



The Importance of Data Management to Environmental Monitoring

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In an era of “Big Data” and the “Internet of Things,” OceanWise is raising the bar on how environmental monitoring data are acquired, stored, and disseminated. This article explains how UK ports and other organisations responsible for a wide range of marine management activities and maritime-based operations are becoming more efficient and reducing risk by adopting a modern, business-orientated approach to information management.

Reliable and up-to-date environmental monitoring data are critical to most, if not all, maritime operations. The data are required in real-time in Vessel Traffic Services (VTS) centres, by pilots and on-site superintendents, and as a historical record to plan, for example, dredging and survey campaigns, licence applications and compliance reporting, and to support engineering and environmental studies. The data are acquired by sensors and through field surveys and laboratory analysis. Many operators often find that whilst the scope and quality of the data are satisfactory, the telemetry (or transmission), management, and display of data are often poorly implemented or completely overlooked.

Furthermore, the ability to discover and exchange data with stakeholders, such as dredging or survey contractors and even the regulator, is often problematic. In addition, the ability to incorporate data into external applications (such as being able to calculate under keel clearance or vessel motion dynamically) or to assimilate data into numerical forecast models or to broadcast the data to vessels at sea automatically via the maritime Automated Identification System (AIS), for example, is also non-existent or limited.

Streamlining and modernising how an organisation considers and manages its environmental data, by adopting a more data-centric approach, can bring major benefits. OceanWise has been working with ports and other marine and maritime operators for over five years and has pioneered the concept of a Port or, when considered more widely, a Maritime Information Infrastructure (Figure 1).

OceanWise’s Maritime Information Infrastructure is based on sound data management principles and best practices that can be described as a Spatial Data Infra-

