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The occurrence of extreme hydrological events in Colombo district and their impacts

B. N. Rathnayake¹, A. D. A. P. Premarathna¹, H.G.T.D. Hewawasam¹, T. Magisa¹ and B. G. N. Sewwandi^{1*}

¹Department of Zoology and Environmental Management, University of Kelaniya, Sri Lanka
*sewwandih@kln.ac.lk

Extreme hydrological events in the Colombo district of Sri Lanka were assessed using the Standardized Precipitation Index (SPI) and the Rainfall Anomaly Index (RAI) and possible adaptation measures to reduce the impacts in the affected areas were proposed as objectives in the research. The analysis encompasses rainfall data from 1989 to 2020 and focuses on four meteorological stations within the Colombo district: Colombo, Ratmalana, Angoda, and Homagama. Rainfall data and impact data were obtained from the Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS) website and the Desinventar website, respectively. RStudio and Microsoft Excel were used for the calculations. The daily rainfall data and the monthly rainfall data were used to calculate the Rainfall Anomaly Index (RAI), and the Standard Precipitation Index (SPI), respectively. The SPI for a three-month period (SPI3) was employed to analyze flood and drought conditions. The RAI serves as a complementary tool to assess wet and dry events. The findings from the SPI analysis indicate several notable periods of extreme wetness, including November and December 1997, March to May 2008, January, February, September, and October 2011, and May, June, and July 2016. These periods pose a high risk of flooding in the Colombo district, potentially leading to significant environmental impacts. The RAI index confirms the occurrence of extremely wet events in October 1997 and May 2016. Furthermore, the research identifies drought periods, particularly in 1992, 1994, 2012, and 2016, using SPI calculations. However, the absence of substantial drought impacts in the Colombo district, which is located within the Wet Zone of Sri Lanka, indicates that the local population may not be severely affected by the dry events. Deaths, injuries, property damages and destructions, and destruction of crops are some of the impacts that people are directly and indirectly affected due to flood. The findings of this research highlight the effectiveness of the SPI and RAI indices in assessing extreme hydrological events. It is fair to conclude that floods have occurred in 1999, 2006, 2008, 2009, 2010, 2011, 2016, and 2019 because impact statistics and identified wet periods from calculations are compatible with each other in those years. It also suggests several measures to reduce damage from flooding, such as improving drainage infrastructure, implementing rainwater harvesting systems, and maintaining clean streets and sidewalks. By understanding the patterns and impacts of extreme wetness and dryness, appropriate adaptation measures can be implemented to mitigate the environmental and societal consequences of climate change in the region.

Keywords: Colombo, Drought, Flood, Impacts, Rainfall data, SPI