

## Overview Of National Hydrogeological Network Of Bulgaria

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### **Abstract**

*National Hydrogeological Network (NHGN) in Bulgaria was found in 1958-1961. The structure of NHGN is presented. The frequency of measurements is mainly once per month. For some karstic springs the daily data are obtained using rating curves. Water level in observational wells is measured usually once in a month. Water level recorders are available only for part of stations. The primary processing is made by technical staff in Regional Units at the National Institute of Meteorology and Hydrology. The functioning of the NHGN is closely related to this of National Hydrological Network. The general management of both networks is executed from Hydrology Department at National Institute of Meteorology and Hydrology. From the year 2000 the Ministry of Environment and Water supports functioning of the Networks. The data from NHGN are used for national and international projects and analyzed in many studies.*

*Key words: hydrogeological network; observational stations; monitoring points; Bulgaria*

### **Foundation of hydrogeological network in Bulgaria**

The foundation of Bulgarian hydrogeological science is related to the assistance of Russian hydrogeologists. The first lector on hydrogeology (1952-1953) in Bulgaria was Prof. N.A. Plotnikov. During this period the Polytechnic University in Sofia comprised geological and mining sciences that later were separated in the High Institute on Mining and Geology. The first Bulgarian lector on hydrogeology was Hr. Antonov who became later Professor and co-author of the monograph "Groundwater in Bulgaria".

Under guidance of Prof. N.A. Plotnikov the Map of hydrogeological regions in Bulgaria has been elaborated. This map became the base for foundation of the National Hydrogeological Network.

With the Decree of the Ministry Council from 19.03.1956, the Hydrometeorological service was responsible to organize and found national network for groundwater regime study in the country.

National Hydrogeological Network in Bulgaria was set up with methodical support of the Russian hydrogeologist Prof. M.E. Altovski (from VSEGINGEO, Moscow, URSS) who arrived in Sofia in 1958. He worked on foundation of the NHGN in Bulgaria and planning of groundwater regime studies in the country. According to the technical support in development of methods for studies of groundwater regime in Bulgaria the program of this theme includes:

- (a) location of hydrogeological network for observation of groundwater regime on the territory of Bulgaria;
- (b) development of handbook on groundwater;
- (c) development of recommendations for themes of studies in the domain of groundwater regime.

Prof. Altovski proposed the hydrogeological network to be divided into two groups: State (Basic) and Departmental. The Basic network operated from the State Office Hydrology and Meteorology was aimed in regional studies of the groundwater regime in Bulgaria for scientific purposes and for needs of different branches of national economy; groundwater regime studies for solving the most important national tasks; and finally, scientific and methodical guidance and general control on Departmental networks.

According to Prof. Altovski, during groundwater observations it was necessary to study in details the conditions of operation of different engineering constructions, and to collect information that characterizes the work of such constructions (quantities of groundwater withdrawal from water-supply systems, dynamic water levels, discharge in drainings), as well as to register all changes in their construction and situation. Besides publishing of yearly books, recommendations were made to summarize the observations in handbooks every 5 years (or another chosen similar period).

## Operation of national hydrogeological network

Nowadays National Institute of Meteorology and Hydrology is responsible to hydrogeological data collection, processing, maintenance of stations and archives, supplying of the state institutions and consumers with data from NHGN, and dissemination of information.

Data processing is performed in regional centers in Plovdiv, Varna, Pleven and Kustendil. The functioning of the NHGN is closely related to this of National Hydrological Network.

The general management of both networks is executed from Hydrology Department at National Institute of Meteorology and Hydrology.

Time series of discharge for springs and groundwater level for observational wells give important information on groundwater regime in Bulgaria. Some of the time series are with 40-year long observational period and reflect the influence of climate variability on groundwater.

In the frames of the Danube and Black sea basins, the most of karstic springs included in NHGN are related to elevated massives of Triassic, Jurassic and Cretaceous limestones. For the Aegean basin some important karstic massives are built from Proterozoic marbles; other karstic springs drain Triassic limestones and dolomites. The major part of observational wells refer to alluvial and proluvial deposits.

