TRANSBOUNDARY GROUNDWATER OF ALBANIA

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Abstract

Water constitutes an important resource for Albania, and in comparison to other European countries is indeed considered to be one of the richest as far as this resource is concerned.

Albania is crossed by several rivers, which flow from mountainous regions to plains, in general from east to west. The most important ones are the Rivers Buna, Drini, Mati, Ishmi, Erzeni, Shkumbini, Semani and Vjosa. All the rivers discharge into the Adriatic Sea.

Albania shares lakes with its neighbouring countries. Lakes Ohrid and Prespa are shared with the FYR of Macedonia, Lake Shkodra with Montenegro, and Lake Prespa with Greece

In this paper are presented some characteristics of most important groundwater basins in Albania and also the characteristics of a traunsboundary aquifer as Mali I Gjere.

1. INTRODUCTION

For the last decade Albania has been in a state of economic transition and has adopted a democratic form of government and a free market economy. Albania had in the past an undeveloped economy, and continues to have severe environmental problems. Damage to forests, loss of wetlands, the use of out of date technology and lack of waste treatment plants for urban areas are among the many consequences of the past neglect of natural resources and environmental degradation. On the other hand, the increase in foreign investments has emphasised the need to address environmental protection issues and the rational utilisation of natural resources.

Water resources of Albania are abundant, almost in all the regions of the country, with an uneven seasonal distribution. The available quantity of surface water, and to a less extent of groundwater also, strongly decreases during the months of summer. Thus, only about 6-9 % of the annual runoff is observed during the dry season (July-September).

The average annual precipitation in Albania are approximately 1485 mm , the mean annual run off is 891 and the mean volume of water, discharged by all the rivers in the sea, is 41 km³ of water. It corresponds to a mean discharge of 1300 m³/s, approximate with those of the Po river in Italy.

Flooding is a frequent problem in Albania. The main causes of the extreme floods are the morphometric and climatic conditions

Degradation of the quality of trans-boundary water resources, caused mainly by pollution from land-based activities (nutrients, pathogens, and oxygen-demanding wastes) is an important problem for Albania. The water sector is one of the priorities of the National Government. Several lending operations from international financial institutions are supporting the rehabilitation of the water and wastewater systems in the country.

The water resources are mainly used for energy production, irrigation, industry, drinking water etc.

2. CLIMATE

The Republic of Albania lies to the Western part of Balkan Peninsula at the coast of Adriatic and Jonian Seas. It is situated between 39° 38 - 42°39 N and 19°16 -21°04 E.

Albania extends over an area of 28748 km2, with 76, 6% mountain and hills. The country combines a coastal plain in the West with fairly high mountains: the highest point reaches 2751 m at the triple border with Yugoslavia and FYROM, while many ridges exceed 2000 m in the northern, central and southern parts of the country.

The country is characterised by typical Mediterranean weather, by hot dry summer, with long days of sunshine, mild winters and abundant rainfall.The rain comes mainly with south-west winds and is affected by the relief. This gives a variety of climates and rainfall patterns in the different regions of the country.

The absolute maximum temperature recorded is 44°C and the absolute minimum temperature recorded is -35°C.

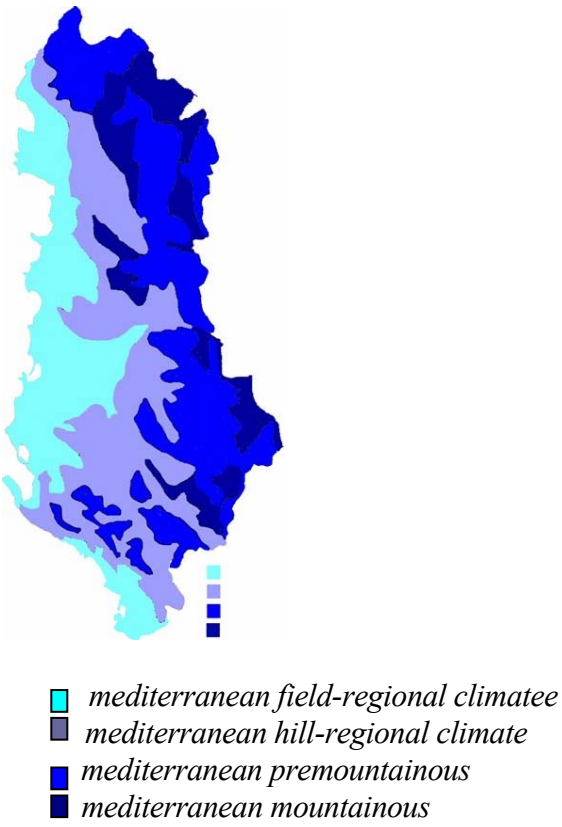

Fig.1.4 main climatic zone

Average annual rainfall in Albania is 1485 mm. In the Alps in northern Albania the average rainfall is over 2500mm and 650-700 mm in valleys of the interior. Annual distribution of rainfall has a maximum of about 40 % occurs in winter and a minimum of about 10% in summer. Secondary maximums are present at the interior part of the country.The 24h maximum rainfall in Albania is recording in Boge 420mm on. The number of rainy days (>1.0 mm) per year over varies from 100-130 days mainly at winter season.

