

HISTORICAL TREND AND FUTURE PROJECTIONS OF EXTREME CLIMATE IN NEPAL

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Abstract

Climate is critical for a country like Nepal where water resources and agriculture largely depend on the existing climate. However, climate is changing at a much faster rate with changes in temperature and precipitation that have far-reaching implications for a country's economic and sustainable development. This study investigates the historical trends in daily extreme temperature and precipitation indices in Nepal using the in situ measurements from 1980 to 2020 and provides future projections of extreme climate indices using five Coupled Model Inter-comparison Project Phase 6 (CMIP6) model datasets under the Shared Socioeconomic Pathways (SSP245 and SSP585) scenarios for the time period of 2021 to 2100. Historical observed climate data from 85 meteorological stations were considered for extreme precipitation, and 23 stations for extreme temperature. In this research, thirteen temperature indices and eleven precipitation indices were developed considering the Expert Team on Climate Change Detection and Indices (ETCCDI).

The findings reveal a significant warming trend across Nepal, with increased occurrences of warm days and warm nights in most stations, while cool days and cool nights are decreasing. The precipitation data show changes in precipitation patterns with increasing consecutive dry days (CDD) in most locations, while trends in consecutive wet days (CWD) are diverse, with some regions experiencing longer consecutive rainy periods, and others facing shorter intervals without precipitation. Future projections based on climate models suggest a probable increase in the duration of consecutive dry days (CDD) across all models, which could have implications for agriculture and water resources. Trends in consecutive wet days (CWD) show variability among models, with both increasing and decreasing patterns observed. Overall, annual total precipitation is expected to increase, along with the number of heavy precipitation events represented by R10mm and R20mm indices.

Keywords: Climate Change, CMIP6, Extreme Precipitation, Extreme Temperature