

**Analysis of wind speeds based on the Weibull model and data correlation for  
wind pattern description for a selected site in Juja, Kenya**

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## ABSTRACT

There is increasing interest in wind energy investment by both public and private producers in Kenya. However, the biggest challenge is the lack of up-to-date site specific data information on wind energy potential across the country. Hence the need for more studies to establish an updated site specific wind data information. In this research, the wind speeds distribution was investigated for JKUAT-Juja whose altitude is 1416 m above sea level, ( $1^{\circ} 10' S$ ,  $37^{\circ} 7' E$ ) in Kiambu county approximately 35 km from Nairobi Kenya. The wind speeds were analyzed and characterized on short term (three months) measured hourly series data of daily wind speeds at 13 m and 20 m heights. Analysis included daily wind data which were calculated to represent; the mean wind speed, diurnal variations, daily variations as well as the monthly variations. The wind speed frequency distribution at the 20 m was determined and the mean wind speed found to be 5.04 m/s with a standard deviation of 2.59. The average wind speeds at the two heights (13 m and 20 m) were used to calculate the wind shear exponent and the roughness parameter for the selected site in Juja; this was found to be 0.16 and 0.048 m respectively. Using the calculated shear exponent, an extrapolation of the speeds was done to higher heights of up to 150m. Maximum speed obtained at the 150 m height was 8.4 m/s during the month of October. The wind speed distribution was modeled using the Weibull probability function and the power density for Juja site was found to be  $131.35 \text{ W/m}^2$ .