

## Geographical characteristics

The River Bregalnica Water Catchment Area is located in the eastern part of the Republic of Macedonia to the left of River Vardar. To the North-East the area borders Bulgaria. It is situated between 42°9'25" and 41°27'20" North Longitude and 21°48'30" and 23°01'50" East Latitude. The distance between the northernmost and southernmost extension of the watershed is 78 km and between the easternmost and westernmost 102.25 km. The watershed covers an area of 4300 km<sup>2</sup> equalling 16.72 % of the country.

The municipalities with land located inside the Bregalnica watershed are: Berovo, Vinica, Delchevo, Zrnovci, Karbinci, Kochani, Makedonska Kamenica, Pehchevo, Probishtip, Cheshinovo-Obleshevo, Shtip, Sveti Nikole, Kratovo, and Lozovo. The watershed divide of River Bregalnica does not perfectly coincide with the administrative boundaries of all of the fourteen municipalities.

The Bregalnica watershed forms part of the Rodopian mountain massif. Tectonic, predominantly very old orogenic movements before and after the Pliocen shaped the current relief. The upper watershed is composed of the mountains Osogovo, Plachkovica, Serta, Konechka, Maleshevo, Ograzhden, Vlaina, Obozna and Golak.

The relief is highly diversified, dominated by the main water course of the Bregalnica River forming deep gorges in its upper part (i.e., Maleshevo-Pijanec, Pijanec-Kocani, Kocani Lakavica, Lakavica-Vardar) and a wide open floodplain in the lower sections (i.e., Ovche Pole and Ezhovo Pole). The four main side-valleys of the Bregalnica River are formed by the Rivers Pijanec, Malesh, Vinica-Kochani and Krivalakavica. Hilly areas, consisting of fluvial deposits and cones covered with alluvial soils typify large areas of the watershed.

Lead-zinc ore deposits constitute the largest and economically most important mineral deposits within the watershed, exploited by the mines of Zletovo, Dobrevo and Makedonska Kamenica. Copper and iron-titanium deposits have been reported from the Osogovo Mountains.

Most common non-metal minerals are asbestos, kaolin clays, granite, limestone, basalt, feldspar, opal breccias, opalised tuff and bituminous schists. The micro region Maleshevia has large deposits of lignite of which 10,000 tons annually are extracted through open-pit mining. The un-exploited "brown" coal reserves of the Delchevo-Pehchevo Basin are an estimated 24 million tons. Other coal deposits are reported from the municipalities of Probishtip and Makedonska Kamenica.

## Climate

The upper Water Catchment Area of the Bregalnica River is characterized by very cold winters. The lowest absolute minimum temperature ever recorded in Macedonia has been from the Municipalities of Berovo and Pehchevo. The average annual temperature amplitude is 21°C, the

absolute amplitude 66 °C. This high temperature fluctuation is indicative of a typical continental climate.

The middle part of the Water Catchment Area averages a monthly temperature of 13°C with a medium amplitude of 23°C. This section is typified by a large number of days with low humidity and temperatures above 30°C, indicative of elements of a Mediterranean climate entering the area via the Vardar River Valley.

The Municipality of Kochani reports an average of 100 days with temperatures above 20°C. The highest temperature records of the Bregalnica Watershed are from the Municipalities Ovche Pole, Shtip and Ergelija with an average monthly summer temperature of 25°C), indicative of a moderate continental climate.

With an average annual precipitation varying between 506 mm in Kochansko Pole and 672 mm in the Maleshevo Region, the Bregalnica Watershed is considered “arid”. Precipitation is distributed unevenly with a maximum recorded for April and May, and a minimum for the summer months of July and August. Snow precipitation occurs from December to March.

The Bregalnica Watershed is known for its large number of sunny days providing excellent opportunities for photovoltaic- and photo-thermal energy production. The lower part of the watershed is well known for its high potential for wind-energy.

## Hydrology

The River Bregalnica is one of the major tributaries of the River Vardar, the largest River in Eastern Macedonia. The Bregalnica Water Catchment Area constitutes the main water resource in Eastern Macedonia, bringing both life and food into the region.

River Bregalnica originates from the Maleshevo Mountains at 1200m a.s.l., close to the Macedonian-Bulgarian border, to the South of the mountain peak “Kalaica”. The Ratevska Reka River, the most significant Bregalnica tributary, drains into the Bregalnica south of the Municipality Berovo.

In its upper reaches the Bregalnica River deposits a high volume of coarse sediments onto the floodplain in the vicinity of Delchevo Municipality. The high turbidity of the Bregalnica characterizing its upper course changes to a slow flow below the community of Istibanja.

From Kochani downstream the Bregalnica assumes the character of a typical lowland river, meandering and depositing its sediments on its shallow banks and flood plain. Following the confluence with the Zletovica River, the Bregalnica enters into a rather scenic, forest covered narrow gorge.

Passed the city of Shtip the Bregalnica carves deep into the paleogenic sediments slowly converting the plain into a deeply furrowed canyon shortly before draining into the Vardar River at the village of Ubovo, located 135 m a.s.l.

The total length of the Bregalnica River is 211.5 km with an average descend of 5‰. The Bregalnica River is divided into three distinct sections: (a) turbulent typical high mountain stream from its source to Istibanja; (b) slower moving section interspersed with shallow rapids up to Shtip; and (c) slow typical potamic character from Shtip to its confluence with the Vardar River.

