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DROUGHT POLICY IN BULGARIA- KEY CHALLENGES

Sn. Dakova,

*National Institute of Meteorology & Hydrology-
BASc, Sofia, Bulgaria*



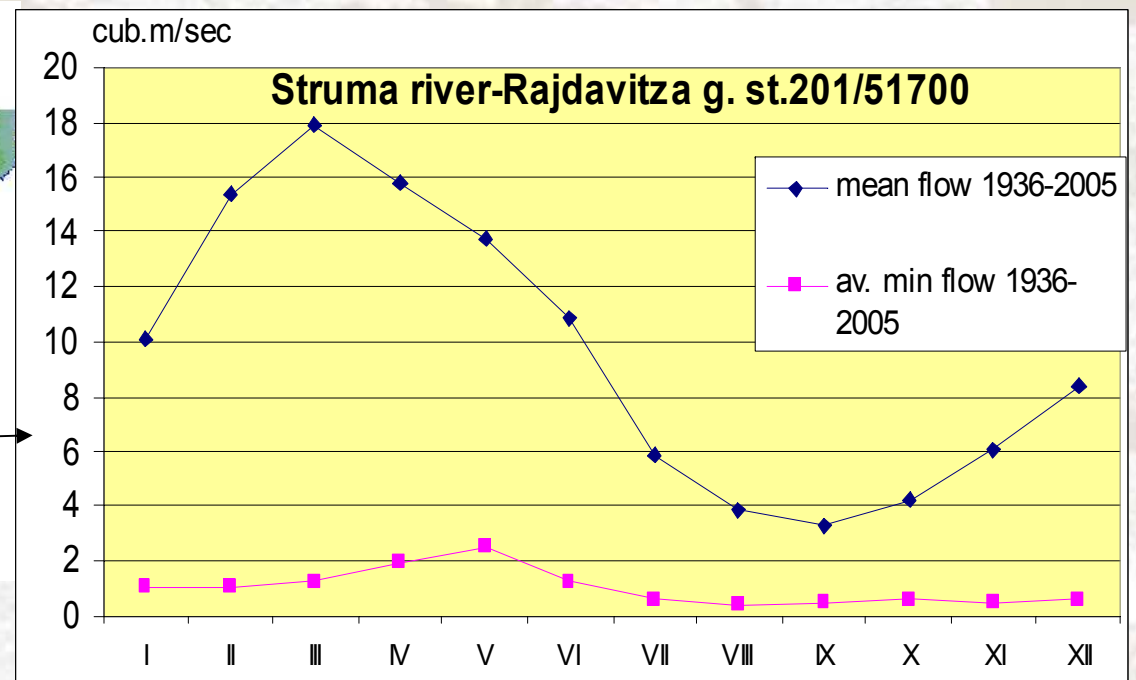
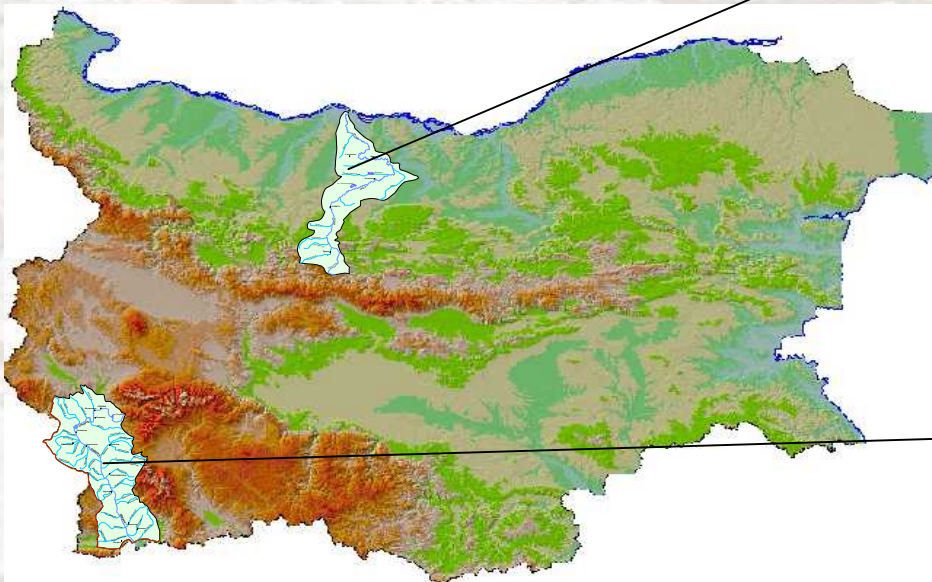
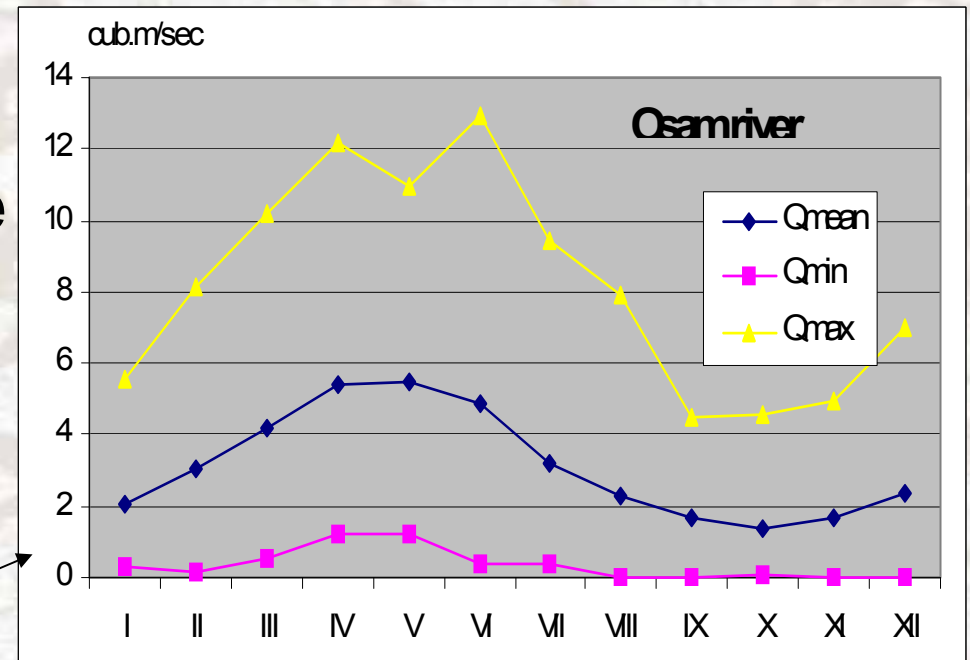
Why drought is important for Bulgaria?