Summer droughts are more pronounced towards the southwest. This phenomenon is typical over the Albanian coast, which is the most important and economically valuable part of the country from the development and environmental viewpoints.

Therefore, summer is dry and drought in some years has caused damage to agriculture. Such prolonged droughts occurred in 1978 (about 100 successive days without precipitation), in 1975 (about 94 days), in 1985 (about 83 days) and in 1986 (about 80 days)

Sometimes, wind speed reaches 40m/s or higher. Such strong winds bring down high-tension pylons, uproot trees, cause damage to agriculture etc. The area between Lezha and Laçi is particularly influenced by strong winds, which caused serious damage to pylons in 1974 and 1996.

3. GROUNDWATER

The hydrographic basin of Albania has a total area of 43,305 km² from which only 28,748 km² are situated within the state territory of Albania. The rest, which belongs to the catchments of the rivers Drini and Vjosa, is situated in Greece, FYROM and Yugoslavia.

Albania is crossed by several rivers, in general East - West direction: Drini, Mati, Ishmi, Erzeni, Shkumbini, Semani, Vjosa are the most important ones.

Groundwater in Albania is present in different sort of rocks of different ages, from Paleozoic to Quaternary, and has a great importance for being the only source of drinking water supply. Yet not much is known about its real availability and extraction capacity. This presently leads to some problems: well fields located near the Adriatic coast near Laç and Durres are now affected by the intrusion of saline water, probably due to over exploitation.

According to local conditions groundwater is exploited through wells, mainly in the plains and valleys, or through springs, most frequently in the hills and mountain areas. But its presence and use are fairly common throughout the country. As frequently the case, and particularly where large karstic areas affect the movement of groundwater, river basins do not coincide with groundwater units.

3.1. THE DRINI BASIN

In the Drini unit, three main aquifers can be defined:

- one north from Shkodra and along the Lake of Shkodra, in the district of Shkodra and Malesia e Madhe. It includes the wells of Dobraç, supplying water for the city of Shkodra with wells yielding 80 l/s of good quality water. No quantitative data are available for the rest of this aquifer, but qualitative information shows that, in quantity and quality, the supply obtained from this aquifer is not satisfactory for the drinking water supply for Koplik and its region; other sources of supply are presently being investigated.
- one on the left side of the Drini downstream of Shkodra; no information, either qualitative or quantitative, are available for this aquifer.
- in the district of Has water is mainly obtained from wells, but no data have been found about the resources .

Most of the groundwater in the Drini basin is taken from springs, 65 of which have a wet season discharge above 100 l/s, mainly in the district of Malesia e Madhe, Tropoje, Kukes, Diber and Bulqize. The quality of these springs is generally good; they yield a fairly stable amount of water with low hardness (5 to 8 German degrees in most cases).

Fig.2. Watershed of Drini river

3.2.THE VJOSA BASIN

The Vjosa basin is rich in groundwater resources; it includes three main aquifers:

- along the lower valley of the Vjosa. It supplies the city of Fier with more than 1 m³/s of good quality water from the wells of Kafaraj, unaffected by the polluted water carried by the nearby

Semani. The well fields of Novosele near Vlora, on the other bank, have also high yield (up to 80 l/s) and good quality water, although sometimes nitrites and nitrates have been found in fairly high amounts.

- around Saranda and Butrinti. It supplies part of the drinking water to Saranda. The water is reported to be of very good quality, and extraction is around 100 l/s for Saranda only.
- in the Drino valley around Gjirokastra. It supplies part of the drinking water to Gjirokastra. The water is of very good quality and extraction is around 40-90 l/s for Gjirokastra only.

Forty-seven main springs are identified in the Vjosa basin. In most cases the discharge is fairly stable, twelve springs yield more than 1 m^3/s and some of the biggest springs of the country are found there, as the Syri i Kalter (Blue eye), with a discharge of about 20 m^3/s, the Spring of Kelcyra, Uji i Ftohte (Could water) near Tepelena etc. Water is of good quality and the hardness varies from low to medium, except near the Ionian coast, where it reaches 20-30 German degrees.

