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# Protocol to Include Ecosystem Service Constraints in a Wind Farm Cost Model

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The Rhode Island Coastal Resources Management Council (CRMC) has been leading an Ocean Special Area Management Plan (SAMP) aimed at zoning the state's coastal waters to accommodate offshore wind farm developments. In previous SAMP related work, the authors had considered the wind farm siting issue as an optimization problem between wind resources and technological constraints. In the present analysis, the additional constraints on wind farm siting of ecosystem services "cost", in particular ecological and social services, are explored in an ecosystem-based management (EBM) conceptual framework. An ecological typology of the coastal area is developed on the basis of ecological variables, using spatial multivariate principal component and cluster analyses. Then, the sensitivity of the resulting ecological subregions to wind farm impact is assessed through the construction of ecological services impact indexes. A fishery service index is used to assess the fisheries services constraints. Ecosystem services constraints are combined with the technological cost and the wind resources to provide a wind farm siting index (WiFSI), which can be used as a tool to identify optimal areas for wind farm siting. In the paper, the authors develop the conceptual approach and present its application to the SAMP area as a case study. The technological cost is based on wind turbines with lattice jacket support structures, as currently proposed in Rhode Island waters, and the WiFSI method is used to identify optimal potential wind farm sites in coastal and offshore Rhode Island waters.

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