of Agriculture and Food on 03.05.2011 and presented to the Ministry of Environment and Water in order to be used for elaboration of Third National Action Plan of Climate Change for the period 2013-2020, elaborated in 2012.

The Third National Action Plan on Climate Change 2013-2020 is adopted by Decision № 439/01.06.2012 of the Council of Ministers of Bulgaria. A main strategic objective of this Third Action Plan on Climate Change is to outline a framework for actions related to climate change for the period 2013-2020 by analyzing and taking into account both the international context and the new realities of global policy in this area, as well as the EU commitments reflected in the legislation adopted in the end of 2008 at the highest political level (by the European Council and the European Parliament). The cost of the measures is estimated at 10.575 bln. BGN (5.41 bln. Euro) or 4.9% of the total investments in the economy during that period.

Annex VI: Examples of the national research programme supporting drought management

STEP 6 (section 3.6 of the Draft Guidelines)

Country: Bulgaria

Bulgaria is one of the EU countries with the lowest share of expenditures on R&D in GDP.

The turnover from innovation is also low (7.6% in 2010) as compared to EU 27 average (13.4% in 2010).

There are many opportunities for improvement of water management and innovation is a key to boost water efficiency.

In the Third National Action Plan on Climate Change 2013-2020 there are also measures planned in the field of science and education with a total value of 90 mln. BGN (46 mln euro) the effect of which is not measured by direct emission reductions but their results should be considered in the long term and within the context of the flagship initiatives of the EU Strategy for smart and sustainable growth "Europe 2020".

In August 2014 the European Commission has adopted a "Partnership Agreement" with Bulgaria setting down the strategy for the optimal use of European Structural and Investment Funds throughout the country. The Partnership Agreement identifies four strategic mutually reinforcing priorities through which the country will implement the EU Cohesion Policy in line with the Europe 2020 strategy for inclusive, smart and sustainable growth, namely:

1. Education, employment, social inclusion and healthcare for inclusive growth;
2. Scientific research, innovation and investment for smart growth;
3. Connectivity and green economy for sustainable growth;
4. Good governance and access to quality administrative services.

All of them will contribute to the efficient use of water resources in drought periods. Water policy is connected directly with the third priority, but the indirect relationship with priorities is multilateral. For example, innovations are necessary in drought areas – effective measures for limitation of water leakages from water supply systems, increasing of reservoirs volume and construction of small water storage ponds, cost-effective waste water treatment technologies and use of treated waters for irrigation or recycling, using the potential of mineral water resources, efficient irrigation, implementation of IWRM in forest watersheds etc. Improvement of drought monitoring is connected with the development of information and communication technologies.

Several project proposals for follow up research in GWP CEE region were given by experts at 2 NCD. One of its concerns the creation and demonstration of *„Computerized Decision Support Ecotechnology (CDSE) for Monitoring, New Estimating and Managing Agroecosystem Water Drought to Obtain Economically Efficient Crop Production and Protect the Environment"*, based on top scientific achievements as a market product friendly for scientists and farmers in all countries of Central and Eastern Europe.

Attendance list

1. Gergana Drumeva – Antonova, National Institute of Meteorology and Hydrology with Bulgarian Academy of Sciences (NIMH-BAS)
2. Yordan Dimitrov – NIMH-BAS
3. Lubomir Krastev – Executive Forestry Agency with Ministry of Agriculture and Food
4. Aneta Stefanova – Agrozone magazine-
5. Bojidar Prashkov – Hydromelioration with Ministry of Agriculture and Food
6. Ivan Raev – Association „GWP-Bulgaria“
7. Ivan Buhov – Vodokanalproekt
8. Petar Petkov – Forest Research Institute with Bulgarian Academy of Sciences (FRI-BAS)
9. Emil Popov – FRI-BAS
10. Krasimira Nacheva – NIMH-BAS
11. Rayna Mladenova – Regional Inspectorate of Environment and Water in Vratza town
12. Elena Kukova – water engineer in pension
13. Mila Chilikova-Lubomirova – NIMH-BAS
14. Kremena Simeonova – Ministry of Environment and Water
15. Aneta Ivanova - Ministry of Environment and Water
16. Vasilka Dimitrova - Ministry of Environment and Water
17. Boyan Boyanov – University of Architecture, Construction and Geodesy
18. Vasil Madjarski – Fondation „EkoCommunity“
19. Maria Grozeva – FRI-BAS
20. Vanya Yoncheva – NIMH-BAS
21. Albena Vatralova – NIMH-BAS
22. Irena Ilcheva – NIMH-BAS
23. Lilia Smedarchieva – Federation of Scientific-Technical Union
24. Georgi Antonov – FRI-BAS
25. Georgi Tsankov- FRI-BAS
26. Grigor Petrov – Water Supply&Sewerage in Plovdiv town
27. Ognyan Kutev - Water Supply&Sewerage in Plovdiv town
28. Albena Bobeva – Executuve Forestry Agency with Ministry of Agriculture and Food
29. Georgi Georgiev - FRI-BAS
30. Dimitar Georgiev – Departmnet „Irrigation“ with University of Architecture, Construction and Geodesy
31. Ilya Christov – Scientific-Technical Union of Water Affairs
32. Madlen Valchev – Municipality Sozopol, Black Sea
33. Hristo Hristov - Scientific-Technical Union of Water Affairs
34. Donka Shopova – NIMH-BAS
35. Anna Veteva – Magazine „Ekology 21“
36. Dany Kenanova - Magazine „Ekology 21“
37. Galia Bardarska – GWP CEE
38. Zdravko Dyankov – former Institute of Water Problems – BAS
39. Milkana Mochurova – Economic Research Institute-BAS
40. Nelly Gadjalska – Soil Institute „Pushkarov“
41. Galina Patamanska - Soil Institute „Pushkarov
42. Ivan Marinov – FRI-BAS
43. Nevyana Teneva – Stroykontrol
44. Evgeny Dimitrov – Forestry University
45. Vesselin Alexandrov – NIMH-BAS
46. Marin Antonov – Federation „Scientific Technical Union
47. Anelya Paneva – Denkstatt
48. Margarita Syarova – Scientific Technical Union of Water Affairs in Bulgaria
49. Pavel Popov - Scientific Technical Union of Water Affairs in Bulgaria