The hydrography of the East Planning Region consists of the river network, reservoirs and natural springs, including mineral and thermal waters. The most significant water resource is the Bregalnica River feeding the Reservoir Kalimanci, the largest reservoir in the Eastern Region. This Reservoir, predominantly used for irrigating 28,000 ha agricultural land of the Kochani- and Ovche Pole Valley, has a volume of 120 million m<sup>3</sup>, constituting 48% of the total annual mean flow volume of the River Bregalnica. The catchment area of the Bregalnica River contains numerous other reservoirs such as Ratevo, Petrashevec, Loshana, Gradche, the village Pishica Reservoir, as well as numerous smaller reservoirs. The maximum flow of the Bregalnica River occurs in April, the minimum flow in September.

Producing a total volume of 23 million m<sup>3</sup> of water, the Zletovica Reservoir - Knezhevo Dam are of great importance in the target area as Key provider of potable water for several municipalities located within the lower section of the watershed including the city of Shtip.

The Bregalnica Watershed is recognized for its numerous thermal springs, with the better known and used located in the Vinica area (Istibanja), Cheshinovo-Obleshevo (Banja) and the Shtip region (Kezhovica).

## Flora and Fauna

Macedonia is known for its high level of taxonomic diversity and the high number of relic and endemic species. The country supports 252 known endemic plant species. An estimated 70 species are threatened. Some 30 plant communities are considered endangered and/or threatened. Due to the extremely high biodiversity of the Balkan Region concentrated in Macedonia (70%-90% of all plant species recorded for the Balkans), the country is widely recognized as the most important 'Biodiversity Hotspot' of Europe.

According to the World Conservation Monitoring Centre Macedonia has 414 known species of amphibians, reptiles, birds, and mammals. Of these 4.8% are reported to be threatened.

Although no records on animal species diversity, relative abundance and distribution are available for the Bregalnica Water Catchment Area -except for game species subject to controlled and well regulated hunting- it may safely be assumed that species diversity and relative abundance is

highest in the upper and least disturbed reaches of the watershed. Animal species diversity within the lower river floodplain, which is mostly under intensive agriculture, is believed to be low as a result of early habitat alienation and the past and current liberal and uncontrolled use of agro-chemicals with unknown effects on animal species which have not managed to adapt to cultivated land.

Forest dependent ungulates, common throughout the Bregalnica upper watershed, include roe deer, wild boar, and red deer (rare). Typical forest-dwelling fur bearers include martens, ferrets, foxes and badgers. River otters are still known to occur in the area. Wolves are relatively common throughout in spite of heavy hunting pressure. Upland game birds of the target area are grouse, chukar partridge, quail, pheasant, and doves. Waterfowl hunted in the target area include several duck species, coots, cormorant and snipe.

The Ictyofauna is represented by species such as chub, barbell, and dace. Less common are the common carp and catfish. Stocks of native trout and most other edible fish species are low as a direct result of extremely high water contamination of the Dams and River Bregalnica proper, and over-fishing.

To date no comprehensive research data on plant species composition and distribution, and only rudimentary information on the habitat types are available for the River Bregalnica Water Catchment Area. The highly diverse topography, relief, geology, soils, water distribution and the numerous micro-climates typifying the Bregalnica Watershed however, suggests the occurrence of a very high plant species diversity.

Several endemic vascular plant species have been recorded from the Bregalnica Watershed which also is well known for its large diversity of “medicinal”- and aromatic plant species widely collected and used by local people. In addition, twenty-five tree species, with multiple sub-species are known to occur. Over 50% of the watershed, mostly in its upper reaches, is covered by forests (136,738 ha), dominated by mixed stands of oak and beech. Coniferous forests, composed of pine, silver fir and spruce, are rare. The habitat type “Dry Meadows”, is found mostly on flat slopes of southern exposure. Sub-alpine meadows, typically rich in herbs and grass species, cover the higher mountains of the upper Bregalnica Watershed.

## Municipalities in Bregalnica Region

The Bregalnica watershed consists of 14 municipalities with over 100 associated villages and hamlets. The total population is 203,213. The largest urban centres in the target area are the cities of Shtip (population of 47,796) and Kochani (population of 38,092). The overall population in the region shows a negative population growth, the population of rural villages is aging with young people leaving the rural communities in search of a better life elsewhere.

The municipalities with land located inside the Bregalnica watershed are: Berovo, Vinica, Delchevo, Zrnovci, Karbinci, Kochani, Makedonska Kamenica, Pehchevo, Probishtip, Cheshinovo-Obleshevo, Shtip, Sveti Nikole, Kratovo, and Lozovo. The watershed divide of River Bregalnica does not perfectly coincide with the administrative boundaries of all of the fourteen municipalities.

Official employment is 22.9% of the population, the rest is self-employed or without a job. 34% of the population is listed as self-employed subsistence farmers. The majority of the available work force and the majority of registered employees are located in the larger urban centres. The three key employment sectors are agriculture (11.71%), trade and retail, (38%) and manufacturing (15.49%). The forestry sector and wood processing industry play a vital economic and social role in the Bregalnica target area where almost 100% of all households depend on firewood as sole energy source for heating and cooking.

More than 70% of the Bregalnica Watershed population lives in rural areas with approximately 32% of all households depending entirely on agriculture for their livelihood and 65% partly. Subsistence farming dominates the rural family life. The lower Bregalnica watershed is known for irrigated rice production.

Most important raw material in the Region with important economic value is lead-zincum mineral from mines Zletovo, Dobrevo and Kamenica. The annual production of these mines is 1.000.000 tones.