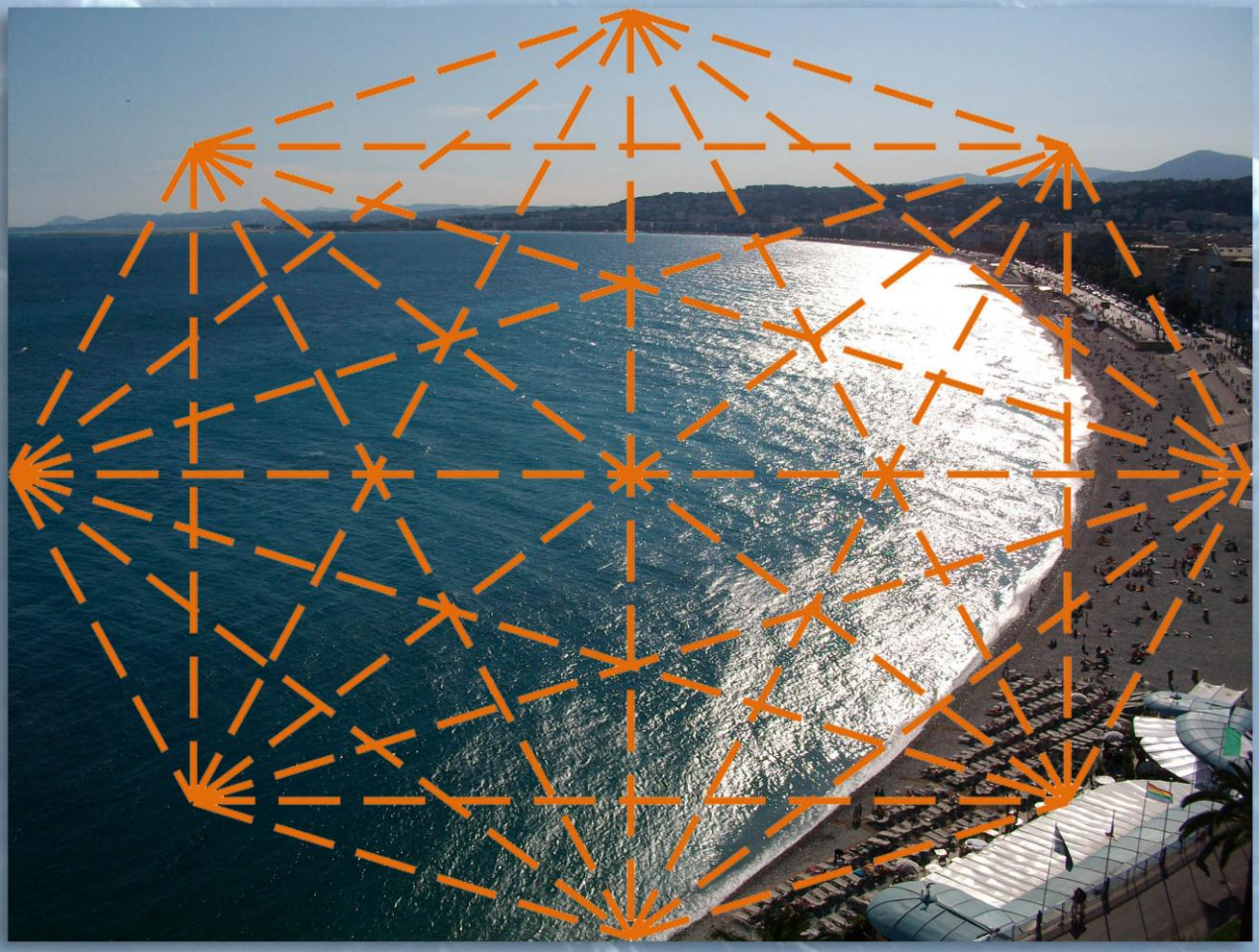
INTERNATIONAL HYDROGRAPHIC ORGANIZATION

SPATIAL DATA INFRASTRUCTURES
" THE MARINE DIMENSION "

Guidance for Hydrographic Offices

Edition 1.0 – October 2009



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Spatial Data Infrastructures "The Marine Dimension"

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IHO Publication C-17 - Edition 1.0

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PREFACE

The 17th International Hydrographic Conference, in May 2007, directed that CHRIS (now the IHO Hydrographic Services and Standards Committee (HSSC)) establish a Marine Spatial Data Infrastructure Working Group (MSDIWG) to identify the Hydrographic Community inputs to National Spatial Data Infrastructures (NSDI). The MSDIWG terms of reference included that the WG should:

- *Propose any Technical and/or Administrative Resolutions that may be required to reflect IHO involvement in the support of NSDI;* and
- *Identify actions and procedures that the IHO might take to contribute to the development of National Spatial Data Infrastructure (NSDI) and/or MSDI in support of Member States.*

The first task above resulted in IHO Resolution K4.7 on MSDI policy, adopted by the 4th Extraordinary International Hydrographic Conference in June 2009 and stating *inter alia* that:

> "*The IHO will support Member States in the identification, development and implementation of an appropriate role in national Spatial Data Infrastructure (SDI) and MSDI initiatives. This will be achieved through:*
> - *The development and maintenance of a Special Publication that will provide a definitive procedural guide to establishing the role of the national hydrographic authority in MSDI."*

Accordingly, a procedural guide to establishing the role of the national hydrographic authority in MSDI was developed by the MSDIWG, under the title *Spatial Data Infrastructures: "The Marine Dimension" - Guidance for Hydrographic Offices*. This document was endorsed by the HSSC at its 1st meeting (Singapore, October 2009), and subsequently approved by IHO Member States as a new publication C-17.

