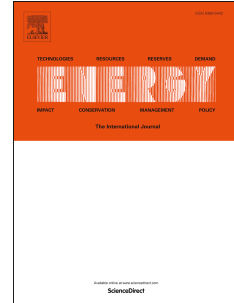


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A comprehensive approach for wind power plant potential assessment, application to northwestern Iran

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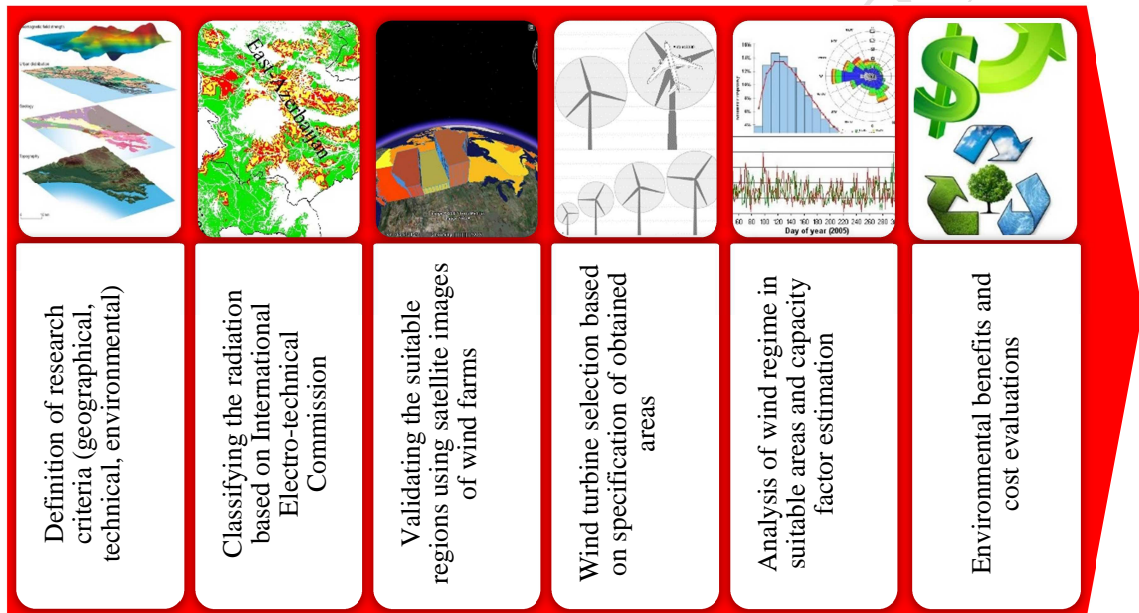
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Graphical abstract

A comprehensive approach for the wind potential assessment in regional scale



Abstract

In the current study, the techno-environmental and economic feasibility analysis was conducted for prospective wind power plants in North West Iran. In order to assess the most appropriate and prospective wind farms, a Multi Criteria Decision Making (MCDM) technique in ArcGIS was used by applying the most important and effective environmental and technical criteria in the study area. Then, the obtained areas were classified on the basis of International Electrotechnical Commission (IEC) turbine classes using the wind speed map of the country to select the most appropriate wind turbine technology. The Weibull function was applied to model the wind behavior using actual meteorological data. The best fitted Weibull parameters including shape factor and mean wind speed were used in System Advisor Model (SAM) software to calculate the capacity factor for the three most promising regions of the study area at three different mast heights. The results indicated that around 9,116 km² was available as suitable area for wind turbine class III power plant implementation. Turbine Vestas V47 was chosen in order to estimate the amount of annual output energy, according to the achieved capacity factors condition. The total potential of annual generation was estimated to be 11,180.17 GWh, which can cover the majority of energy demand in the area. Finally, economic evaluation for this turbine showed that the generated power cost is around 0.15 \$/kWh (4,350 IRR/kWh). In the last step of this study, the amount of greenhouse gases reduction was calculated for each site.

Keywords: Wind Energy; MCDM; Weibull distribution; GIS; Iran

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