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Optimising Submarine Cable Routes from Offshore Windfarms – Site Suitability Mapping

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The Irish Government's Climate Action Plan aims to increase renewable energy generation capacity to 22GW by 2030, with at least 5GW of this to be produced by offshore wind. The potential to harness and develop this resource is significant; however not all areas offshore are suitable. Moreover, not all routes from windfarms to land are suitable for the submarine cables needed to transfer the energy produced offshore back to the onshore grid.

This research utilizes geospatial analysis to identify the optimal route selection for offshore export cables. The area under consideration for this research encompasses the South and West coasts of Ireland in the North Celtic Sea and Eastern Atlantic Ocean, areas under intense development for offshore wind, particularly floating wind platforms.

To achieve this, a geospatial repository of publicly available data was compiled to ensure the key features related to cable route feasibility were included in the spatial analysis. These layers included bathymetric, geological, and ecological data, as well as information on human activities in the area, to assess the potential hazards to a submarine cable within a particular region. Each variable was assessed as to its importance in the route selection model using criteria weights derived from the Analytical Hierarchical Process and expert opinion of a panel of industry representatives. The resulting data layers were combined into a suitability map of the seabed using a Weighted Overlay Analysis.

Individual offshore wind sites and coastal landfall sites were selected based on proposed developments. GIS route selection methods were then implemented, principally the least-cost path algorithm, to identify the optimal route.

The combined criteria map produced in this project classifies regions off the South and West coasts of Ireland into zones of suitability for cable routes and highlights the main areas along the coast most appropriate for cable landfall sites. By using automated route selection tools in GIS along the suitability map surface, realistic paths along the seabed can be quickly designed to allow for adequate burial of the cable, and avoidance of obstacles, hazards and zones of exclusion.

The findings of this research indicate that distance from existing coastal substations is a key factor in terms of the economic viability of a cable route. Many windfarms will require more than one export cable, and with several windfarm proposals within the same coastal region, bottle necks at

suitable landfall sites may be expected.

The results of the study provide a useful tool for policy makers and developers in the planning stage. In a broader context, these findings can be upscaled, customised and applied at a national level for other countries to allow a systematic approach to offshore renewable energy development.