Study of hydrosystems dam-groundwater: case of the Beni Haroun dam (Oued El Kebir, Eastern Algeria) and the surrounding groundwater bodies

Nour El Imene Benchabane[1,2,*] Nabil Chabour[1], Mounira Djebbar[1], Henia Dib[1], Nabila Gaci[2]
[1]Department of Geology, FSTGAT, Mentouri Brothers University of Constantine 1, 25017 Constantine, Algeria; [2]Department of Geological Sciences, Faculty of Biological and Agronomical Sciences FSBSA-UMMTO, Mouloud Mammeri University, 15000 Tizi Ouzou, Algeria
[*]E-mail**:** nourelimanebenchabane@gmail.com

The study deals with an assessment of the impact of setting water of Beni Haroun dam on the underground water resources of the Constantine region. The geological site consists of complex formations of carbonates and marls, strongly tectonized, in the Neogene basin between Constantine and Mila. The dam was thus built on a limestone bed in the form of a syncline, set between two marly formations (Eocene downstream, Paleocene upstream). This synclinal, flared in trough on the right bank, tightens in direction of the left bank where the layers become vertical at the same time as its axial plane undergoes an incurvation towards the South. The tectonics affected this structure by a system of faults, passing south of the dam (in the reservoir), diving towards the NW, as well as a system of tensile fractures roughly oriented NS. The few outcrops of Triassic age, namely gypsum facies, observed upstream of the dam, on the slopes of the basin, injected into Cenozoic rocks, are associated with the existence of weakness zones.

The large-scale reservoir (1 billion m^3) on Oued El Kébir, downstream from the Rhumel-Endja confluence and a few tens of km north of Constantine, is one of the most important in the East. This hydraulic structure is located in an area with high potential in surface water (Oued Rhumel, Oued Endja, etc.), and underground (karstic aquifer, alluvial Oued Endja, etc.). This set of water bodies is reminiscent of a systemic functioning, a classic case of exchanges between surface and underground waters, and the various risks they incur or cause in the environmental context.

The objective of the study thus consists of the hydrosystems knowledge in order to establish the different risks incurred by the underground environment and the reservoir. These facts will be sought through the piezometric measurements of water bodies during high water periods.

Piezometric measurements of the aquifer in recent wet years have shown a close relationship between the impoundment and the groundwater laden.

In addition, the result of the piezometric monitoring at the level of the piezometers installed at the dam site gives an insight into the infiltration of dam water towards the karst representing the seat of the dike. It appears that the water flow is concentrated on the left bank following two drainage axes: the contact between the limestones and the Paleocene marls NW part and the discontinuities network of breach and fracture. The piezometric observations on the left bank of the dam have demonstrated anisotropic permeability of limestones, highly parallel than transverse to the layers, thus implying circulations parallel to the stratification. These observations prove the risk of water loss from the reservoir into the karstification voids of the rock.

It is clear that the exchanges made between the water bodies expose the Béni-Haroun dam to the risk of instability due to the choice of the geological site. Indeed, fractured and karstified carbonates are likely to benefit from a concentrated infiltration of subsurface waters downstream of the dam. It constitutes a loss for constraint. Also, the fault beneath Oued Rhumel bed and the overlap of Sidi Merouane, west of Oued El Kebir, corresponding to a flexure zone developed during the lower Miocene compression, constitutes a more important source of water loss from the reservoir into the

karst. This state of facts is accentuated by active tectonics with earthquakes reaching a significant threshold.

Finally, from an environmental point of view, the introduction of surface water into groundwater may cause serious issues threat to the chemical quality of the aquifer, the karst aquifer is less concerned because of the mobile water it drains into its ducts.