Contents **Page**

Assumptions

In this document the term Hydrographic Office (HO) is used to mean the national hydrographic authority charged with overall responsibility for hydrographic matters particularly as they relate to the provision of hydrographic and nautical charting services under the State obligations of Chapter V of the convention on the Safety of Life at Sea (SOLAS V). In some States this will be a recognised Hydrographic Office; in others it may be a national committee or other government agency or department charged with the responsibility to ensure appropriate services are provided.

Part 1 All about SDI

1. Introduction

This guidance document seeks to explain the way that HO's might promote, support, and participate in Spatial Data Infrastructures (SDI's). It is not definitive in its nature, preferring instead to provide guidance on how best to achieve this through practical advice, simple step by step processes, useful links to reference material and examples of best practise.

Much has already been written about SDI, but primarily from a land-based perspective. However, such reference material comprises theory and policy that is usually universal rather than sector specific. It also provides guidelines rather than advice for specific domains such as the hydrographic community. Rather than repeat this general information at length, the relevant literature reviews are listed at Annex A of this document. The reader is encouraged to consult these references at an early stage of any MSDI development.

This document aims to provide guidance, references, examples of best practise and support in making the right choices regarding whether an HO is, or seeks to take on, a leading role in SDI development or whether that HO seeks to support an existing SDI initiative or work with others to develop an SDI. In all cases, however, the HO should be seen as the competent authority concerning the provision of hydrographic and related data under any national and/or regional SDI.

Working in an SDI environment as described in this document can provide a useful template to developing an SDI capability within the individual HO. An HO could choose to participate at the national or regional level in order to enjoy the shared benefits such an association might bring.

2. Expanded Benefits from an SDI

IHO publication M-2 outlines the benefits and options for the development of a national hydrographic policy that ensures a State has a knowledge of the physical features of the seabed and coast, as well as the currents, tides and certain physical properties of the sea water, such that the needs of safety of navigation and protection of the marine environment can be met.

A successful national hydrographic policy will not only meet the requirements of the mariner but can provide additional and often greater benefits to the State. Such benefits include:

- Safe and efficient operation of maritime traffic;
- Coastal Zone Management;
- Exploration and Exploitation of Marine Resources;
- Environmental Protection; and
- Maritime Defence.

Most HO's hold data in order to support nautical charting requirements with less emphasis usually placed on providing that same data to support wider environmental and commercial coastal and offshore activities. SDI places a greater emphasis on the unlocking of all geospatial information, including hydrographic information, and to make that information more widely available to support the myriad uses as described in Annex B of this document. HO's are therefore well placed to support SDI's.

The development of an SDI is a natural extension in the management and dissemination of the underpinning hydrographic information to a wider user community in an integrated manner. All HO's should therefore consider how they might engage and play a full role in the development of, or participation in, an SDI.

3. Definitions

3.1 What is Spatial Data?

Spatial Data is the data or information that identifies the geographic location of features and boundaries on Earth, such as natural or constructed features, oceans and more. Spatial data is usually stored as coordinates and topology, and is data that can be mapped. Spatial data is often accessed, manipulated or analysed through Geographic Information Systems (GIS).

3.2 What is a Spatial Data Infrastructure (SDI)?

Spatial Data Infrastructure (SDI) is "the relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data." (Ref: Global Spatial Data Infrastructure (GSDI) Cookbook)

SDI is a term used to summarise a range of activities, processes, relationships and physical entities that, taken together, provide for integrated management of spatial data, information and services. The term:

- covers the processes that integrate technology, policies, criteria, standards and people necessary to promote geospatial data sharing throughout all levels of the public sector;

- embraces the structure of working practices and relationships among data producers and users that facilitates data sharing and use. It 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.

SDI's are now being developed at the National level (NSDI) and at the Regional level (RSDI) supported by Governments, practitioners and users.

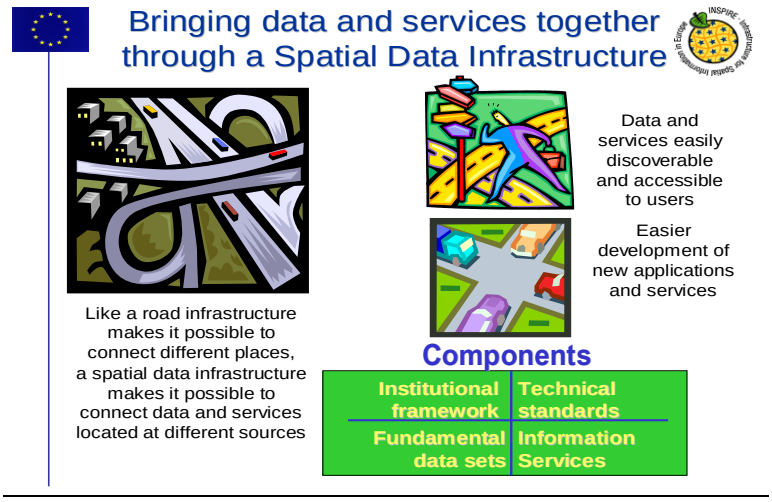

Fig 1: Example SDI component diagram [Ref: European Union: INSPIRE]

3.3 Marine Spatial Data Infrastructure (MSDI) - the marine dimension of an SDI

MSDI is the component of an SDI that encompasses marine geographic and business information in its widest sense. This would typically include seabed topography (bathymetry), geology, marine infrastructure (e.g. wrecks, offshore installations, pipelines and cables), administrative and legal boundaries, and areas of conservation, marine habitats and oceanography.