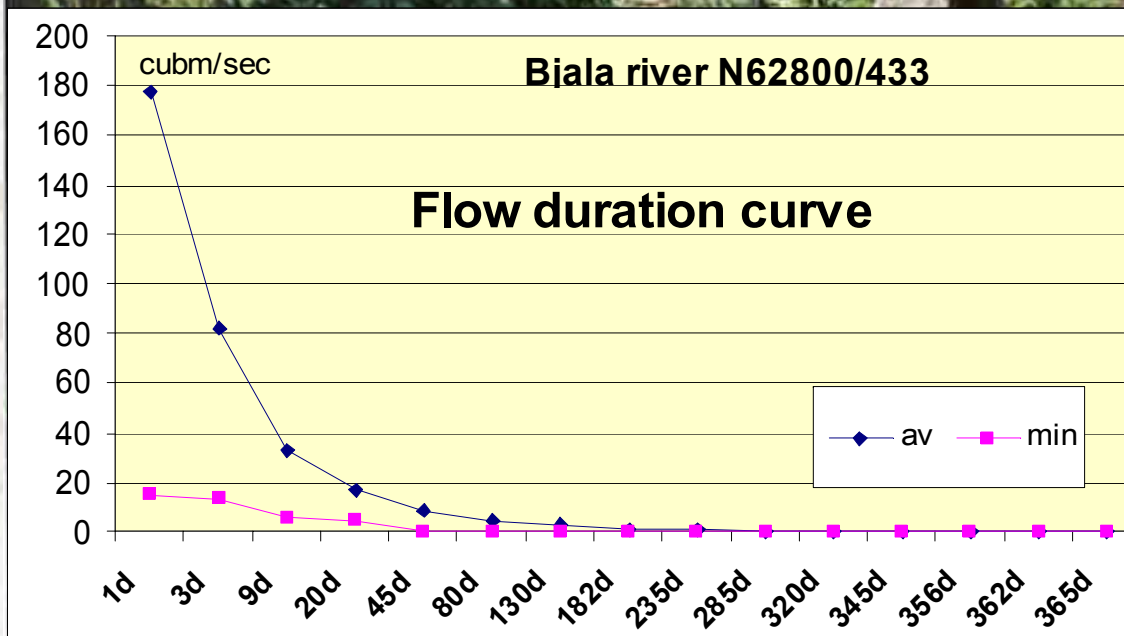
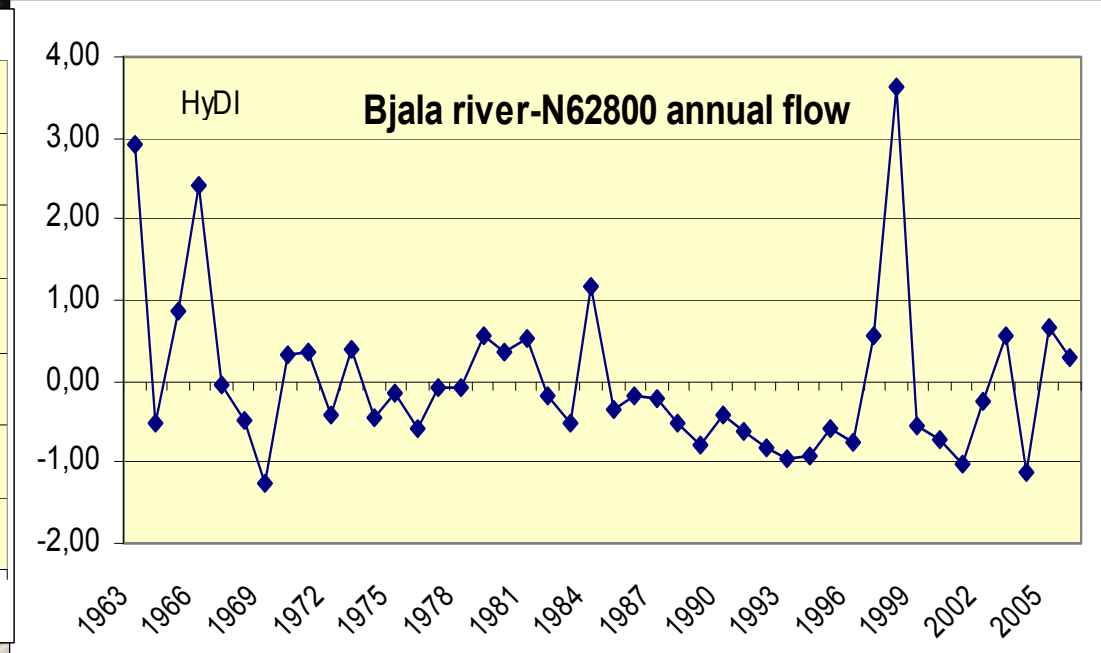
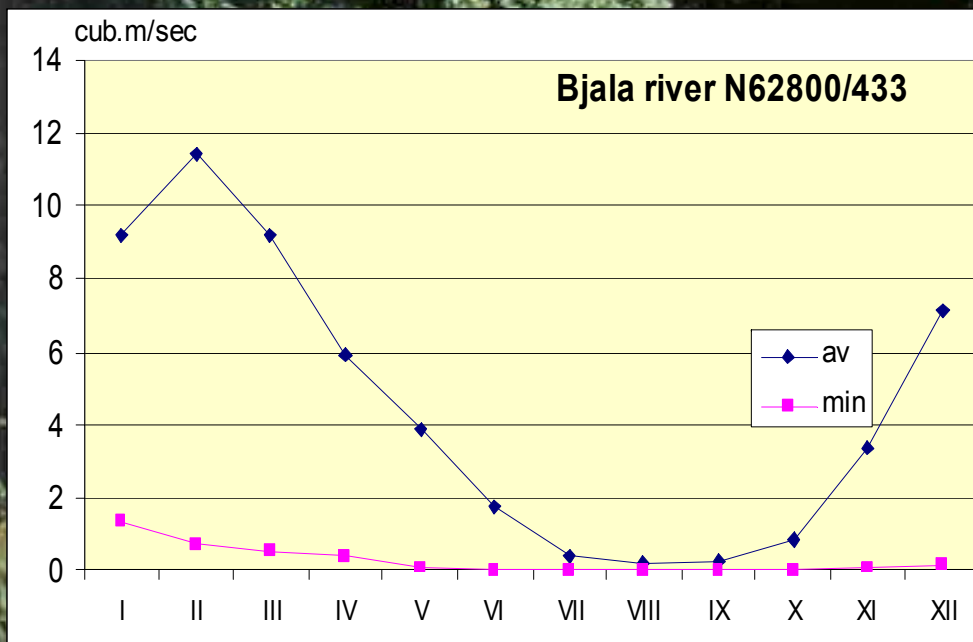
- About 90% of public water supply is from surface water. Running waters are accumulated in reservoirs and spring waters – in heads (captages). In the conditions of long term drought the settlements supplying through head are suffered from water supply regime each summer.
- Recently, a lot of small hydropower plants have been built. During July-September they have a sanitation. But the over built small hydropower plants cause ecological problems. (such as Iskar river where only on the part of 120 km there are about 45 -56 SHPP
- Irrigation- the reservoirs have seasonal regulation

