

Wind Speed Forecasting Based on Historical Data Using Modern Prediction Methods in Selected Sites of Geba Catchment, Ethiopia

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Abstract : This study aims to assess the wind resource potential and characterize the urban area wind patterns in Hawassa City, Ethiopia. The estimation and characterization of wind resources are crucial for sustainable urban planning, renewable energy development, and climate change mitigation strategies. A secondary data collection method was used to carry out the study. The collected data at 2 meters was analyzed statistically and extrapolated to the standard heights of 10-meter and 30-meter heights using the power law equation. The standard deviation method was used to calculate the value of scale and shape factors. From the analysis presented, the maximum and minimum mean daily wind speed at 2 meters in 2016 was 1.33 m/s and 0.05 m/s in 2017, 1.67 m/s and 0.14 m/s in 2018, 1.61m and 0.07 m/s, respectively. The maximum monthly average wind speed of Hawassa City in 2016 at 2 meters was noticed in the month of December, which is around 0.78 m/s, while in 2017, the maximum wind speed was recorded in the month of January with a wind speed magnitude of 0.80 m/s and in 2018 June was maximum speed which is 0.76 m/s. On the other hand, October was the month with the minimum mean wind speed in all years, with a value of 0.47 m/s in 2016, 0.47 in 2017 and 0.34 in 2018. The annual mean wind speed was 0.61 m/s in 2016, 0.64, m/s in 2017 and 0.57 m/s in 2018 at a height of 2 meters. From extrapolation, the annual mean wind speeds for the years 2016, 2017 and 2018 at 10 heights were 1.17 m/s, 1.22 m/s, and 1.11 m/s, and at the height of 30 meters, were 3.34m/s, 3.78 m/s, and 3.01 m/s respectively. Thus, the site consists mainly primarily classes-I of wind speed even at the extrapolated heights.

Keywords : artificial neural networks, forecasting, min-max normalization, wind speed

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