

Land Suitability Analysis Based on Ecosystems Service Approach for Wind Farm Location in South-Central Chile: Net Primary Production as Proxy

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Abstract : Wind power constitutes a cleaner energy source with smaller unfavorable impacts on the environment than fossil fuels. Its development could be an alternative to fight climate change while meeting energy demands. However, wind energy development requires first determining the existing potential and areas with aptitude. Also, potential socio-economic and environmental impacts should be analyzed to prevent social rejection of this technology. In this context, this work performs a suitability assessment on a GIS environment to locate suitable areas for wind energy expansion in South-Central Chile. In addition, suitable areas were characterized in terms of potential goods and services to be produced as a proxy for analyzing potential impacts and trade-offs. First, layers of annual wind speed were generated as they represent the resource potential, and layer representing previously defined territorial constraints were created. Zones depicting territorial constraints were removed from resource measurement layers to identify suitable sites. Then, the appropriation of the primary production in suitable sites was determined to measure potential ecosystem services derived from human interventions in those areas. Results show that approximately 52% of the total surface of the study area has a good aptitude to install wind farms. In this area, provisioning services like food crops production, timber, and other forest resources like firewood play a key role in the regional economy and thus are the main cause of human interventions. This is reflected by human appropriation of the primary production values of 0.71 KgC/m².yr, 0.36 KgC/m².yr, and 0.14 KgC/m².yr, respectively. In this sense, wind energy development could be compatible with croplands, which is the predominant land use in suitable areas, and provide farmers with cheaper energy and extra income. Also, studies have reported changes in local temperature associated with wind turbines, which could be beneficial to crop growth. The results obtained in this study prove to be useful for identifying available areas for wind development, which could be very useful in decision-making processes related to energy planning.

Keywords : net primary productivity, provisioning services, suitability assessment, wind energy

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