4. What constitutes an SDI?

SDI is a framework comprising the following key components:

4.1 Policy

A policy should exist defining the need to create information that is interoperable. This policy is often linked to a nation's or organisation's strategy for sharing and exchanging geographic information (e.g. *INSPIRE* in the EU, *Geoconnections* in Canada)

4.2 People & Organisations

Functional SDI requires willingness and practical co-operation between the various organisations that create, share and use information to implement the overall

policy. There should also be a clearly defined governance structure and transparency in decision-making and reporting to foster a shared sense of working towards a common goal.

4.3 Enablers

The enablers in SDI are the essential building blocks in the development of SDI's that provide the framework for data acquisition, management, updating and dissemination. Examples include:

- Standards: International Standards for geographic information exist or are being developed and, in many areas, sector-based standards are being put in place that depend on these over-arching standards; for example, IHO S-100 relies on the ISO 19100 series of geographic standards. The standards work of the Open Geospatial Consortium (OGC) especially in the areas of data content modelling, data transport, and web services are critical to developing a robust SDI approach;

- Technology: The provision of technical infrastructure will enable the delivery of data and services to allow the viewing, transformation and downloading of information. As the technical infrastructure matures, development can include the ability to work within various geodetic systems and transform data between such systems; and

- Metadata: At its simplest, metadata is 'data about data' and describes the characteristics of a dataset (i.e. content, value and limitations) and is normally held in a metadata management system or clearinghouse to provide mechanisms of search and retrieval. It is a vital component in "discovering" data and information and understanding how the data can be used.

4.4 Content

Arguably, the most important component of SDI is the information content which is available to users. Without content, expressed within a consistent coordinate reference system, SDI is of minimal use. At the core of this information is reference information (i.e. the common datasets, themes or spatial data layers that most people use most of the time and which collectively make up a digital base 'map' that can be viewed and queried). Reference information may be defined as any geographic feature that is used as a location reference for application information, or can be used in geographic analysis. Application information provides the 'outer layer' of information which is generally "application" or "business" specific. It may contain no spatial reference(s) other than provided by the reference information and consist only as supplementary properties.

Reference information is sometimes arbitrarily divided into base and associated thematic reference information with base information comprising fundamental topographic features (e.g. buildings, roads and elevation) describing complete and detailed coverage of the Earth's surface (Ref Fig 2). Associated reference

information comprises supplementary datasets where this is also commonly used to support geo-referencing or analysis (e.g. transport networks, land cover)[1].