Fig.3. Watershed of Vjosa river

3.3.MALI I GJERE

This massif is part of Vjosa aquifer. Countries that shared this aquifer are Albania and Greece. Massif extents at Kardhiqi valley situated to the northwest part of the country. Shared international boundary length is 20km. Aquifer type is carbonatic.The surface of carbonatic part is 442km^2.Higher point is 1589m and the lowest point is 150m. (Bistrica source).

Mali I Gjere massif is an asymmetric anticline structure overturned. Easter side descend in northeast with angle 25-30° while the Westside is detached tectonically till to riding. In south of Dhrovian the riding decreased gradually and begin to appear the west side ofanticline. From Dhrovian village and in north during riding line seemed evaporates. Over them are setting limestone formations that begin with dolomite of T_3 and go on with plate biomicritic and silicas limestone witch followed from flysch clayer-sandstone of oligoceni. The flysch in sector Dervican-Jergucat is missed and carbonates rockies contact in surface with marshy deposits that filled Dropulli field.

Carbonates deposits that construct Mali I Gjere Massif in surface are with high level of charst. Also the charst development is connected with the great surface that occupied cretacbcarbonates deposits, smoothtopography and the full absence of vegetation in the greater part of its.

The development of charst along fissures of stratification has concluded in cave and cavern in forming. The greatest is Skotinia cave. This cave is developed in stratiform limestone of Paleocen.

The sources that drained the massif of Mali i Gjere are most, for example “Syri i Kalter”, Vrisi in Delvina, sources of Kardhikaqi and Kallagjeras in west side. In east side of massif the limestone has the lowest altitude in sector Jergucat-Derevican 200-300m. Here there are no sources but only in intensive rainfall period, the waters of massif appear in surface as sources, for example the cave of Skotinia and the sources of Viroi in Gjirokaster.

The source of Bistrica is situated in west of Muzina at the altitude 152-170m. Average discharge of this source is estimated 18m^3/sec water. The source of Viroi drains in altitude 195m and represented the lowest point of limestones in east side of this structure. Maximal discharge is up 30m^3/sec. The other sources that drained the massif are: Sotira sources, Koshovica, Leshnica, Vrise Kardhikaqi with discharge that oscillate from 30-450l/sec. Annual average discharge estimated arrived in 1m^3/sec.

Annual volume that drained from sources is 24m^3/sec.Annual volume of precipitation is 30m^3/sec.In totality effectiv infiltration value is 0.5. Annual average precipitation that fall over the surface of carbonatic massif (442km^2) is 2200mm/vit, and the discharge is 16m^3/sec that makes up only 65% of water value that drained from massif.Ground water flow direction is southwest.

The water is used for drinking, irrigation and hydropower of Bistrica.

4. CONCLUSIONS

The hydrographic basin of Albania has a total area of 43,305 km² from which only 28,748 km² are situated within the state territory of Albania. The rest, which belongs to the catchments of the rivers Drini and Vjosa, is situated in Greece, FYROM and Yugoslavia.

Albania has a rich basin of groundwater composed by basins of Drini, Vjosa, Shkumbini, Mati, Erzeni, Ishmi, Semani rivers.

Groundwater in Albania is the only source of drinking water. It is a huge source of development potential, but also extremely vulnerable to overexploitation and pollution. The quality of groundwater in Albania, in generally is good, except those well fields who are near the coast line or are effected by pollution.

By establishing a basis of joint management of their watersheds, the projects which are implemented or are waiting to be , will promote a cost-effective solution to transboundary natural resources management and pollution problems, and provide a basis for the sustainable economic development of the groundwater in Albania.

5. RECOMMENDATION

Europe alone has more than a hundred transboundary aquifers. The boundaries and recharge areas of groundwater systems are often unknown. Moreover, the impacts of actions in upstream countries on downstream countries are usually not directly visible and may not even occur until years later. There is a general lack of expertise when it comes to aquifer management, and even less law on transboundary aquifers than on transboundary rivers.

Managing water systems that cross national boundaries poses a unique challenge. Waters contained entirely within one country are subject only to that country's administrations. But transboundary waters are subject to the politics, cultures, stages of development, and development goals of various mediterranean countries.

The efforts are needed to:

- Build confidence between Mediterranean countries that share aquifers, gradually leading to the time when countries are willing to work together and allocate resources to solve collective problems.
- Linking water management and sustainable regional development
- Developing and sharing best practices and principles
- Moving towards integrated management of shared basins
- Improving institutions
- Improving understanding and use of human and political processes
- Raising awareness about benefits of cooperation

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