

# Use of Digital Elevation Models for Simulation of Wind Energy Potential in West Nusa Tenggara

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## Abstract:

The ratio of electricity in West Nusa Tenggara region is still relatively low which may be caused by the difficulty of on-grid electricity development. Therefore, the development of alternative electrical energy generator needs to be done to meet the electricity needs of the community and as a climate change mitigation efforts. One such effort is the developing the wind-driven electrical generator that can be stand alone developed in the regions with high topographic variation. To support this, the study engaging the elevation and surface roughness factors is important to conduct to estimate the potency of wind energy in various vertical altitudes and horizontal areas.

This paper describes the potential of wind energy in West Nusa Tenggara by considering the elevation factor that produces electrical energy output in various conditions. Digital Elevation Model (DEM) used to estimate the wind energy potential at various heights is GTOPO30 and the land cover map used to estimate surface roughness is the Moderate Resolution Imaging Spectroradiometer (MODIS). Furthermore, the simulation of wind speed/direction and wind turbine generators in several heights (10m, 30m, and 50m) and at various horizontal area (coastal beaches, region between the mountains, and open land) was processed using WAsP v.10 software and estimated using Wind Profile Power Law. Validation of the estimated wind speed was done using vertical wind profile obtained from Soundings observation. The results showed that the wind speed and the potential electrical energy are maximum obtained in open land and coastal areas at altitude of 50m. The maps of output are also shown in this paper to identify the potential of wind energy spatially and vertically.

Keywords: GTOPO30, WAsP v.10, West Nusa Tenggara, wind energy potential, wind profile