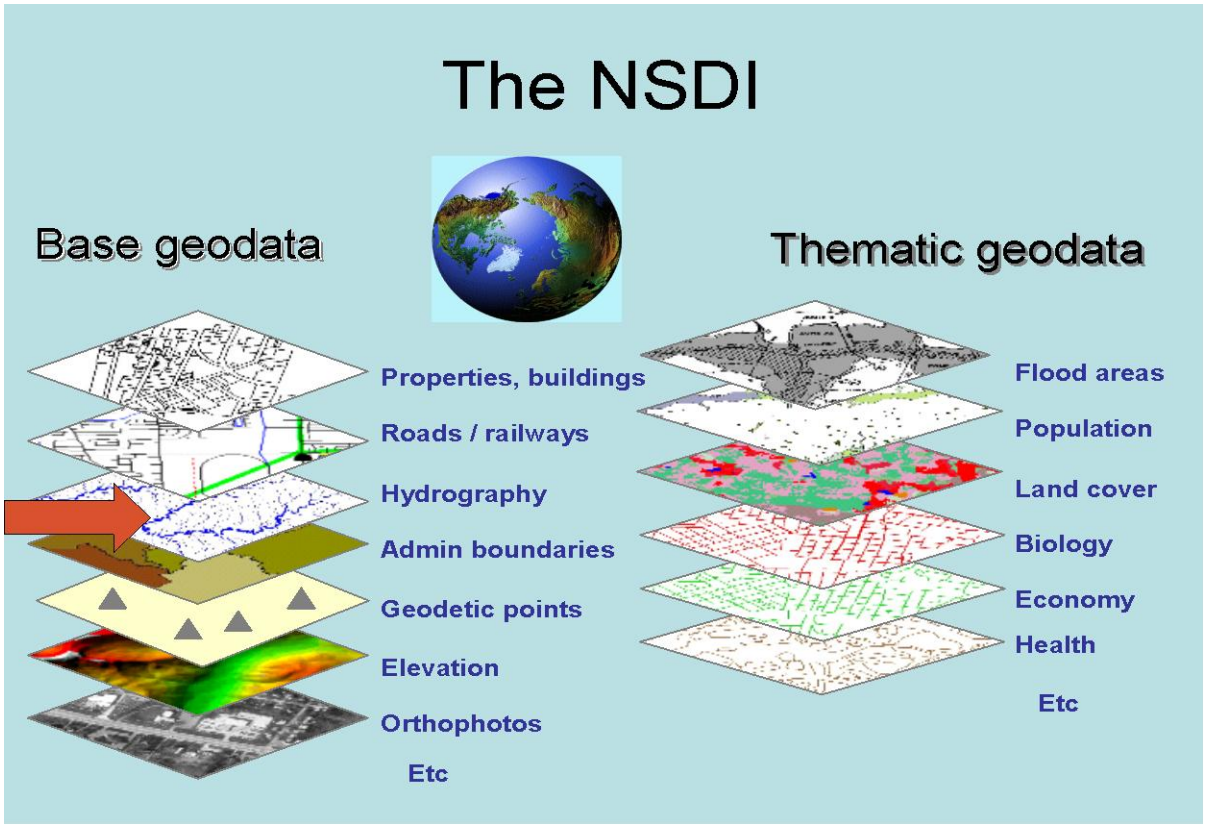

Fig 2: NSDI schema showing the importance of Hydrography [or bathymetry in this context] as a reference information (Ref: Norway Digital)

Part 2 Getting Ready for SDI

1. What role should a Hydrographic Office have in SDI?

An Hydrographic Office (HO) is uniquely placed to play a central role in the development of the marine component of all SDI's. Hydrography, with its subset of data themes, forms the key "base reference" or "core geography" layer for the sea space in each State or region. In this capacity, HO data provides a rich and unparalleled resource for users at all levels.

Some HO's will already be involved in SDI whilst others will be considering participation and how such involvement might benefit both the HO and other marine/maritime data providers. Some will be seeking ways to improve their knowledge and understanding of SDI. This document provides guidance, references, examples of best practise and support in making the right choices as to whether the HO is taking, or seeks to take, a leading role in SDI development or

[1]The EU INSPIRE Directive makes no such division and, although not explicit, the data themes identified in its annexes can all be considered as reference information although these are unlikely to be not exhaustive.

whether the HO seeks to support an existing SDI initiative or work with others to develop an SDI.

Being involved in SDI does not mean that the data must be provided to a central information "warehouse" or database; it can be held and managed at the organisational level.

2. What are the benefits to an HO in supporting an SDI?

The following benefits and opportunities are likely to be realised when HO's engage with stakeholders involved in their SDI:

- greater appreciation of the inherent value in HO information which will lead to the wider use of hydrographic data and information in the development of new products and services;
- improved decision making (e.g. spatial planning, integrated coastal zone management, flood mitigation, and climate change adaptation);
- increased efficiencies in organisational processes (e.g. data collection and management) by reducing duplication and encouraging co-ordination;
- improved data management practises especially in the critical areas of land and marine convergence (coastal zone);
- increased market exposure through hydrographic information provided for non-navigational use;
- greater recognition and understanding of the role and functions of the HO through multiple use of data;
- more effective use of public funds;
- the HO will be in the mainstream of geospatial decision making;
- greater co-operation with other information providers;
- increased security in data use and reduction of risk;
- cost savings through efficiencies;
- increased opportunities for resources and funding; and
- additional revenue generation opportunities.

3. What are the challenges an HO may face when participating in an SDI?

- Being able to work with other organisations and adopting a partnership approach (e.g. develop new joint policy approaches to SDI).

- Changing the organisational culture by winning over the sceptics at the people and/or organisational level.

- Challenging the way things are currently done to ensure they are undertaken more efficiently in the future.

- Accepting that hydrographic data is information rather than product.

- Investing in improved business processes and information management.

- Difficulty by the non-marine community to understand marine SDI components, unique challenges and relevance.

- A lack of funding to progress their involvement in SDI.

- Persuading decision makers and budget managers to support SDI activities.

- Gaining the trust of other stakeholders.

- Ensuring the HO has the knowledge, training and skills for involvement in SDI.

4. What is needed for an HO to become involved in SDI?

- Prepare and define the HO policy and role on SDI (if not done already).

- Identify an SDI "champion" to influence, lead and gain support for MSDI at the highest levels of leadership (this may need to be at Ministerial and/or Senior Management level).

- Identify key HO stakeholders and their requirements.

- Build support for engagement at Senior Management level.

- Identify national or regional initiatives/legislation which might support SDI.

- Participate in the appropriate IHO Regional Hydrographic Commission(s).

- Identify other data providers to the SDI:
    - Who are they and what is their data?
    - How does that data complement that of the HO?
    - Who are the key people in that organisation to engage with?
    - What do they expect from the HO?
    - How do they interact with other organisations in the SDI?
    - What are their data sharing and exchange protocols?

- Invite other data providers to get involved with you.

- Plan engagement with stakeholders and all other data providers and work to get stakeholder support (e.g. users, influencers, enablers).

- If the SDI is new; consider developing a "White Paper" for discussion and comment at both Ministerial and Senior Management level across all stakeholders (only if the HO is the lead organisation in the new SDI).

- Promote the benefits and opportunities to all non-HO stakeholders.

- Gain necessary HO approvals for involvement.

- Set up and/or participate in SDI stakeholder groups (e.g. Steering Group).

- Scope the work plan required (including timescales).

- Identify internal HO benefits and promote them to colleagues.

- Engage, respond, and communicate with all stakeholders.

- Develop SDI with HO involvement.

