



A Classification Framework for Heterogeneous Seabed Mapping Data in Marine Spatial Data Infrastructure (MSDI) for Sustainable Marine Management

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Marine spatial data infrastructure (MSDI) enables comprehensive management of marine geospatial data for ocean governance, although the incorporation of seabed mapping data from heterogeneous sources creates significant issues since there is no established mechanism for communicating the reliability of the data collected, which can lead to misinterpretations and ineffective governance decisions. In this study, an entirely qualitative approach was adopted, whereby analysis of literature through a systematic review of the standards set by the International Hydrographic Organization (IHO) will form the basis of the development of a user-oriented framework of accuracy classification of bathymetry data in MSDI. A dual-level accuracy classification matrix is proposed based on the above information. There are three primary levels in this classification system: high, moderate, and low - to quickly assess users' requirements. In addition, nine secondary levels are proposed from "ultra-high accuracy" to "provisional," with a combination of seven technology layers and six category zone of confidence (CATZOC) classes ranging from A1 to below D. Testing the accuracy matrix using a hypothetical dataset provided by the Hydrographic Office, National Aquatic Resources Research and Development Agency (NARA) of Sri Lanka resulted in identifying the secondary classification level at "Standard Plus" and primary classification level at "Moderate." The framework makes clear that all bathymetry data, regardless of age and source, has its significance for MSDI, provided that it has a clear accuracy status associated with it. This classification matrix serves as a governance instrument for marine data policy, enabling legally defensible data use, standardised quality assurance, and accountable decision-making across jurisdictional boundaries and survey orders. Furthermore, this matrix offers a scalable, standards-based solution for global MSDI implementation for bathymetric data, empowering informed decision-making for navigation safety, marine spatial planning, and sustainable ocean management. This can be extended to other MSDI data categories.

Keywords: *Marine spatial data infrastructure, Bathymetric accuracy, Sustainable ocean, Data policy, Classification*