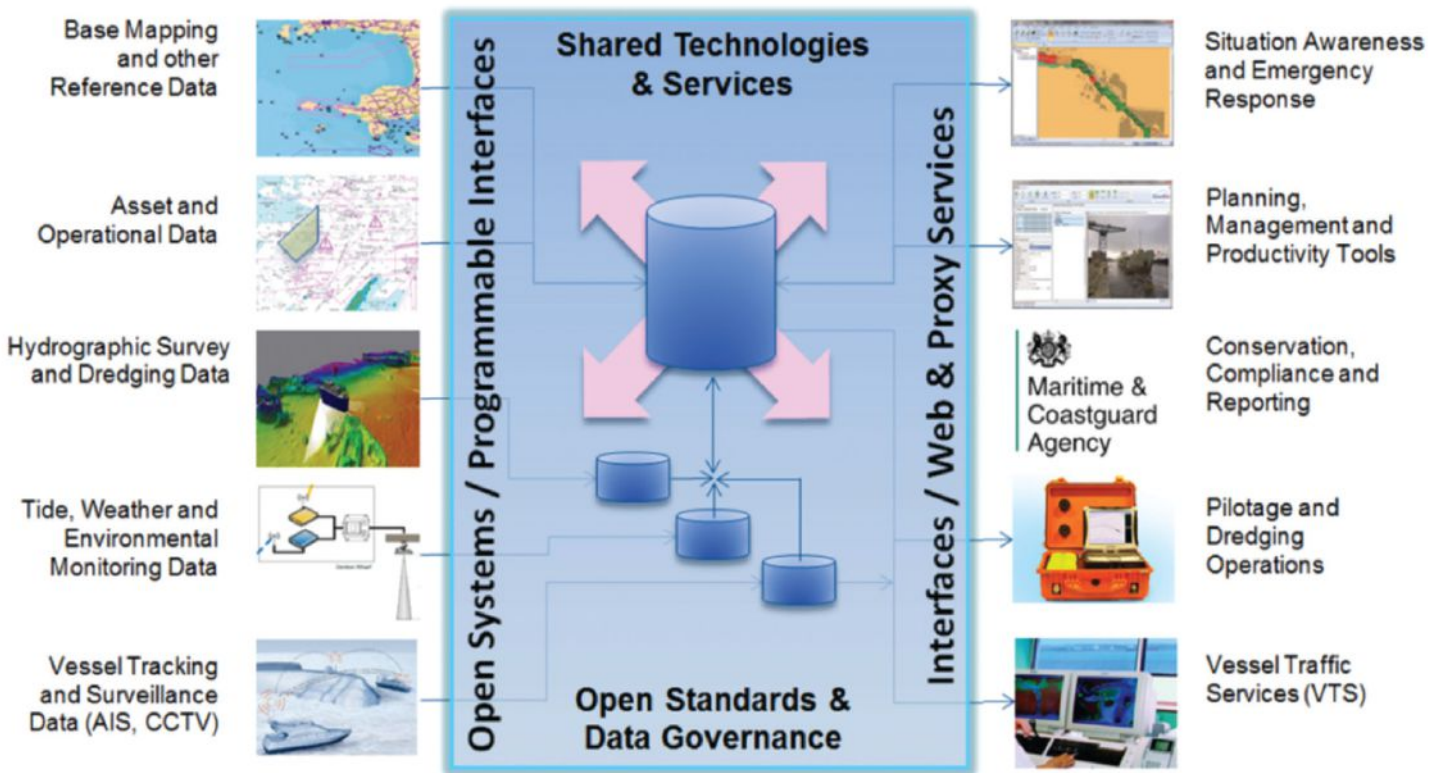


Figure 1. Maritime Information Infrastructure (Enterprise SDI).