5. People and the Organisation

Identify the appropriate skills and knowledge in the workforce to enable the development of SDI within the HO to progress. These skills should include:

- Understanding what constitutes an SDI and how it might be developed and delivered;

- Understanding the data (e.g. its constituents, capture, aggregation);

- Knowledge of Data Management (standards, metadata, architecture, modelling, best practise);

- Knowledge of Information and Communications Technology (ICT) such as web services and delivery, interoperability, data sharing and exchange, geo-portal development;

- Ability to communicate (e.g. with users to determine requirements and describe data; with management to gain support, acceptance and funding to provide the best service);

- Knowledge of software solutions across the GI industry (e.g. platforms for delivery, database design and operation); and

- Team working to ensure delivery of common SDI goals.

6. Business Planning

In order to develop an HO "road map" towards an SDI, it will be necessary to undertake some business planning to ensure the organisation is prepared. This might take the form of a business plan and would typically include the following elements:

- Have a Vision for the organisation as part of an SDI;

- Prepare a Mission Statement (e.g. "The HO will be the centre of expertise for all hydrographic information");
- Identify existing data, products and services;
- Confirm the HO organisational structure and governance approach;
- Define the key objectives to ensure success;
- Prepare an Action Plan or "Road Map";
- Identify the value SDI involvement will deliver to stakeholders;
- Define the risks and constraints; and
- Return on Investment: Define a process to assess benefits and costs of developing an SDI.

Part 3 SDI – Making it happen!

In order for the SDI to operate at its optimum level, minimum requirements in terms of data management will be required. This is not an onerous task as HO's will be able to define which data is relevant and at what level they wish to provide data.

Data Management will probably include inputs such as policy and plans necessary to deliver metadata, data sharing and exchange mechanisms, levels of data interoperability, network services including "discovery", "view", "download", "invoke" and "transform" and other plans necessary to ensure compliance with SDI requirements (e.g. data licensing, digital rights management, pricing).

Step 1 Skills and Knowledge

Ensure the necessary skills and knowledge is available to enable the development of SDI within the HO (see Part 2, Section 5).

Step 2 Identify what data you hold, where it is held and how it is held

HO data which **should** be part of an SDI includes any navigational or other[2] water body data and comprises at least:

- "source" data (e.g. dense bathymetric data) and/or
- product data (e.g. ENC data, digital nautical publications, Digital Elevation Model) complete with
- metadata (data about data).

Identify those themes of data that are in the SDI as "base reference" information (e.g. bathymetry, seabed characterisation, coastline).

Data Ownership

[2] This remit will depend on the constitution of the individual HO

An HO which provides information/data into an SDI must take steps to ensure that it owns the data or the rights to the data to allow it to populate the SDI. Often, HO's rely on the provision of bathymetric survey data from other parties such as port authorities, the offshore industry and other HO's. In this case, the HO is not the "owner" of the data but rather a "custodian." When considering what data the HO may contribute to an SDI, it should be aware that it may not have authority to include source data for which it is not the owner. Generally, the HO would be able under its agreements with the data suppliers to include product level data.

Types of Hydrographic data (by theme) **may** include:

- Bathymetry (e.g. Digital Elevation Model, Triangulated Irregular Network, Grid, points);
- Coastline;
- Tidal data (heights and streams);
- Oceanographic data (e.g. sound velocity, salinity, temperature, currents);
- Aids to Navigation (e.g. lights, landmarks, buoys);
- Maritime information and regulations (e.g. administrative limits, traffic separation schemes);
- Obstructions and wrecks;
- Geographical names (e.g. sea names, undersea feature names, charted coastal names);
- Seafloor type (e.g. sand, rocks, mud);
- Constructions/infrastructure at sea (e.g. wind farms, oil platforms, submarine cables, pipelines); and
- Shoreline constructions/infrastructures (e.g. tide gauges, jetties);

Some of the above themes of data might be held by other authorities who are also providing inputs to an SDI. Ideally, the HO should discuss with other data providers where potential overlaps exist in data holdings. Part of this discussion would involve the need to de-conflict data where overlap occurs. Source data should prevail over derived/generalised product data.

Note: For themes of data mandated as part of the EU INSPIRE programme see Annex C

Step 3 Create the metadata

Increasingly, hydrographic organizations are collecting, storing and archiving large quantities of digital data which are important national assets that must be managed, controlled and made available for dissemination and use. In order to

achieve this, data custodians need to record information about their data – in the form of metadata.

The minimum set of metadata required for data discovery for hydrographic requirements should describe information about the type of data, the extent of data, the quality of the data and the spatial/temporal reference systems used for the data.

Metadata should:

- provide data producers with appropriate information to characterize their data properly;
- facilitate discovery, retrieval and reuse of data so that users will be better able to locate, access, evaluate, and utilize their resources;
- enable users to apply data in the most efficient way by knowing its basic characteristics;
- provide optional metadata elements to allow for more detailed description of data;
- Use the ISO 19115 as the standard to ensure full interoperability.

An essential part of metadata includes information on the Geographic Reference Systems used[3] . This includes both horizontal and vertical datum and projection (e.g. EPSG (European Petroleum Survey Group) codes, Coordinates (e.g. xyz), WGS84 datum, Vertical Datum (e.g. local and regional)).

Step 4 Capture data sets in digital form

- Scan manuscript documents into raster formats ensuring that the scan density is such that it can be used without resorting to the hard copy to resolve readability; and/or
- capture the data in vector format where possible. This could be done using optical character recognition methods or capture using double digitisation to ensure the quality and completeness of data capture (e.g. hand-drawn soundings).
- Ensure rigorous checking and validation is in place.
- Capture data as close to source scale or highest resolution as possible (i.e. not at product scale).

