

# Delivering Quality Marine Data and Services: the IODE Quality Management Framework

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Marine data are fundamental to our understanding of the processes that control the environment. These data are a key requirement for effective strategic decision making and play an important role in promoting the development of economic activities and underpin many of our activities. Reliable marine data are key inputs to the efficient management of marine resources and it is essential that accurate data be accessible in a timely manner to facilitate informed decision making. The value of such data increases when they are provided by organizations that have established and adhere to quality management principles.

Quality management is the process for ensuring that all the activities necessary to design, develop, and deliver a product or service meet the requirements of the end-user. Quality management focuses not only on product and service quality, but also on the means to achieve it. Users of marine data, products and services are increasingly calling for quality management systems to be put in place to provide a level of confidence in quality.

The International Oceanographic Data and Information Exchange (IODE) programme of the Intergovernmental Oceanographic Commission (IOC) of UNESCO maintains a global network of more than 100 National Oceanographic Data Centres (NODC) and Associate Data Units (ADU) responsible for the collection, quality control, archive, and online publication of many millions of ocean and marine observations which are made available to Member States.

The IODE has long held the view that there is a need for a quality management framework to ensure that NODCs and ADUs are established and operate according to defined principles, including adherence to agreed standards and the requirements of the IOC Oceanographic Data Exchange Policy. This will ensure NODCs and ADUs are able to provide data of known quality to meet the requirements of a broad community of users.

The IODE has implemented a Quality Management Framework (IODE-QMF) to provide the overall strategy, advice and guidance for NODCs and ADUs to design and implement quality management systems for the successful delivery of marine and related data, products and services. The IODE-QMF addresses the implementation of quality management systems that will assure the quality of final data, products and services.

The IODE has implemented an accreditation process whereby NODCs and ADUs must satisfy a minimum set of requirements to ensure compliance with IODE standards and to establish a mechanism to regularly monitor and assess the quality of their data and services. IODE has been accredited as a WDS Network Member and is certified against the Network Member Catalogue of Criteria developed and managed by the WDS-SC. Network Members are bodies representing groups of data stewardship organizations, some of which may or may not be WDS Regular Members. IODE contributes to the WDS through its network of NODCs and ADUs and the IODE accreditation process will ensure these centres can demonstrate their capability to meet the WDS certification requirements.

In response to the IOC-IODE guidance and to the requirements of funding agencies, the Marine Institute of Ireland included "Quality" as a goal in its Data Strategy (2017-2020), with a target of achieving the IOC-IODE accreditation as the NODC for Ireland. The Marine Institute was awarded IOC-IODE accreditation in February 2019. In its submission to IOCE-IODE, Ireland's National Marine Data Centre (hosted by the Marine Institute) included a Data Management Quality Management Framework

(DM-QMF) model; a manual detailing this model and how it is implemented across the scientific and environmental data producing areas of the Marine Institute; and, at a more practical level, an implementation pack consisting of a number of templates to assist in the compilation of the documentation required by the model and the manual (Leadbetter, et al., 2019).

This paper discusses the key steps required to implement a quality management system and the accreditation process used to ensure NODCs and ADUs can demonstrate their capabilities to provide data, products and services in compliance with established standards and procedures. The real-world experience of the Marine Institute in developing a DM-QMF is presented along with a discussion of the ongoing implementation progress within the organisation 18-24 months after the DM-QMF was initially piloted.

## **References**

Leadbetter, A., Carr, R., Flynn, S. et al. Implementation of a Data Management Quality Management Framework at the Marine Institute, Ireland. *Earth Sci Inform* (2019). <https://doi.org/10.1007/s12145-019-00432-w>