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Temporally-explicit and spatially-resolved global onshore wind energy potentials

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8 **Abstract**

Several influential energy systems models indicate that renewable energy must provide a significant share of the world's electricity to limit global temperature rises to below 2°C this century. To better represent the costs and other implications of this shift, it is important that these models realistically characterise the technical and economic potential of renewable energy technologies. Towards this goal, this paper presents the first temporally-explicit Geospatial Information System (GIS) methodology to characterise the global onshore wind energy potential with respect to topographical features, land use and environmental constraints. The approach combines the hourly NASA MERRA-2 global wind speed data set with the spatially-resolved DTU Global Wind Atlas. This yields high resolution global capacity factors for onshore wind, binned into seasonal and diurnal time-slices to capture the important temporal variability. For each country, the wind power generation capacity available for various capacity factor ranges is produced, and made freely available to the community. This data set can be used to assess the economically viable wind energy potential on a global or per-country basis, and as an input to various energy systems models.

22 Keywords: wind power, technical potential, Global, Geospatial, renewable energy, energy systems model

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