Hydro-climatic variability of the Hadejia-Jama’are river systems in north-central Nigeria

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Abstract The study investigates the hydrological fluxes and land-use dynamics of the Hadejia-Jama’are basin in north-central Nigeria for sustainable agricultural development. The empirical Thornthwaite model was used to determine the potential evapotranspiration (PE) loss taking into account the land-use dynamics obtained from change detection using Landsat TM of 1986 and 2006. Using the results obtained from land-use dynamics, multiplying factors were determined and future water balances computed for high and medium emission climate change (HCC; MCC) scenarios for 50 and 100 years. The results reveal that the basin is currently recording a water deficit and that this will increase by 0.52% for the 50-year MCC, 0.53% for the 100-year MCC, 7.25% for the 50-year HCC and 37.82% for the 100-year HCC in Nguru, relative to the 2006 water balance. Sustainable agricultural practices and appropriate dam optimization techniques to ensure eco-friendly developments were recommended.

Key words hydro-climatic; land use; water stress; climate change; Hadejia-Jama’are river systems, Nigeria