Towards a pan-European infrastructure for marine and ocean data management

+ Importance of standards

By
Dick M.A. Schaap – Technical Coordinator SeaDataNet & Coordinator EMODnet Bathymetry

Hydrography Day, The Netherlands, 26 June 2015,
Marine Data are relevant for many uses:

- Scientific Research to gain knowledge and insight
- Monitoring and assessment (water quality, climate status, stock assessment)
- Coastal Zone Management
- Modelling (including hindcast, now-cast, forecast)
- Dimensioning and supporting operations and activities at sea (shipping, offshore industry, dredging industry, ..)
- Implementation and execution of marine conventions for protection of the seas
- Implementation of international Directives, such as in Europe directives for water (WFD), marine strategy (MSFD), coastal zone management

Users originate from government, science sector, and industry, nationally and internationally

Good and harmonised marine data management on a large scale is very important
EU cost – benefit analysis: cost of marine observation in Europe is circa 400 Million Euro per year for space data and another 1 Billion Euro per year for in-situ data.
A pan-European infrastructure has been set up and is operated for managing marine and ocean data in a cooperation of National Oceanographic Data Centres (NODCs) and oceanographic data focal points from 35 countries bordering European seas.
NODCs as core partners in SeaDataNet

- **National Oceanographic Data Centres (NODC’s)** are mostly divisions of major national marine research institutes and based in 35 countries, surrounding the European seas.

- NODC’s are experienced in managing data, which includes quality control, documenting, long term stewardship and publishing, for their own institute and for many other institutes in their country.

- NODC’s are members of IOC-IODE and ICES for sharing global practices.

- NODC’s are increasingly building national infrastructures on SeaDataNet basis to support their national networking.
Portal with standards, tools, and services, both for users and data centres

http://www.seadatanet.org
Standards are instrumental

- Set of common standards for the marine domain, adapting ISO and OGC standards and achieving INSPIRE compliance
  - Adoption of ISO 19115 – 19139 standard for describing **metadata** on data sets, research cruises, monitoring networks, and research projects => marine metadata profiles, schema’s, schematron rules

- **Controlled vocabularies** for the marine domain (> 160,000 terms and > 60 lists), with international governance and web services

- Standard **data exchange formats**: ODV ASCII and NetCDF (CF) fully supported by controlled vocabularies

- Maintenance and dissemination of standard QA-QC procedures, together with IODE and ICES
Services and tools

- **Set of tools** to be used by each data centre and freely available from the SeaDataNet portal: metadata editor, data conversion software, download manager, data analysis software, data interpolation software

- **Capacity building** by training workshops for uptake of standards and tools by the data centres in order to achieve standardisation

- **Pan-European services** for harmonised discovery, access, visualisation of data and data products

- Common SeaDataNet **Data Policy** and SeaDataNet License
Pan-European Directory services

Overview of organisations in Europe with their involvement in marine projects, data sets, cruises and monitoring
EDMO – Directory of Marine Organisations

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<tr>
<th>Name</th>
<th>Country</th>
<th>CDI</th>
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<th>EDMERP</th>
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> 3000 organisations; also population by USA and Australia (ODIP)
CDI service for discovery and unified access of data

European data sources

SeaDataNet Portal

Metadata + transaction data

Data download

search shop

SDN Portal

Already 106 data centres connected and more underway
Cooperation for populating and wider deployment of the infrastructure

- Adoption of SeaDataNet standards and services, including adaption in a range of **EU projects** for **DG Research and DG Entreprenise and Industry**: Black Sea SCENE, Upgrade Black Sea SCENE, CaspInfo, Geo-Seas, CoCoNet, JERICO, JERICONext, Eurofleets, Eurofleets 2, Micro B3, CitClops, ClipC, AtlantOS, ENVRÍplus, .......
Pan-European directory services

Increase in time sept 2012 – June 2015
CDI service for discovery and unified access of data
Coverage June 2015: > 1,76 million CDI entries from 106 data centres in 34 countries and 546 originators for physics, chemistry, geology, geophysics, bathymetry and biology; years 1800 – 2015; 85% unrestricted or under SeaDataNet licence
Cooperation and synergy

- **Strategic cooperation** with: EuroGOOS, Copernicus Marine Service, POGO, EurOcean, OGP (SIMORC), USA and Australia (ODIP)

- **Partner in developing and building:**
  As part of the Maritime Policy the EU proposed to take steps towards an overarching **European Marine Observation and Data Network (EMODNet)**

- The initial Roadmap for EMODNet was released in April 2009
SeaDataNet as partner in developing and building: European Marine Observation and Data Network

<table>
<thead>
<tr>
<th>Year</th>
<th>Phase Description</th>
<th>Cost</th>
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<td>2009</td>
<td>Phase 1 – limited sea basins (ca 6 MEuro)</td>
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<td>2010</td>
<td>Phase 2 - low resolution (ca 16 MEuro)</td>
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<td>2020</td>
<td>Phase 3 - multi-resolution (&gt; 100 – 200 MEuro)</td>
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PROTOTYPING:
allows users to assess and improve product by trying it out