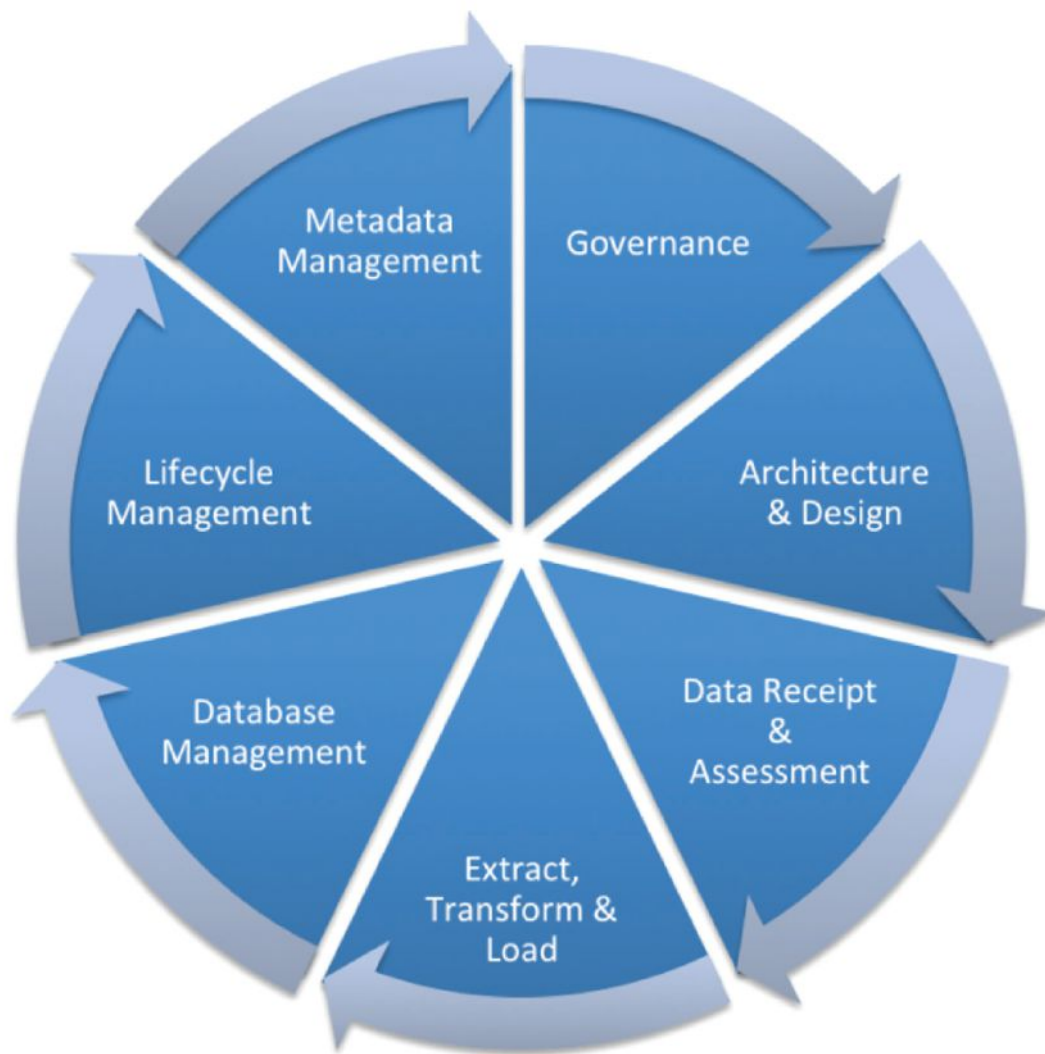


Figure 2. DAMA International Body of Knowledge Data Management Wheel, modified by OceanWise.

structure (SDI) operating at an enterprise level and encompassing land and marine as well as commercial and logistical components. Developing this concept over time, an organisation can consider its data and information as a centralised and valuable asset (second only in value to its employees), connecting disparate sources of data (e.g., sensor data) and thus making data processing and information exchange more effective. In doing so, significant business improvements are realised for all its stakeholders.

The means of achieving these benefits is endorsed by adopting a data governance framework, policy, and

management system that sits alongside and supplements other business management systems, such as for Quality, Environment, and Health and Safety. Whilst it is feasible to improve how data and information are managed without a data policy and management system in place—and OceanWise has assisted many organisations to do this—it does encourage the high level buy-in and managerial commitment necessary for long-term investment and success. Whilst there is currently no international standard for data management, similar to ISO 9001 for Quality Management, there are plenty of reference material and examples of best practice (Figure 2).