The Mediterranean Basin



Drought have occurred in the past and will occurs in the future in Bulgaria. Usually, the climate patterns cause intensive precipitations with floods in spring and long and dry summer.

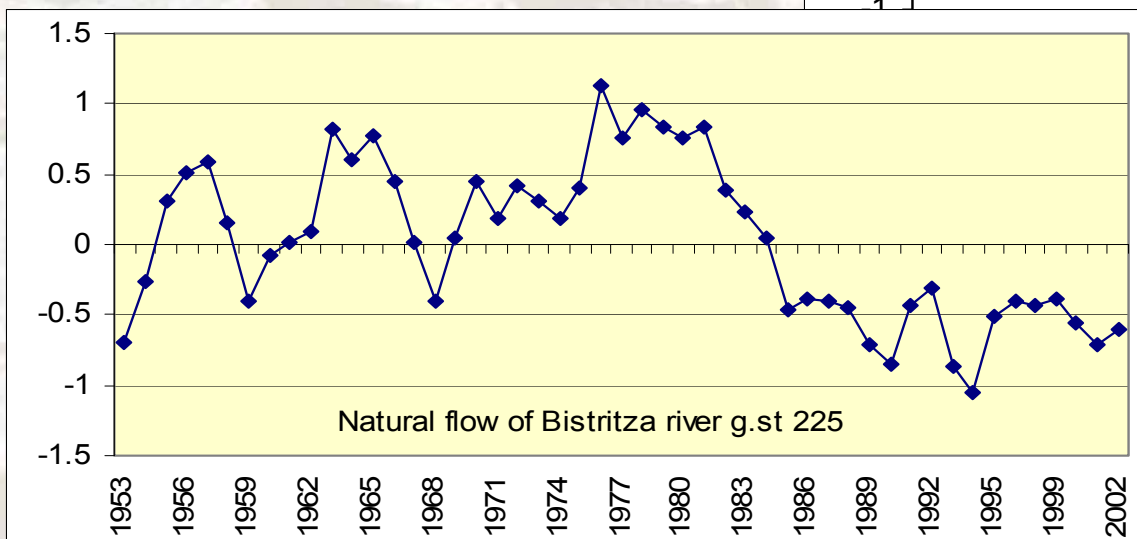
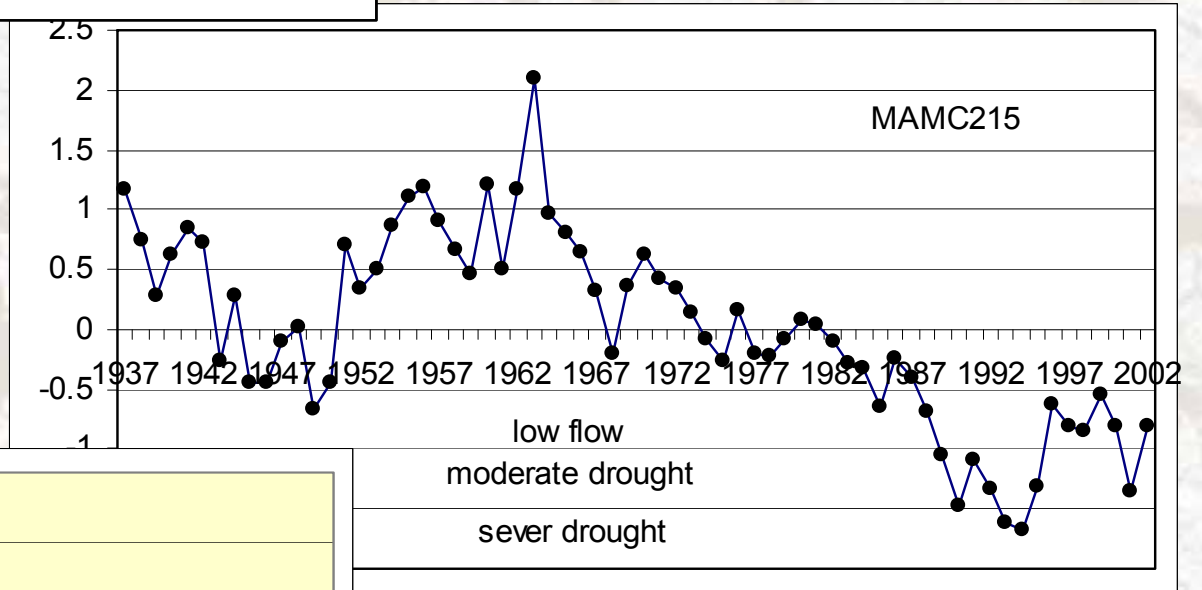
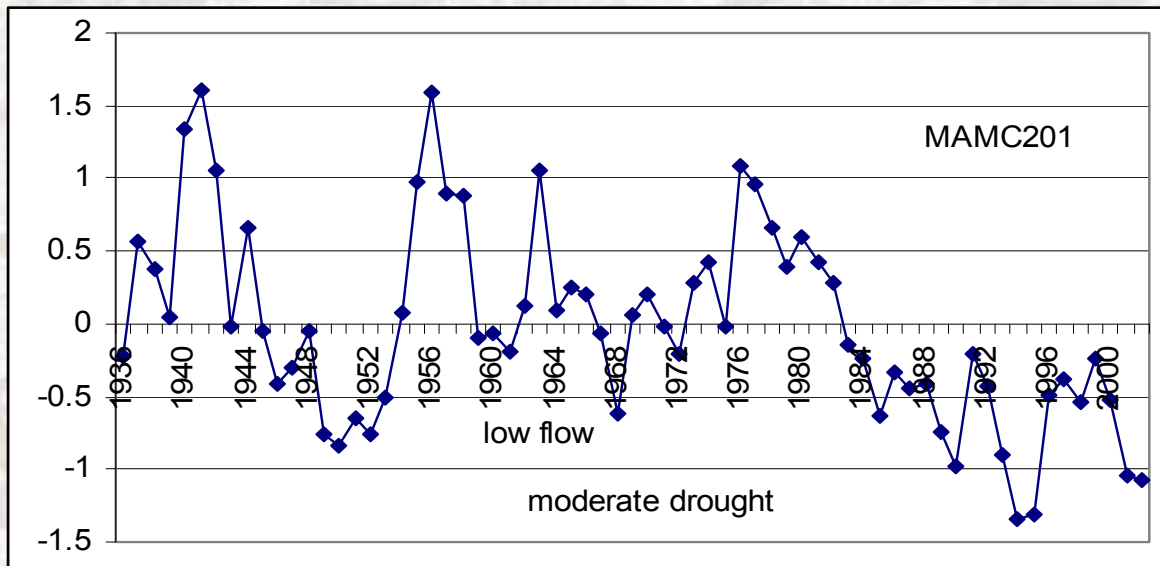




