INTRODUCING SPATIAL DATA INFRASTRUCTURES

Marine SDI

Global warming, climate change, rising sea levels and increased commercial exploitation of the seabed and sea space are important global indicators of a changing world environment. A crucial role is played by hydrographic and oceanographic spatial data in supporting response. Accurate and timely base reference information minimally comprises seabed topography and characterisation to which temporal information such as wave, tide and current can be referenced.

In order to provide a complete picture, information held by HOs, National Mapping Agencies (NMAs), geologists, biologists and oceanographers can be brought together to provide solutions through enabling frameworks known as Spatial Data Infrastructures (SDIs). It is important that organisations work together to ensure best practise and that spatial data is made "interoperable" to ensure multidisciplinary use.

The International Hydrographic Organisation (IHO) represents member interests of the National Hydrographic Offices and the hydrographic community across the world. It has successfully focused on the primary role of its membership to ensure the development and sustainability of standards associated with the capture, management and use of hydrographic data in support of UN Convention for Safety of Life at Sea (SOLAS). It does this through the publication of "official" navigational charts and supporting publications.

In November 2005 the IHO hosted a seminar in Rostock, Germany entitled "The Role of Hydrographic Services with regard to Geospatial Data and Planning Infrastructure". The sem–inar recognised formally that hydrographic data was not only important in support of safety of life at sea, but also to defence and the wider envir–onment.
March 2007 saw the following statement by IHB president Vice Admiral Maratos: 'The HO is an important part of the National Geospatial Data Infrastructure and the IHO has an important role to play in co-ordinating requirements and demands for data collection, interoperability, dissemination, access, standards, security, pricing, policy and funding models for hydrographic data"

The hydrographic community has a reputation based on quality and professionalism. It has built up a store of experience and expertise that is relevant when considering the wider use of hydrographic data. The role of IHO is to impart knowledge, provide guidance and standards to practitioners, and inform government and other stakeholders on hydrographic matters. The change in the IHO constitution to embrace the need to encourage wider use of hydrographic information represents an opportunity for the organisation to use this wealth of knowledge and experience to underpin the development of best practice in the creation of marine components of NSDI.

Regional Moves
Regional SDIs are emerging; for example, in the European Union legislation is being formulated to create an Infrastructure for Spatial Information in Europe (INSPIRE). This will develop interoperabilitybetween datasets (e.g. land and sea interface at the coastline), harmonise data and metadata standards, develop network services and encourage the reuse/sharing of public-sector information. The EU Directive INSPIRE was announced on 22nd November 2006 and will be implemented in mid-2007.

HOs may wish to establish a role for themselves and the information for which they are responsible in the development and management of National Spatial Data Infrastructure (NSDI) programmes. The IHO recognises that this can only be done on the basis of the structure of the individual national administration and that this will differ from country to country.

Defining SDI
Spatial Data Infrastructure is a term used to summarise a range of concepts, processes, relationships and physical entities that taken together provide for integrated management of spatial data and information. The term covers the processes that integrate technology, policies, criteria, standards and people necessary to promote geospatial data sharing throughout all levels of government. It covers the structure of practices and relationships among data producers and users that facilitates data sharing and use. It also covers the set of actions and new ways of accessing, sharing and using geographic data that enable far more comprehensive analysis at all levels of government, the commercial and not-for-profit sectors and academia. And describes the hardware, software and system components necessary to support these processes.

Marine Spatial Data Infrastructure (MSDI) in particular is the component of NSDI that encompasses marine geographic and business information in its widest sense. This would typically include seabed topography, geology, marine infrastructure (e.g. wrecks, offshore installations, pipelines and cables etc), administrative and legal boundaries, areas of conservation and marine

habitats and oceanography.

SDI is a framework comprising the following key components. Policy: above all there needs to be a policy to create interoperable information. This is often linked to national or organisational strategy for geographic information (GI). People and organisations: there needs to be willingness and practical co-operation between the various organisations that create, share and use information to implement the overall policy. Enablers: these are essential building blocks in the development of NSDIs, providing the framework for data acquisition, management and updating. Examples include:
-standards: these are being created internationally for geographic information (ISO19xxx, OGC) and in many areas are referenced to sector standards (e.g. S-100)
-Geodetic Reference System: the horizontal and vertical datum to which geospatial information (content) is referenced and the coordinate transformations between systems
-metadata: at its simplest, 'data about data', describing the characteristics of a dataset (content, value and limitations).

Content
Content is at the core of SDI and should be application-neutral, thereby ensuring that it meets the needs of the widest user base. Users should have immediate and easy access to up-to-date, accurate and appropriate information that is linked to other information in a way that reflects how it exists in the real world. Content may be described in the following ways. Reference Information refers to geographical features used by a majority of users as location reference for application information, or in geographical analysis. It comprises base and associated reference information. Application Information is any business-oriented information that requires connectivity through a geographic reference of some kind (such as a building, field, road or user-defined feature such as a property parcel) to enable the end-user to analyse and interpret the integrated information from different sources.

Data
Good quality data is required to support SDI. Whilst many HOs hold data at their own establishments it is not widely appreciated that this, which might include bathymetry, surface navigation, seabed obstructions, seabed characterisation and/or pipelines, is of immense value to a much wider user community outside the traditional navigational uses. The chart, with its in-built shoal bias and heavily sub-sampled depth data, has historically been used to support environmental solutions across the world. Practitioners are now requiring access to better and more consistent data and information.

S-100
The IHO S-57 Transfer standard for Digital Hydrographic Data was developed to meet ENC requirements for an IMO-compliant ECDIS. Its inflexible maintenance regime and inability to support future data themes such as gridded bathymetry and Digital Elevation Models (DEMs), plus the widely held view that the S-57 standard and the ENC Product Specification are identical, has led the IHO to suspend work on its future development. Instead it will define a Geospatial Standard for Hydrographic data, S-100, which will be product-neutral and will support a great variety of source data themes allowing for onward product and service generation.

S-100 will support Marine GIS applications, Web Based Map and Feature Services [WMS, WFS] and be built on sound international standards that enable data interoperability and sharing, metadata creation and network development. In developing S-100 the IHO is embracing the fundamental data requirements of a SDI.

HO Support
Hydrographic Offices (HOs) wishing or invited by their National Governments to be involved in the development and management of National SDI should consider the following questions.
1.Does the structure of the national SDI allow for a comprehensive marine SDI (MSDI), one that excludes hydrographic information, or only a specialised hydrographic SDI (HSDI)?
2.Does the NSDI allow for a HO to become responsible for or partner their national MSDI and its incorporation into the NSDI?
3.Does the type of data provided by HOs support MSDI and/or NSDI?
4.Does the HO collect data purely for the safety of navigation or does it meet the needs of a wider user community?
5.Do the quality and usability of existing spatial databases within the NSDI framework include access to metadata?
6.What are the requirements for quality assurance of data outside of its use in support of SOLAS?
7.Does the establishment of user requirements for supply of hydrographic information impact on any necessary restrictions on data access?
8.Do financial, administrative and technical requirements and/or national policy on cost recovery impact on the establishment and maintenance of MSDI and/or NSDI?

Next steps
In order to prepare the worldwide hydrographic community to respond to the growing requirement for such information, the IHO is to set up a Working Group tasked with developing thinking on how the hydrographic community might respond. Included in deliberations will be how data producers can work together and what processes are necessary for the delivery of data to effectively support wider environmental decision-making processes. The aim of the working group will be to feed back its findings to the IHB in late 2008.

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