Resulting in uptake of SeaDataNet standards and expansion of the infrastructure of data centres giving data overview and access
CDI Data Discovery & Access service

June 2015: 106 data centres connected
Preparatory Actions 2008-2010

€6,450,000 spent

six portals now operational

Thematic EMODnet portals upgrading from pilots to operational and EU coverage
EMODNet Bathymetry

- Ongoing in 3 consecutive projects since 2009 with expanding consortium (at present >30 partners)

- Consortium consisting of bathymetric and IT experts and data providers from National Hydrography Services, marine research institutes and SME’s

- **Overall objective:** to bring together bathymetric surveys of European seas and to produce, publish and serve a harmonised and medium resolution Digital Terrain Model of all European seas
EMODNet Bathymetry consortium

PARTNERS

MARIS

ASSOCIATE PARTNERS

Norwegian Petroleum Directorate

azti tecnalia

MINISTERIO DE MEDIO AMBIENTE Y MEDIO RURAL Y MARINO
Process flow and services

Adoption of SeaDataNet standards and services

Common method and software (Globe) used by all data providers and regional sea coordinators
Methodology
Use of GLOBE software by most partners

Norwegian and Icelandic seas – Arctic – interim status
EMODNet Bathymetry – Regional DTMs
Results so far

- Up till today, **13883** survey CDI metadata records from **27** data centres and **166** data originators **from 1816 to 2015** have been collated and imported into a dedicated EMODnet Bathymetry CDI data discovery and access service. This service was launched in May 2010 and has been upgraded over time with extra functionality.

- The SeaDataNet Data Products Catalogue service gives **42** metadata records about composite DTMs that have been used next to survey data sets.

- These survey data (circa 6000) and other gathered composite DTMs have been collated into regional EMODnet DTM’s (**1/8 * 1/8 arc minutes**) for all European regions by 9 regional working groups.

- The harmonized EMODnet DTM is available for interactions and viewing as well as for downloading in 16 tiles in several formats via the Bathymetry Products portal service.

- The dedicated EMODnet Bathymetry Products portal has been launched in May 2010. It sits atop of the central DTM database and interacts with the CDI service and Sextant service and provides OGC WMS services.
Central portal for discovery and access to data and data products

**Welcome to the EMODnet Bathymetry portal**

The EMODnet-Bathymetry portal is being developed in the framework of the European Marine Observation and Data Network (EMODnet) as initiated by the European Commission. It provides services for discovery and requesting access to bathymetric data (survey data sets and composite DTMs) as managed by an increasing number of data providers from government and research. The portal also provides a service for viewing and downloading a harmonised Digital Terrain Model (DTM) for the European sea regions that is generated by the EMODnet Bathymetry partnership on the basis of the gathered data sources. The image below gives the workflow and direct access to each of the interrelated services.

**Survey data sets**

**Composite DTM’s**

[http://www.emodnet-bathymetry.eu](http://www.emodnet-bathymetry.eu)
CDI overview of bathymetric data sets

http://www.emodnet-bathymetry.eu
DTM for European sea basins
Portal for Bathymetry
Bathymetry Viewing and Download service
CDI overlay to indicate surveys
CDI overlay to indicate surveys + retrieve CDI metadata per survey
Sources layer to indicate used surveys and composite DTMs
Sources layer to indicate used surveys and composite DTMs
Sources layer with pop-up showing metadata of specific data set
Zoom in for the North Sea and English Channel / Le Manche
Retrieve depths incl source reference and downloadable depth profiles
Download DTM tiles in various formats
Bathymetric DTM – 3D-Viewer

DTM loaded into 3D-Viewer as developed and freely downloadable from Geo-Seas
Bathymetric DTM – 3D-Viewer

DTM loaded into 3D-Viewer as developed in Geo-Seas and freely downloadable
Successful approach

- Providers of bathymetric data sets understand and are welcoming the applied approach

- Data sets are gathered for internal use by regional consortium groups to compile the DTM product which can be viewed and downloaded without any registration

- Data sets are described and included in the CDI Data Discovery and Access Service and composite DTMs in the Sextant Data Products Service.

- Each cell in the DTM product gives information about the data sets used and leads to the CDI / Sextant service for more information about the data provider and options for requesting the data itself

- This works as a shop window and results in more data providers coming forward
Next

- New release of the EMODnet DTM at 1/8 * 1/8 arc minutes taking away some identified anomalies (after summer 2015)

- Further cooperation and synergy with GEBCO. New GEBCO 2015 has adopted EMODnet DTM and EMODnet has adopted GEBCO 2015 to cover gaps in survey coverage.

- New EMODnet DTM release will include 3 pilot High Resolution DTMs for coastal areas (Germany, France, Ireland) based upon combination of LIDAR and Multibeam data

- The viewing portal will be further improved and possibly end 2015 will also feature 3-D viewing (without plug-ins)

- Dedicated EMODnet project has been launched for a European coastal mapping plan. There will be synergy with on-going Bathymetry project

- New Call expected from EMODnet for higher resolution bathymetry DTM for Europe to continue and deepen the activities (e.g. big data processing) and cooperation between HO’s, marine research institutes and industry.