Agricultural Water Consumption Estimation in the Helmand Basin

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Abstract : Hamun Lakes, located in the Helmand Basin, consisting of four water bodies, were the greatest (>8500 km2) freshwater bodies in Iran plateau but have almost entirely desiccated over the last 20 years. The desiccation of the lakes caused dust storm in the region which has huge economic and health consequences on the inhabitants. The flow of the Hirmand (or Helmand) River, the most important feeding river, has decreased from 4 to 1.9 km3 downstream due to anthropogenic activities. In this basin, water is mainly consumed for farming. Due to the lack of in-situ data in the basin, this research utilizes remote-sensing data to show how croplands and consequently consumed water in the agricultural sector have changed. Based on Landsat NDVI, we suggest using a threshold of around 0.35-0.4 to detect croplands in the basin. Croplands of this basin has doubled since 1990, especially in the downstream of the Kajaki Dam (the biggest dam of the basin). Using PML V2 Actual Evapotranspiration (AET) data and considering irrigation efficiency (≈ 0.3), we estimate that the consumed water (CW) for farming. We found that CW has increased from 2.5 to over 7.5 km3 from 2002 to 2017 in this basin. Also, the annual average Potential Evapotranspiration (PET) of the basin has had a negative trend in the recent years, although the AET over croplands has an increasing trend. In this research, using remote sensing data, we covered lack of data in the studied area and highlighted anthropogenic activities in the upstream which led to the lakes desiccation in the downstream.