

Abstract

Environmentally friendliness of renewable energy, sustainability, and championship from international bodies such as IRENA and United Nations under the Sustainable Development Goals (SDGs) has led to the massive rise of development and utilization of renewable energy in the world. Global installed wind-generated capacity onshore and offshore has increased by a factor of almost 75 in the past two decades, jumping from 7.5GW in 1997 to 564GW by 2018. Kenya is spearheading the renewable energy sector in Africa with more than 70% of its electricity production from geothermal and the recent development of the Lake Turkana Wind Power Project. In this study, a GIS-based Multi-Criteria Decision Analysis (MCDA) was used to determine the suitable locations for the development of large-scale wind power projects in Isiolo County. Both dynamic and simple, relevant criteria were determined through thorough literature studies on the topic and expert advice. The MCDA approach utilized the power of AHP to derive weights for the criteria considered. The analysis process produced restriction zones, suitability maps per criterion, and a composite suitability map from an overlay of the suitability maps and the restriction maps. The analysis classified the area of study as least suitable, moderately suitable, very suitable, and extremely suitable. Approximately, 0.76% of the total study area was poorly suitable, 30.74% moderately suitable, 7.57% very suitable, and 3% extremely suitable. A follow-up study such as the use of questionnaires should be conducted to determine the community's response to any potential wind installation on their land. Additionally, a cost/ benefits analysis associated with developing wind power farms at the determined extremely suitable and very suitable locations should be conducted to improve this research. It was evident that this approach of integration of GIS and MCDA is useful for solving complex problems and can be applied in many areas such as environment, planning, waste management, ecology, site selection, etc.