56 completely drying water bodies have been identified in the Water Management plans

To reduce the threat of drought caused by natural conditions and to mitigate water scarcity, over of two thousands reservoirs have been constructed since fortieths years of XX century aiming the distribution of water from flood period to the low flow and drought periods

In spite of that, an unusual very sever and long drought occurred during period 1982-2002 when the annual natural flow was with 20-30% in the mountains and 40-50% in the plains lower than this one for the previous period (since beginning of the hydrological observation in Bulgaria , 1935/36-1985)



High mountin natural flow

Diminishing Water resources during the unnormal sevier and long drought

period	Osam-North Bg	%	Struma river - South Bg	%
1936-1975	539,6 x 10 m ³	100	2669 x 10 m ³	100
1936-1985	536,1 x 10 m ³	-0,65	2730 x 10 m ³	2,28
1936-1995	509 x 10 m ³	-5,06	2566 x 10 m ³	-6,01
1982-2000	372,3 x10 m ³	-31	1604 x10 m ³	-40

Drought impact —a vision of the future

- **Increased impacts associated with increased frequency of meteorological drought and vulnerability**
- **Increased frequency and severity of drought**

Hydrological drought would be in category of “**sever drought**” in South Bulgaria and “**Moderate drought**” in the North Bulgaria. The future severity of drought (mean annual values at time level 2025) would be approximately as the passed twenty years period 1982-2002. The degree of diminishing of water in the next time levels will be grown up. The second order tributaries will be dry toward 2050, 2100. **Wherefore, the Ministry of Environment and Waters (MOEW) revised its general water policy in order to promote effective water governance and to provide water security so that every person can access safe water.**

PROGRAM CONCERNING THE NECESSARY MEASURES IN THE CIRCUMSTANCES OF TREND TO DROUGHT has been elaborated in 2002 and is in force for period 2002-2010.

The main directions are:

- water resources preservation;
- overcoming the water supply crisis ;
- irrigation water supply insurance:
- creation of knowledge and awareness for water resource savings;

In the Drought plan,
the follows specific measures are defined:

- Determine the indicators and thresholds that will establish the starting point, the ending point, and severity levels of the exceptional circumstances. In addition, thresholds of pre-alert and alert levels should also be defined.
- Set up the measures to take during the pre-alert and alert phases in order to prevent deterioration of water status.
- All the reasonable measures have to be taken in case of prolonged drought in order to avoid further deterioration of water status.
- All practicable measures have to be taken to restore the body of water to its prior status, once the event has finished and the sooner as reasonably possible.
- Make a summary of the effects and measures taken and subsequently revise and update the existing drought management plan.

In 2009 the **Water Management Plan (WMP)** has been elaborated in concordance with **WFD 2000/60 EU** with **duration to 2015**. Drought preparedness plans for drought impact reduction strategies is an integral part to WMP. The main directions that have to be undertake to provide administrative provisions, organizational and investment measures are involved into WMP as “necessary measures” in the schedule for “immediate realizations”. WMP will entry into force from this 2010 year.

Besides, the **EU documents concerning Drought**, and also Bulgarian documents such as **Strategy for water supply**, **Strategy for environmental protections**, **Strategy for combat with desertification**, **Strategy for renewable energy**, **Action plan for climate changes**, **Agricultural irrigation plan**, etc. have been considered in the **WMP**

Some measures requiring hydrological based decisions fallow from the Program implementation and WMP preparation

- **Ensuring of the river basin water resources management, which allows at the highest degree the effective uses and precaution of water resources in accordandce of defense of the national interests.**
- **Looking for alternative water supply resources - additional runoff regulation in new 8 reservoirs for water supply**
- **Ensuring of minimum permissible runoff in the rivers.**

