

# **Assessing the Water – Energy Nexus in the Beqaa Valley in Lebanon by Estimating Groundwater Depletion Using Remote Sensing**

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## **Abstract:**

The Beqaa valley in Lebanon currently hosts the highest number of refugees per capita in the world. It is also the major agricultural production area in the country. Groundwater levels in some regions of the valley have decreased by more than 15 meters in the last five years. Water use estimates at the regional and the field scale for this valley are crucial for enhancing resilience and for managing competing sectorial water demands. In this research, we plan to derive an actual evapotranspiration estimate using a one source energy balance-based algorithm at the field scale for the Beqaa for the period 1984-2017. For this we utilize all available Landsat imagery including Landsat 4, 5, 7, and 8 using local weather data. The METRIC energy-balance approach will be used to determine the 30-m ET maps over the study area. We will also calculate the increase in energy consumption due to the declining groundwater levels caused by this depletion. This work will be the first of its own that makes use of the full range of Landsat products in calculating evapotranspiration over the Beqaa valley. The outcome of this research also offers unique opportunities for estimating past and future trends of groundwater withdrawals. Results can provide insights into the sustainability of irrigated agriculture and the required international interventions in the water sector for enhancing resilience of refugee and local communities.