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# Unraveling Climate Shifts: A Data-Driven Analysis of Urban India's Changing Climate

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## ABSTRACT

Climate change is one of the most pressing global challenges of this era which has significantly affected the urban environments, changing temperature patterns and precipitation trends sometimes leading to extreme weather events like flooding or droughts. For the purpose of this research we examined long-term climate variability across five major Indian urban centers—Delhi, Uttar Pradesh, Mumbai, Bangalore, and Chennai and also integrating future projections generated by climate models under different scenarios (SSPs) to estimate how climate might change in the coming years. The historical climate data (1951–202) are analyzed using statistical techniques, including the Mann-Kendall test and Sequential Mann-Kendall test to detect trends in temperature and precipitation. The research further uses machine learning techniques like Bi-LSTM to enhance predictive accuracy in climate trend analysis. These findings provides insights into India's changing climate and it can be used to develop strategies to overcome these challenges.

**Keywords:** Bi-LSTM; CMIP6; Mann-Kendall; Sequential Mann-Kendall; Trend analysis