

The groundwater occurrence, flow pattern, rate of recharge and hydrochemical setup in the Tekeze River Basin (TRB)

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The groundwater occurrence, flow pattern, rate of recharge and hydrochemical setup in the Tekeze River Basin (TRB) is strongly controlled by the type of rocks and their stratigraphic positions (litho-stratigraphy), geological structures, the topographic setup and the prevailing climatic conditions. The basin constitutes diversified rock types ranging in age from Precambrian to Quaternary and complex tectonic structures. Different sets of folds, faults and lineaments with diverse orientations and associated fractures prominently affect almost all the rock formations in the TRB. Climate and geomorphology of the basin are also diverse.

The major aquifers in the basin are confined in the Tertiary volcanics, Antalo limestone, Adigrat sandstone and quaternary sediments. The most important large-scale groundwater basins in the north-eastern highlands of the TRB are areas like Abreha-atsbeha, Wukro, Agulae-Haikmesahil, Upper Illala-Aynalem-Upper Cheleket, and around Adigudom. Few places in the lowlands of Humera area are also known for their localized groundwater potential. Four potential groundwater zones (the Debark-Debat plain; the Belesa Plain; the Lalibela and the Sekota areas) have also been identified in the Upper Tekeze sub-basin. The dolerite dykes and sills which occur associated both with the Mesozoic sedimentary rocks and volcanic rocks play a double role, as localized aquifers when intensely jointed/weathered and as barriers to groundwater flow or as aquicludes when massive. Whereas, the basement rocks and associated intrusives are usually considered as regional aquicludes in almost all parts of the basin even though some localized aquifers are evident along regional faults and associated fractures. In general, secondary porosities that are found associated with structural disturbances in the rocks play significant role in controlling the groundwater of the basin.

Groundwater recharge to aquifers in the Tekeze basin basically originates from summer rainfall and recent rainwater recharged groundwater is dominant. The total annual recharge rate within the basin is estimated at 50 to 100 mm/yr from global estimates.

Majority of the water samples in the TRB are characterised by Ca-Mg-HCO₃. But, the water type of the basin generally ranges from Ca-Mg-HCO₃ to Ca-Mg-Na-HCO₃-SO₄-Cl type.

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