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Identify a potential location for wind power plant in Jaffna district, Sri Lanka using GIS techniques

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Wind energy is one of the renewable energy sources in the Sri Lanka. Currently, there are some active wind power stations located in Central region, Hambanthota, and Puttalam. National Renewable Energy Laboratory (NREL) estimates that there are nearly 5000 km² of windy areas with good-to-excellent wind resource potential in Sri Lanka after accounting for excluded lands like national parks, nature reserves, archaeological and cultural sites. The windy land represents about 6 % of the total land area (65,600 km²) of Sri Lanka. Hence the population increment has become a major problem on electricity demand and the hydro power is limited especially in dry season, this study is focused on finding a suitable location to establish a wind power plant in Jaffna District using Geographical Information Systems (GIS). The land was selected considering criteria namely; the distance from obstructions as 150 m, the distance from Coastal area as 100 m, the height from buildings and trees as 9 m and 1.5 acres of land area was considered as providing 2 MW of power. The land use maps were collected from Survey Department, Sri Lanka and the wind data was taken using wind finder software. Under the methodology, the wind speed data of selected points were clipped to Jaffna district map. The wind speed, land use, terrain, building area and nature reserve maps were reclassified and assigned weights using weighted overlay tool in ArcGIS software to derive the suitability map. The weights were given as wind speed (70%), land use (15%), building area (10%), nature reserves (4%) and terrain (1%). According to the results shown in the map, the wind speed was high in Delft Island and Nainatheeve and poor in Chundikulam. When considering all the criteria, Delft island (5000 ha) should be the best place and the land area of 200 ha can be used for the construction of the wind power station.

Keywords: Location, weighted overlay, land use, potential