

Sustainable development of natural resources in Northern Greece, focusing on water supply reliability and public health protection

Nikolaos Papadakis^{a*}, Nikolaos Veranis^b, Nikolaos D. Arvanitidis^b

^a*Hygiene Laboratory, Medical School, Aristotle University of Thessaloniki, 54006 Thessaloniki, Greece
Tel./Fax +50251999158; email: npapad@med.auth.gr*

^b*Institute of Geology and Mineral Exploration (IGME), 1 Fragon Str., 54626 Thessaloniki, Greece*

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Abstract

The rapid and almost uncontrolled growth of population has a result a continuously increasing water demand in agriculture needs, industrial uses and domestic services. This has a dramatic impact on the available water resources and at the same time put the basic infrastructure facilities under severe pressure. As a result, significant deficiencies have emerged such as service discontinuity and interruption in distribution and delivery. This most of the times leads to contamination of potable water or at least affects the quality of it.

Research has shown that water resources in Northern Greece is well above the current, the mid- and the long-term needs of its local communities. Although only 79% of the municipalities which correspond to 61% of the population of the area is provided with uninterrupted water flow.

This is due to unwise strategies used in water management at a national, regional and local level along with lack and bad quality of infrastructures concerning water reservoirs and water networks.

There is a critical need for advance actions to be taken and arrangement of integrated strategies which will ensure both water sufficiency and protection of the public health.

Keywords: Water sufficiency; Water accessibility; Hydrological basins; Hydrogeological basins; Northern Greece

1. Introduction and aim

The water demand is continuously increasing due to mainly population growth and raising needs in agriculture, industrial uses and domestic

services. Integrated water management has a strong impact on long-term protection and sustainability. The water resources in Greece are considered to be the most potential among the Mediterranean countries. However, variations in the hydrogeological conditions, the rainfall intensity and frequency, the population density

*Corresponding author.

and the industrial activities affect water discharge rates in many parts of the country.

The aim of this paper is to demonstrate that sustainable management of water resources in Northern Greece, in relation to interruptive water flow and delivery at existing domestic service systems, is essential to ensure adequate supply of water in terms of reliability, quality and quantity. Therefore, multitemporal testing of the frequency of service discontinuity in interruptions and delivery has been conducted in Macedonia and Thrace, and it has examined its interrelation with water regions and water reserves of the area. Finally, it has studied the impact on the public health [1,2].

2. Material and methods

Multitemporal testing of the frequency of service discontinuity in interruptions and delivery has been conducted in Macedonia and Thrace and it has examined its interrelation with water regions and water reserves of the area. Finally, it has studied the impact on the public health [1,2].

In this research, it has taken into consideration the data of the National Statistical Service of Greek, the archives of the Laboratory of Hygiene of the Aristotle University of Thessaloniki, and data analysis of relative questionnaires which have been sent to all municipalities of Macedonia and Thrace. A total of 1350 questionnaires have been sent and collected from all the Municipality Departments in Northern Greece. The questions asked were about water sufficiency, frequency of water interruptions in distribution and delivery because of lack or wear out of water supply networks, examination and chlorination of potable water, water supply networks state and the number of residencies connected with the central sewage system.

The collected data have been analyzed and the results were cross-checked with data from the State Offices and Municipalities.

Collected data were classified by municipality and were analyzed according to urban, semi-urban and rural population. Also it has examined the evolution of the above found numbers during a 15 year period, 1988–2004.

Data and researches from the Institute of Geology and Mineral Exploration (IGME) and the Ministry of Development of Greece were used [1,3–5].

3. Results and comments

3.1. Water sufficiency in Macedonia and Thrace

Intermissions in water supply are related either to limited reserves or to technical problems. During intermissions, external impure substances can penetrate into the water, which can put at risk the consumer's life by causing serious health problems. The possibility of any water quality related impacts during these periods is relatively high. In fact, uninterrupted water delivery is very important. The opposite, as it was mentioned above, can be very dangerous because several contaminating and polluting microorganisms develop in the stagnant water of the pipes, which were transferred to the consumers. These microorganisms are more likely to be pathogenic. Additionally, concentrations of toxic metals, as for example Pb, increase and may reach inadmissible levels [2–4,6].

Research showed that

In East Macedonia and Thrace, 89% of the consumers are provided with uninterrupted water supply. Corresponding percentage for western Macedonia is 79% and Central Macedonia 46% [3,4].

- (1) In rural areas (less than 2000 people), almost 82% of the population, have permanent access to water. Corresponding figures for semi-urban areas and large cities are 75 and 46%, respectively [3,4].
- (2) In the prefectures of Pella, Pieria, Kavala, Imathia and Drama, more than 90% of the

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