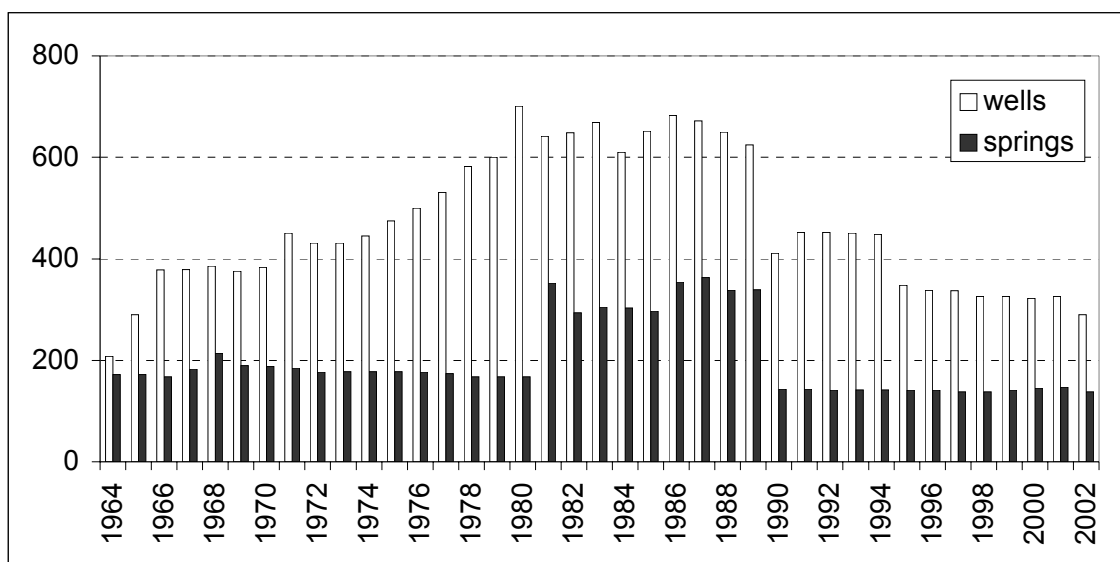
The groundwater quality is determined 4 times per year for selected springs and pumping stations. Basic components, nitrates and some others are defined.

## Structure and dynamics of monitoring points

National Hydrogeological Network in Bulgaria includes observations of spring discharges for springs and groundwater levels in observational wells.

At some springs the water level is recorded by limnigraph, at other stations, water level is measured every day by observers. Measurement of spring discharge (using a current meter) is 12 times annually as usual. Using rating curve, the daily data for spring discharge were obtained. For the majority of the springs the measurements of discharge are made once-twice in a month without daily observations on water level.

The dynamics of observational stations is presented in Fig. 1. The springs with daily observations are up to 25% from the total number of springs. During last years the total number of hydrogeological stations is about 500.



**Figure 1.** Dynamics of observational stations from NHGN

From 1980 some deep boreholes were placed on the disposal of NHGN and equipped with water level recorders of types AOTT (West Germany) and GR-38 (URSS).

## Problems

The problems of operation of NHGN are different: methodical, organizational and financial:

- (a) methodical – favorable or unfavorable situation of stations; measurement of remainder water after withdrawals; inefficient wells (partly obstructed screens); water-supply systems were not monitored;
- (b) organizational (insufficient control at different levels, related to financial problems);
- (c) financial (expensive water-level recorders; low rewards to observers; needs of maintenance of stations).

Very hard financial problems started from the beginning of the economical transition, especially in 1990-1992. The number of stations was reduced considerably. However, the high level of inflation had strong negative impact on the activity. Then the networks succeeded to survive. After that the finance support was increased but insufficiently. From 2000 the Ministry of Environment and Water supports functioning of the Networks. Still, there is no funds for technical improvement of existing equipment.

## Some new negative impacts:

- breaking of the equipment – vandalism;
- personal interest of observers is low;
- weak inter-institutional links – between producers and consummators of the information.

So far, some important recommendations by Prof. Altovski have not been realized:

- periodical reports (after 5-year period);
- the effectiveness of the operation of constructions (for water supply and drainage works) have not been pointed out as a priority task.
- the control over activity of Departmental networks was impossible;
- the hydrogeological yearbooks were published with delay of several years.

## Publication and utilization of NHGN data

Despite the problems, we should estimate highly the significance of NHGN. The data from NHGN are available from 1958 and are published in hydrogeological yearbooks (1958-1979) and Reference books.

The data have been used for national and international projects, Master schemes, and analyzed in many studies. Papers on groundwater regime were published by P.Betzinski, N. Boyadjiev, K.Boteva, B.Rajkova, L.Vasileva, M.Machkova, J.Kirova, T.Orehova, E.Bojilova.

## Acknowledgements

From 1990 to 2003 the first author as hydrogeologist at NIMH-BAS was involved into primary and secondary data processing and preparing of hydrogeological yearbooks for 2000, 2001 and 2002. Tatiana Orehova wants to express her deep gratitude to Department Hydrology, NIMH – BAS, for giving her a chance to perform carrier in the field of hydrogeology.

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