Step 5 Develop a technical architecture and environment

In order for data to be more easily shared and exchanged as part of an SDI, certain things have to be considered:

[3] Iliffe, J and Lott, R (2008) "Datums and Map Projections": Whittles Publishing, Dunbeath

- Apply SDI implementation rules (defined by the SDI to which the HO is joining);

- Study best practise guidelines if the HO is creating an SDI itself;

- Identify where harmonising the data from other providers to meet SDI requirements in terms of its interoperability is possible. Always keep it simple;

- Define the standards with which the HO is already compliant (e.g. S-57, S-100, ISO 19100 series, OGC standards) (Ref: Para 4.3); and

- Use of "web-based" services based on OGC standards (e.g. Web Feature Service, Web Map Services, Web Coverage Services).

Step 6 Make the metadata searchable

- Initially on your website (but ideally through SDI Geo-portal if available).

- Update the metadata to identify raster or vector data availability.

- Enable the search for metadata by type, area and/or key word.

Step 7 Make the data available

- Develop download facilities for data sets (note that for some dense datasets, the use of web delivery is not possible).

- Develop automated search and download of data sets via web mapping services.

- Develop a seamless validated database of vector data using international standards (e.g. S-57 object catalogue or S-100 concept dictionary or data model). feature

- Where security of data is an issue, develop an acceptable level at which data can be made available either in-country or internationally. This may involve data thinning or gridding to a level where data might be declassified.

- Facilitate automated search and download of data via web feature services.

- Establish a licensing or cost recovery regime supported and underpinned, where required, by government policy.

Step 8 Monitoring and Reporting

HO's should provide reports to their respective Regional Hydrographic Commission (RHC) meetings on the progress the HO is making towards building and/or contributing to an SDI. Such a report should include:

- What data is being disseminated (through web-based access or manual dissemination);
- Identify which datasets complete with metadata are to be provided into an SDI and report progress on preparation;
- Monitor and report on feedback from users and stakeholders; and
- Define the type of data services and products being offered by the HO.

Part 4 SDI's in Perspective

The majority of users of spatial data have regular, defined products that they create from well-understood data sources. HO's are no different in this regard. If they acquire data from organisations outside their own, their usage of the data will be governed by bilateral agreements.

The involvement of HO's in an SDI will not usually be a mandatory requirement. However, there are exceptions such as the European Union INSPIRE Directive. Such involvement presents a desirable way forward in achieving best practise in digital data capture, ingest, management, discovery and dissemination. Because many HO's will be approaching the SDI question from a point of limited knowledge and understanding, it is very important that they should focus initial efforts on the obvious need to get their processes and procedures correct, to view data as the important commodity by understanding what data they hold, by describing it, and by making it discoverable to users. Only then should an HO consider contributing to a national or regional SDI.

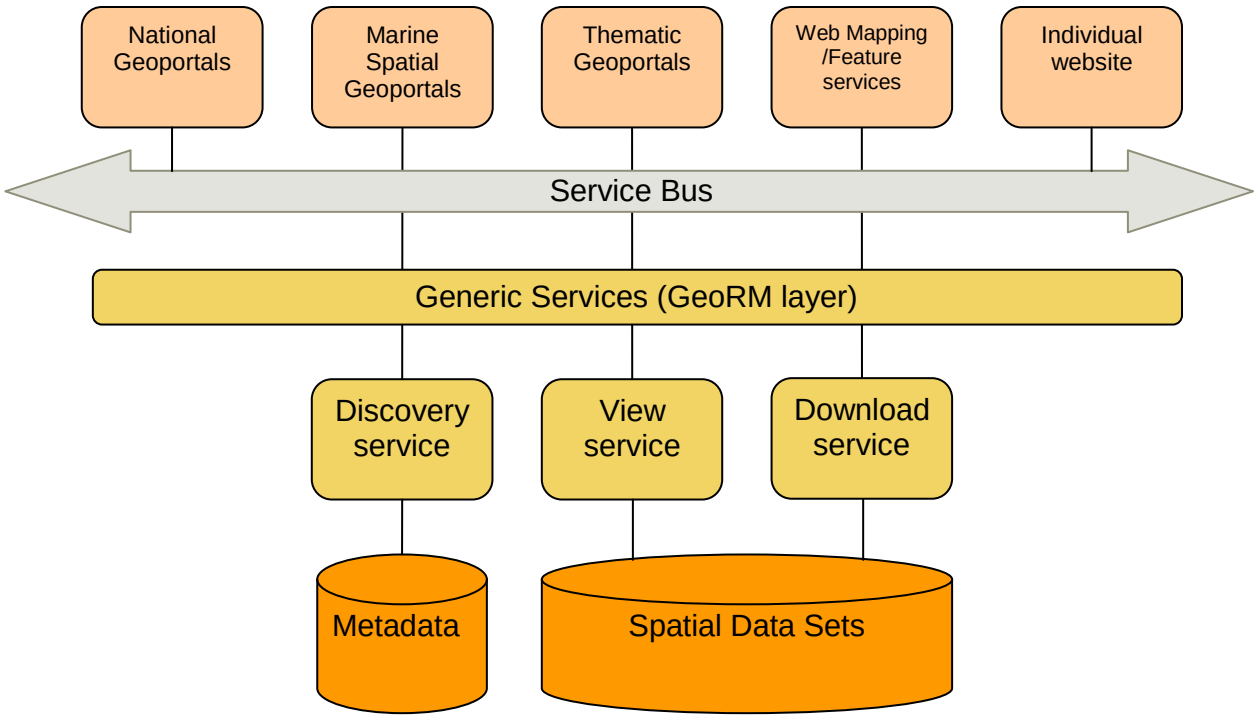

Fig 3: Illustrative integrated data model: a key principle of SDI is to publish data once and use many times