- Reassessment and in case of needs reconstruction of the now functioned reservoirs in the light of predicted diminishing of streamflow caused by the climate change impact
- Use technologies, approaches and instruments ensuring water saving.(circulation cycle).Designing and constructing sewerage systems and sanitary for repetition use of water for other purposes „ principle of grey water“

Hydrology actions need:

- Evaluation of the water availability in drought conditions
- Determination when drought is transformed in disaster.
- Draw up criteria providing the optimal number of Small hydropower plants on running waters which might be built in one water body and what has to be the optimal distance between neighboring plants

In the process of preparation of the WMP, the following gaps in low flow and drought knowledge are identified and need further development and investigation:

- Lack of Methods of assessment of minimum permissible runoff in the rivers and setting up in conformity with WFD 2000/60EU
- Lack of criteria and methods giving the optimal number of Small hydropower plants in cascade might be built in the running stream and which would be the optimal distance between neighboring plants.
- Lack of criteria to digital evaluating measure to consider some water body modified or heavily modified etc.
- Lack of criteria for Water volumes in “bordering sections”. Which volume should be used in mutual benefit, without environmental damage downstream during the management of droughts of any of the affected country.

Assessment of minimum permissible runoff

- The principle of the methods follow the Water Framework Directive 2000/60/EC where is specially noted that “quality and quantity of water resources, together with their physical structure should be sufficient in order to protect and maintain good ecological status and functioning of the water environment as well as to meet the water needs of habitats of wetlands and terrestrial ecosystems”.
- Multiple regression models have been used.

- Impute data: synchronized obtain data for hydrological, biological and chemical elements.
- Hydrological: Q , Velocity, Temperature
- biological spaces which later have been calculated in three groups of indices such as: saprobic index (SPUB), species diversity indices (SDIV, HIND, EVNS, DOMN) and biotic index (BGBI) and
- The chemical indexes are accepted BOD – biochemical Oxygen Demand, nitrite ions (N- NO_2), and ammonium ions (N- NH_4) and N- NO_3 , which have been involved in the current regulations

- The most favorable combinations among this three types of elements are specify and were use in multiple regression equations .
- **Difficulty:**
- Each water body has own biological and chemical parameters, which need collection data for each water body.

The results, obtain from the pilot basins, are generated into the follow recommendations :

- To keep good ecological status or ecological potential it is necessary the requirement flow to be not lower than 50%P from the mean flow duration curve
- For "Heavily modified water body" the requirement ecological flow need to be not lower then the mean Q5days flow.
- For regulated streamflow-not lower that mean Q10 day
- As critical flow under which the ecological community degrade is accepted the 95% percentile of minimum monthly flow.

In the policy of Trans-boundary rivers:

- Ensuring of the management of the transboundary river basin water resources that allows in the highest degree the effective use and preservation of water resources , in accordance of defense of the national interests
- Preparation of criteria what has to be Water volumes in “bordering sections“ ensuring mutual benefit, without environmental damage in downstream during the management of droughts of any of the affected country.

Next Steps:

- The evaluation of criteria and methods giving the optimal number of Small hydropower plants in cascade on running water, is the subject of different branches of knowledge such as: hydrology, hydro-power specialists, economists etc. IT is quite important to choose between price of electricity effect and environmental damages.
- Elaboration of Criteria to digital evaluating measure to consider some water body modified or heavy modified etc.
- Elaboration of criteria for Water volumes in "bordering sections". Which volume should to be used in mutual benefit, without environmental damage downstream during the management of droughts of any of the affected country.



crossing-rivers	border rivers Running in countries	basin area (sq.km)		river length in (km)	
		Ftotal	F in Bg	L total	L in Bg
Struma	Bg,Gr, Serb&Mac	1733	10797	420	292
Mesta	Bg, Gr	5925	3400	273	126
Maritza	Bg,Gr,Turkey	53000	21084	524.6	326
Arda	Bg,Gr,		5201	271.7	241.3
Tundja	Bg,Turkey		7884	405.2	345.5

TANKS FOR YOUR ATTANTION

contact: Snejana.Dakova@meteo.bg

