

ABSTRACT

Responding to the threats of climate change by cities requires relevant actions that will communicate future climate conditions in a reliable and effective manner for sustainable and transformational climate actions. Given that the population of urban areas in Nigeria continues to rise and that changes in climate conditions continue to have profound implications on urban residents, a better understanding of the implication of these changes has informed this study. The study presents the current and future climatic conditions of major Nigerian cities in the past by using the analogy approach (climate similarity) and presents the implications for future sustainable city related actions. The future climates of the cities were identified in the past under two representative concentration pathways RCP4.5 (mitigation scenario), RCP8.5 (emissions continuing to rise throughout the 21st century). The climate similarity was calculated using data set from coupled model inter-comparison project-5 (CMIP5), a downscaled and biased-corrected projections of future climate for total monthly precipitation and average temperature (running mean of 2030s and 2050s) and a modified R similarity script. The study revealed that the climate of Nigerian cities in the current (average of 2030s) and future (average of 2050s) periods will be similar to the historical (1971 to 2000) climatic condition of another place on the globe based on the similarity scores. The new places with similar climate conditions are to the south of the corresponding cities (indicating warming) and within the neighbourhood of longitude (10°W to 20°E) in the tropics. The similarity scores in the mitigated scenario for the 2030s climate are; 0.81, 0.78, 0.77, 0.80, and 0.74, while the unmitigated scenarios are; 0.79, 0.64, 0.76, 0.68, 0.75 for Abuja, Lagos, Makurdi, Benin, and Port Harcourt respectively. This implies that the high similarity values of 0.81 and 0.79 for the city of Abuja presents a climatic condition most similar to Kuje and Teungo while the city of Kano with low similarity values of 0.64 and 0.68 presents a drastic change in climate conditions which is an indication climate novelty. Similarly, the results for similarity scores for the 2050s are; 0.80, 0.64, 0.74, 0.67, 0.71 if climate mitigation continues and 0.7, 0.61, 0.74, 0.69, 0.69 for the unmitigated scenario. Also, the city of Abuja in the 2030s has a 2.59 °C increase in temperature when compared to the historical period while the indices shows that the highest warming in minimum temperature is in Abuja and Kano. This significantly increasing trend in the hot and warm indices and the decreasing trends in the occurrence of cool days is an indication of warming for the cities. These are indications of increased exposure of the cities to climate impacts such as heatwaves, and for Kano city, water scarcity. The results implies that despite the use of a highly optimistic climate change scenario (RCP 4.5), the climate conditions of the cities will change or shift to such a great extent that they will resemble more closely the conditions of another place entirely. Drawing from the interaction between the cities and their analogues, the study advances the urban climate resilience literature by illuminating the future impacts of different climate scenarios on urban areas. To develop a climate sustainable city, a mix of infrastructure and behavioural change such as the incorporation of climate considerations into urban designs and policies to enhance human thermal comfort are required. The findings guides the understanding and application of the analogue approach and developed a more relate-able

communication approach for climate change awareness by simplifying the complex abstracts and scientific projections of climate into personal experiences. While future research might apply qualitative studies and additional data to support the analogue results, the findings presents the use of analogue approach into environmental issues in Nigeria and other West African countries in accordance to sustainable city goals (SDG 11).