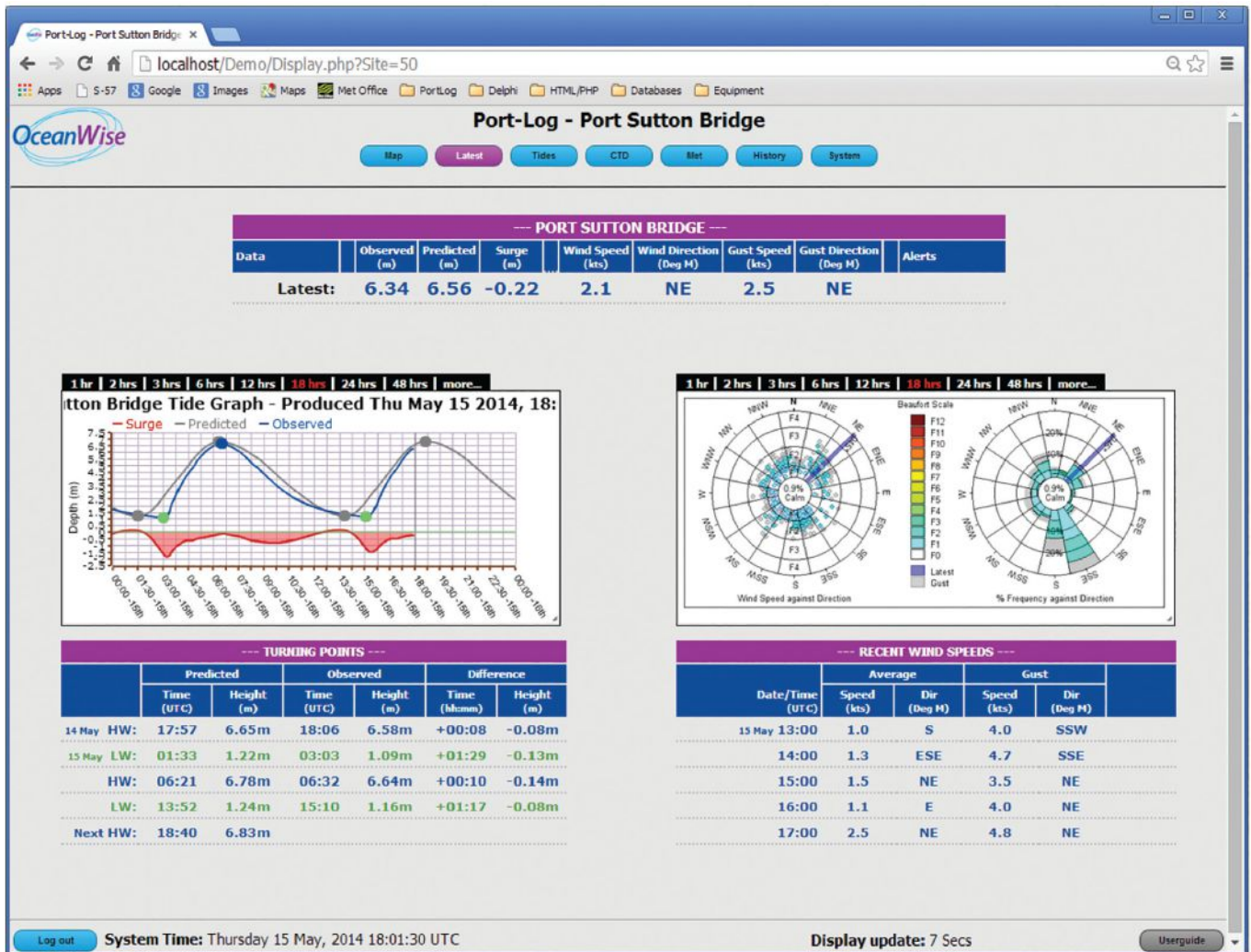


Figure 3. Example Port-Log.net data management and display system for Port Sutton Bridge, Lincolnshire, UK.

Port-Log.net, OceanWise’s Environmental Data Sharing and Publishing platform, uses open standards and a data-centric approach to help many organisations globally achieve the above aims (Figure 3). It provides access to reliable data 24/7 all year round for multiple purposes and provides a reliable long-term record. The online (cloud-based) system means there is no need to install new servers or worry about upgrading existing hardware and software. Also, the system provides for the integration of almost any sensor and data type (air and water quality, tide and weather, seabed samples etc.), meaning it can use existing monitoring equipment, resulting in large cost and time savings, and with the security and comfort of a fully supported flexible system.

OceanWise’s Geographical Information System (GIS) and Productivity Tools software simplify how data are ingested, exchanged, and manipulated to meet the needs of specific tasks, such as Dredging and Licensing Management and the production of Port and Bathymetric

ENCs (Figure 4) as well as provide immediate access to crucial data and information on a map for maritime security, and emergency planning and response. Tasks that are traditionally paper- or spreadsheet-based become simpler and more efficient by having the data ready to hand in a well-structured system.

Data are managed by personnel, called “data stewards,” who are best placed to understand them and keep them up to date; these data stewards ensure that the data are shared with the rest of the organisation or wider afield and used in third-party applications. Exporting, reformatting, and transcribing data becomes a thing of the past, resulting in time and cost savings of up to 40% and eliminating transcription and other errors, thus reducing risk and ensuring data are kept up to date.

At the backend of both OceanWise’s environmental monitoring data and software products and services is Ocean Database (ODB). Realisable on proprietary sys-