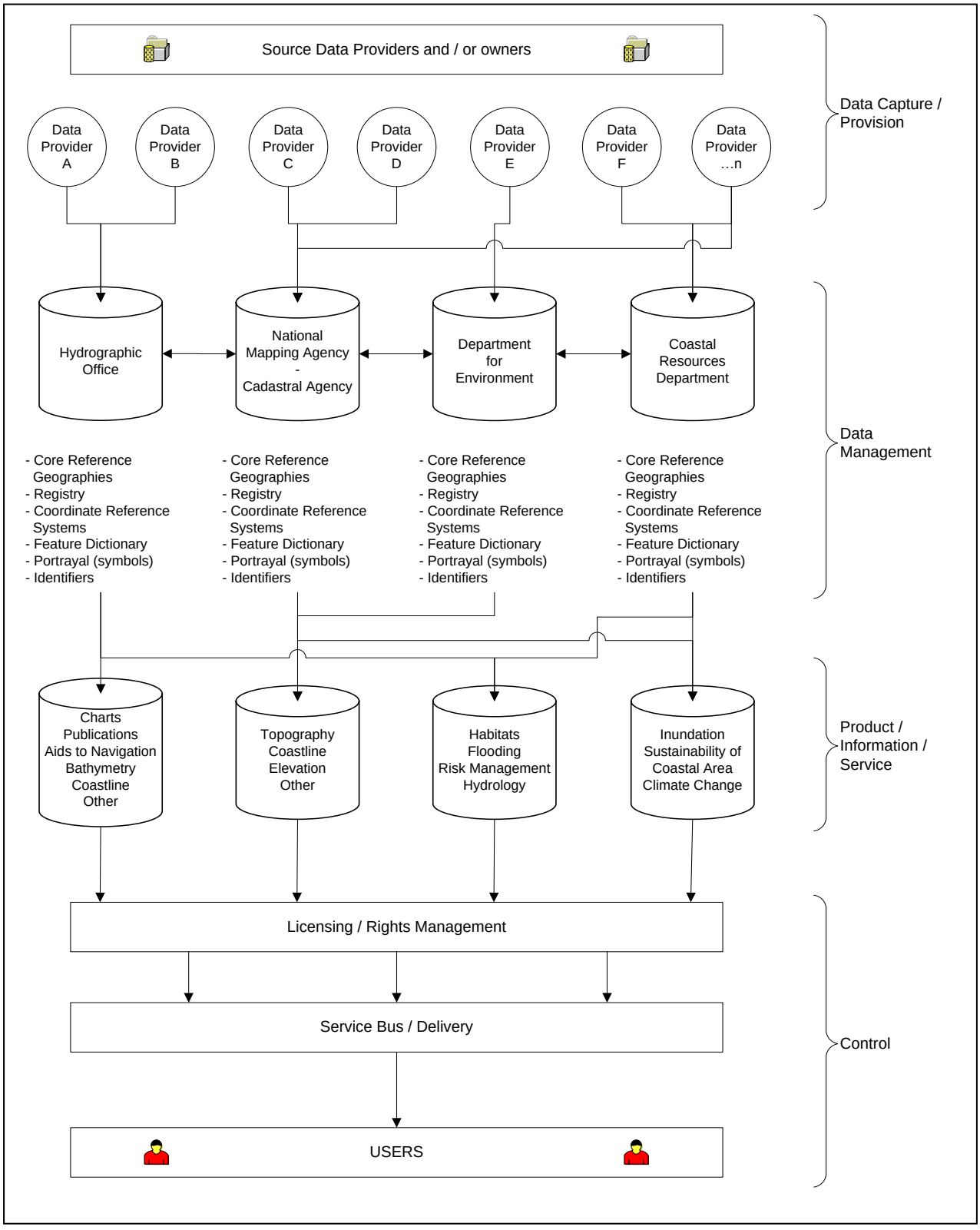

Fig 4: Illustrative SDI Data Management Flow Diagram

Annex A

SDI References

General: Global Spatial Data Infrastructure (GSDI) Association: *Developing Spatial Data Infrastructures – The SDI Cookbook - Version 2.0 dated 25 January 2004.*
This SDI Implementation Guide or Cookbook provides geographic information providers and users with the necessary background information to evaluate and implement existing components of SDI. It also facilitates participation within a growing (digital) geographic information community known as the Global Spatial Data Infrastructure (GSDI). The Cookbook is an excellent guide/introduction to SDI theory and practice.
http://www.gsdi.org/docs2004/Cookbook/cookbookV2.0.pdf
http://www.gsdi.org/gsdicookbookindex.asp

Australia: Australian Spatial Data Infrastructure - The ASDI is a national initiative to provide better access for all Australians to essential spatial data. It aims to ensure that users of spatial data will be able to acquire consistent datasets to meet their requirements, even though the data is collected and maintained by different authorities. www.ga.gov.au/nmd/asdi/

