



FAIR Marine Data Workflows for Policy: Unifying Seabed Integrity and Connectivity in Irish SACs via EDITO and DestinE

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Abstract Text (235 words):

Making marine geospatial data Findable, Accessible, Interoperable, and Reusable (FAIR) remains challenging for researchers and policy implementors, particularly in integrating geological and biological datasets for Special Areas of Conservation (SACs) management. This contribution shares experiences developing domain-specific FAIR workflows for west coast Ireland SACs (Porcupine Seabight, Belgica Mound, Inisheer Island), harmonizing INFOMAR multibeam data, EMODnet Geology, OBIS biodiversity, and Copernicus currents via the European Digital Twin Ocean (EDITO) and Destination Earth (DestinE) platforms (and others).

Seabed integrity metrics (e.g., Bedrock Suitability Index information) and substrate maps (85% accuracy, Random Forest classification) will be processed on available platforms, e.g., EDITO and DestinE HPC, post-QC for best possible and valid geometries and INSPIRE compliance. Biodiversity connectivity matrices (previous published work and code from the coastalNet R package will be cited and explored), pairwise probabilities e.g., 0.35 Belgica-to-Porcupine) overlay oceanographic simulations (e.g., ESRI EMUs), deposited as interoperable WMS layers on Figshare DOIs with plain-language metadata and APIs.

Specific challenges include integrating "dark" datasets and bridging technical-policy gaps; solutions involved AI-driven summarization, automated versioning, and user-centric pilots (e.g., co-design workshops, tracking download rates, policy citations). Additional challenges include alignment with MSFD thresholds (>25% degraded seabeds) and OSPAR goals fostered adoption, with sensitivity analyses (low BSI reduces connectivity 20-40%) potentially useful for informing trawling vignettes and conservation and restoration efforts (reefs on BSI>0.7).

This approach respects ocean science needs while promoting cross-disciplinary understanding and reuse (e.g., hydrology via sediment mobility), demonstrating cultural shifts through stakeholder panels and GDPR-compliant training toolkits. Outcomes advance RDA ESES goals by scaling FAIR practices for real-time AI dashboards, inviting dialogue on community-driven refinement.

How to cite: Auerbach, J. and Crowley, Q.: FAIR Marine Data Workflows for Policy: Unifying Seabed Integrity and Connectivity in Irish SACs via EDITO and DestinE, EGU General Assembly 2026, Vienna, Austria, 3–8 May 2026, EGU26-21811, <https://doi.org/10.5194/egusphere-egu26-21811>, 2026.