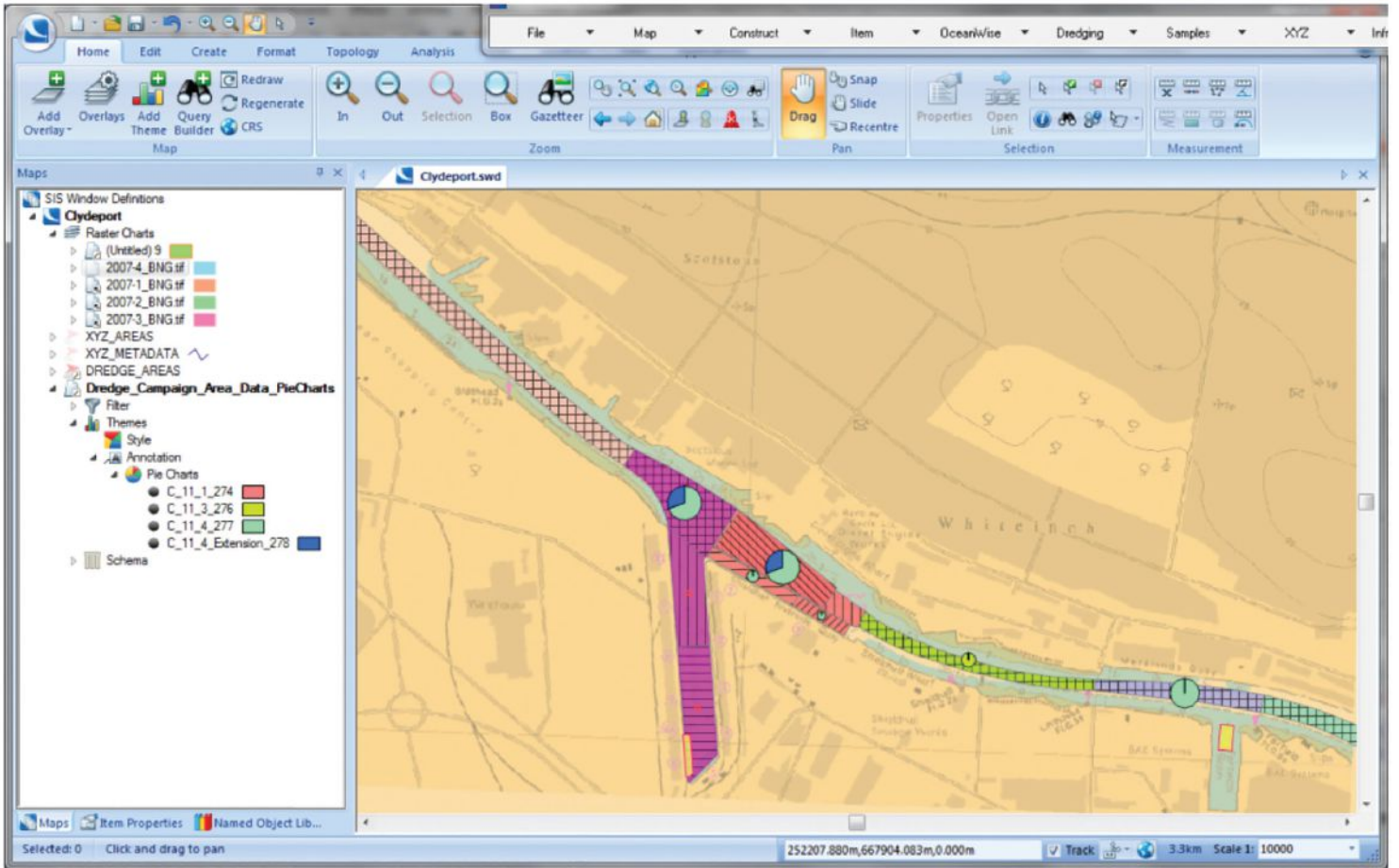


Figure 4. Example map display used in conservancy management.

tems, such as Oracle and Microsoft SQL Server, and open-source software, such as MySQL and PostGIS, ODB is the only known off-the-shelf relational database management system for marine environmental datasets.

ODB is based on a comprehensive and flexible data model encompassing multiple data types gathered from a wide range of sensors and laboratory analyses, as well as spatial datasets, such as land and marine base mapping, buildings, and other infrastructure and assets. ODB includes metadata records for each dataset and links to trusted vocabularies, which are both crucial for data management best practice and data exchange. ODB also includes calibration records, which are essential for keeping sensor data accurate.

OceanWise's consultative approach is much appreciated by the company's customers. Often, the customer does not require a completely new monitoring system when a phased upgrade will suffice. OceanWise ensures that existing hardware is re-used whenever possible and replaced only where absolutely necessary. As Russell

Bird, Peel Ports Group Hydrographer, explains: "This is a big attraction as it means lower front-end costs and a much quicker installation."

Being customer-focused and by providing a modern integrated approach to environmental data management means that OceanWise's systems are being rolled out across several major port groups in the UK and overseas. Soon, all major port groups in the UK, notably Peel Ports and Associated British Ports, as well as wind farm and other maritime operators and agencies globally will be realising the incremental benefits that result from not just undertaking environmental monitoring but also ensuring that the data are properly managed as well.

If you would like to learn more about how to improve your data management, a good place to start is the IMarEST-run Marine Data Management Awareness Course. Details and how to register are available on the IMarEST website (www.imarest.org/events-courses/training-courses/marine-data-management-awareness-course).