

Changing hydroclimatic and discharge patterns in the northern Limpopo Basin, Zimbabwe

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Abstract

Changing regional and global trends in climate and discharge, such as global warming-related declines in annual rainfall in south-eastern Africa, are likely to have a strong influence on water resource availability, and to increase livelihood risk. It is therefore important to characterise such trends. Information can be obtained by examining and comparing the rainfall and runoff records at different locations within a basin. In this study, trends in various parameters of temperature (4 stations), rainfall (10 stations) and discharge (16 stations) from the northern part of the Limpopo Basin, Zimbabwe, were statistically analysed, using the Spearman rank test, the Mann-Kendall test and the Pettitt test. It was determined that rainfall and discharge in the study area have undergone a notable decline since 1980, both in terms of total annual water resources (declines in annual rainfall, annual unit runoff) and in terms of the temporal availability of water (declines in number of rainy days, increases in dry spells, increases in days without flow). Annual rainfall is negatively correlated to an index of the El Niño – Southern Oscillation phenomenon. The main areas of rising risk are an increasing number of dry spells, which is likely to decrease crop yields, and an increasing probability of annual discharge below the long-term average, which could limit blue-water availability. As rainfall continues to decline, it is likely that a multiplier effect will be felt on discharge. Increasing food shortages are a likely consequence of the impact of this declining water resource availability on rain-fed and irrigated agriculture. Declining water resource availability will also further stress urban water supplies, notably those of Zimbabwe's second-largest city of Bulawayo, which depends to a large extent from these water resources and already experiences chronic water shortages.

Keywords: climate variability, climate change, discharge analysis, Pettitt test, rainfall analysis, water resources, Limpopo Basin, Zimbabwe, Southern Africa