Australia and New Zealand:
ANZLIC - the spatial information council, is the peak inter-governmental council responsible for the coordination of spatial information management in Australia and New Zealand. It provides focus and leadership for the spatial information community and is responsible for leading the development of the ASDI. - www.anzlic.org.au

Belgium: GIS-Flanders - www.agiv.be
Walloon SDI and Geoportal – www.cartographie.wallonie.be

Canada: GeoConnections helps decision-makers use online location-based (or "geospatial") information, such as maps and satellite images, to tackle some of Canada's most pressing challenges. The program focuses on working with partners in public health, public safety and security, the environment and sustainable development, Aboriginal matters, and geomatics technology development.
http://www.geoconnections.org/Welcome.do

Europe: Humboldt Project - a four-year EU project contributing to the implementation of a European Spatial Data Infrastructure (ESDI) that integrates the diversity of spatial data available for a multitude of European organisations. It is the aim of the project to manage and advance important parts of the implementation process of this ESDI.
http://www.esdi-humboldt.eu

Europe:	INSPIRE - The purpose of this Directive (legislation) is to lay down general rules aimed at the establishment of the ***IN****frastructure for* ***SP****atial* ***I****nformation in the Eu****R****op****E****an Community* for the purposes of Community environmental policies and policies or activities which may have an impact on the environment. **See also Annex C** http://inspire.jrc.ec.europa.eu/
Finland	The National Spatial Data Infrastructure of Finland http://www.maanmittauslaitos.fi/paikkatiedot/default.asp?id=866
France:	Marine SDI - http://www.geoconnexion.com/geo_news_article/CARIS-Marine-SDI-Solution-for-France/3260
Germany:	EU SDI ⇨ Federal SDI ⇨ Regional SDIs (16) ⇨ Local SDIs (1,000s) www.gdi-de.org/de/f_start.html
Norway:	Norway Digital - the national geographical infrastructure: http://www.statkart.no/Norge_digitalt/Engelsk/About_Norway_Digital/ Norway digital is the Norwegian government's initiative to build the national geographical infrastructure. Norway digital is already a working co-operation and infrastructure with reference data and thematic data available, more than 100 operational web map services, geo-portal and other services. Thus Norway digital is an existing implementation of the infrastructure described by the European Inspire directive.
Spain:	The Spatial Data Infrastructure of Spain (Infrastructure de Datos Espaciales de España, IDEE). http://www.idee.es
Sweden:	A National Geodata Strategy including a new "gedoadata.se" portal currently under construction. A business model is being produced for introduction in 2010. http://www.geodata.se/en/
UK:	MEDIN (Marine Environmental Data and Information Network); a UK wide partnership working together to improve access and stewardship of marine data [http://www.oceannet.org/mdip/index.html].
USA:	The Federal Geographic Data Committee (FGDC – http://www.fgdc.gov/) is an interagency committee that promotes the coordinated development, use, sharing, and dissemination of geospatial data on a national basis. This nationwide data publishing effort is known as the National Spatial Data Infrastructure (NSDI – http://www.fgdc.gov/nsdi/nsdi.html). FGDC Marine and Coastal Spatial Data Sub-committee (http://www.csc.noaa.gov/mcsd/) FGDC Marine Boundary Working Group (http://www.csc.noaa.gov/mbwg/)

Regional SDI Initiatives / Networks:

European Spatial Data Information Network (ESDIN) http://www.esdin.eu/

Asia Pacific Permanent Committee for GIS in Asia Pacific (PCGIAP) http://www.pcgiap.org/

Africa Committee for Developing Information - GI Sub Committee (CODI-Geo) http://www.uneca.org/disd/geoinfo/main.htm

Permanent Committee on SDI for the Americas (PCIDEA)

Caribbean Regional SDI Coordination Body [in preparation]

ANNEX B

Some uses of HO data for purposes other than navigation

- Habitat mapping & heritage assessment
- Conservation assessment & designation
- Site selection (e.g. renewable energy and oil & gas extraction)
- Route optimisation
- Vessel location and disposal monitoring
- Homeland security and defence
- Aggregates extraction
- Fisheries regulation
- Coastal protection & shoreline management
- Licensing & consent evaluation
- Emergency planning & management
- Survey planning & execution

ANNEX C

INFRASTRUCTURE FOR SPATIAL INFORMATION IN EUROPE [INSPIRE] DATA THEMES

Priority One

1. Coordinate reference systems
2. Geographical grid systems
3. Geographical names
4. Administrative units
5. Addresses
6. Cadastral parcels
7. Transport networks
8. Hydrography [hydrology]
9. Protected sites

Priority 2

1. Elevation [inc: bathymetry]
2. Land cover
3. Ortho-imagery
4. Geology

Priority 3

1. Statistical units
2. Buildings
3. Soil
4. Land use
5. Human health and safety
6. Utility and governmental services
7. Environmental monitoring facilities
8. Production and industrial facilities
9. Agricultural and aquaculture facilities
10. Population distribution – demography
11. Area management/restriction/regulation zones & reporting units
12. Natural risk zones
13. Atmospheric conditions
14. Meteorological geographical features
15. Oceanographic geographical features
16. Sea regions
17. Bio-geographical regions
18. Habitats and biotopes
19. Species distribution
20. Energy Resources
21. Mineral resources

For more information, refer to www.inspire.ec.gis.eu