

SELECTION OF BEST-FIT CMIP6 GCMS FOR THE PROJECTIONS OF FUTURE PRECIPITATION AND TEMPERATURE IN SRI LANKA

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Climate change refers to long-term variations in climate parameters. Significant long-term variation of climate parameters is referred to as climate change. Future climate information can be projected using General Circulation Models (GCMs). Projections are perplexed from GCM model to model leading to a certain degree of uncertainty. The selection of best-fitted GCMs with recent updates can significantly reduce the uncertainty in climate projections. This study aimed to rank and select a subset of best-fitted models for Sri Lanka by evaluating the performance of GCMs. Precipitation data of 45 years from 51 stations were compared with the outputs of historical runs for 30 CMIP6 GCMs to evaluate the performance of GCMs. The maximum and minimum temperatures of 33 years from 18 stations were also compared with the outputs of historical runs for the same period for 17 CMIP6 GCMs. Three indicators, namely, Percentage bias (PBIAS), Root Mean Square Error-observations standard deviation ratio (RSR), and Pearson correlation coefficient (r), were used to assess the performance of the GCMs, and the weights for each indicator were determined using the entropy method. For performance ranking of GCMs, compromise programming (CP) approach and Multi-Criteria Decision Making (MCDM) technique, were employed. The top-ranked models for simulating annual precipitation were CESM2, FGOALS-f3-L, FIO-ESM-2-0, and GFDL-ESM4. For simulating *Yala* season, GCM model CanESM5-CanOE, CMCC-CM2-SR5, CMCC-ESM2, and CNRM-CM6-1-HR were accurate, while CNRM-CM6-1, CNRM-CM6-1-HR, CNRM-ESM2-1, and EC-Earth3-Veg-LR resulted higher accuracy for *Maha* season. The maximum temperature was accurately simulated by INM-CM4-8, INM-CM5-0, KIOST-ESM, and MIROC6, while AWI-CM-1-1-MR, CNRM-CM6-1, CNRM-ESM2-1, and INM-CM4-8 delivered the highest accuracy for the minimum temperature. Identified high-accuracy GCMs can be used for simulating future climate change impacts on water resources and crop production, as well as to identify vulnerable regions for proactive adaptation and mitigation strategies.

Keywords: Climate change, Compromise programming, General circulation models, Simulations