EMODnet Thematic Lot n° 0 – High Resolution Seabed Mapping (HRSM)

EMODnet Phase III

1st Annual Progress Report

Reporting Period: 20/12/2016 – 20/12/2017

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Contents

1. Executive summary

This report gives the progress in the 1st year of the EMODnet **High Resolution Seabed Mapping** contract (HRSM) which runs for 2 years from 20th December 2016. It is a follow-up of the earlier developments in EMODnet Hydrography, Seabed Mapping, and Bathymetry projects which took place since June 2009 and that resulted in the portal: http://www.emodnet-bathymetry.eu.

EMODNet HRSM aims at a continuation of services, at an extension by expanding the European coverage of sea basins with arctic waters, and at a refinement by upscaling the resolution of the overall DTM from 1/8 minute * 1/8 minute to 1/16 minute * 1/16 minute and including higher resolution DTMs where possible. Two other new challenges are i) to establish best-estimate European digital coastlines for a range of vertical levels and ii) provide national legal baselines for European countries.

In the first year 2 plenary meetings were organized with all consortium members, including training to give all hands-on instructions with the EMODnet HRSM methodology, tools and services. The first part of the project was also dedicated to improving the methodology, and software tools for processing bathymetric survey data sets and Composite DTM data sets from data providers into Regional DTMs. This has resulted in updated Guidelines. Moreover the GLOBE software for pre-processing and pre-gridding of input data sets and generation of the Regional DTMs has been upgraded. In the HRSM project not only regional coordinators but also data providers are advised to use it preparing their data input. This way there will be a harmonized process in all steps from data input to Regional DTMs.

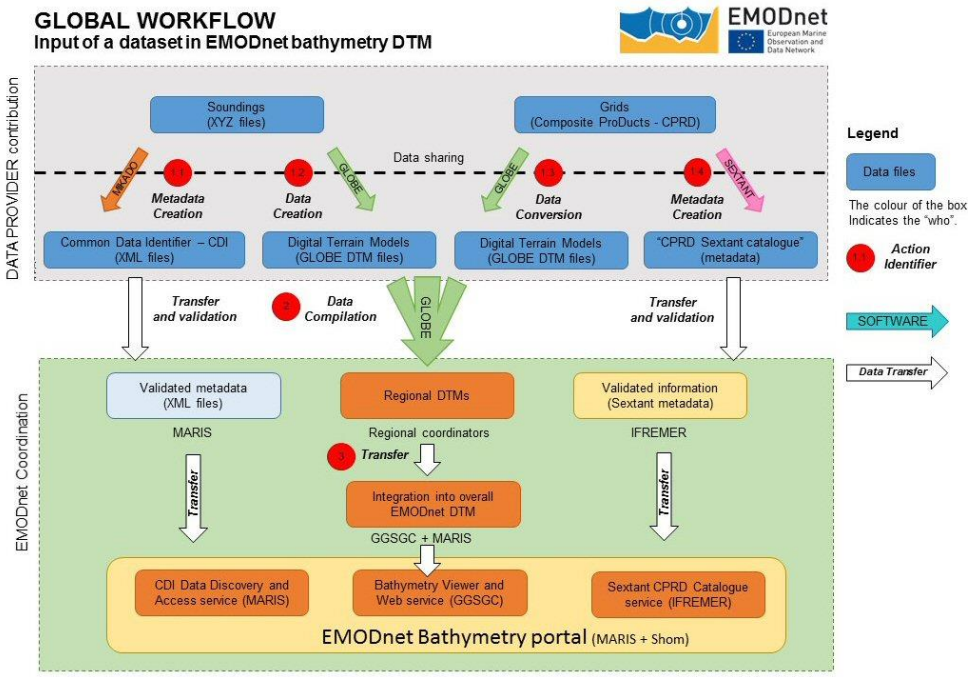

Image: Workflow for EMODnet HRSM

Extra efforts were needed for making all data providers acquainted with the EMODnet HRSM approach in a relative short time period, and capable of implementing. This includes gathering and describing survey data sets respectively Composite DTM data sets with standard metadata formats in the SeaDataNet CDI Data Discovery & Access service respectively the SeaDataNet Sextant catalogue service. Related software tools & services had to be explained and taken into operation by new partners with support of technical partners. The support and training activities have proven successful. The total number of CDIs has increased from **14791 to 26875** records and Composite DTM entries from **78 to 115.** The latter also includes 18 satellite derived Composite DTMs generated by partner EOMAP for the Mediterranean coastal zones of Spain, Greece and Libya. The total number of data providers has increased from **28 to 39.**

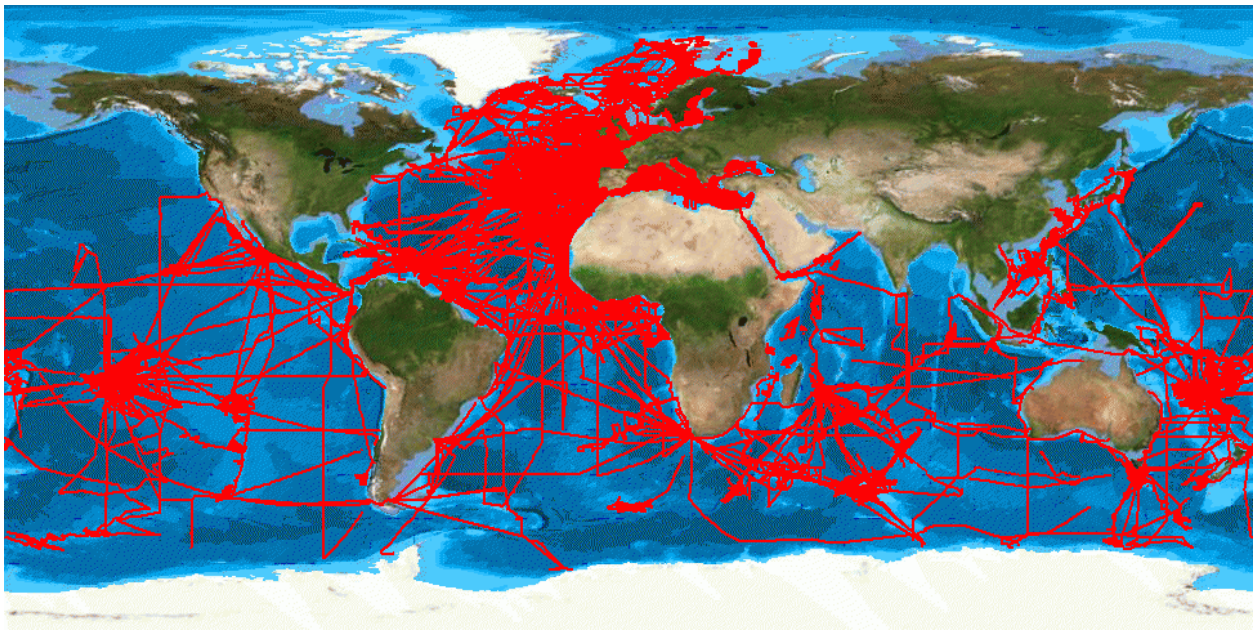

Image: Map of all entries in the CDI catalogue service

The generation of Regional DTMs will be undertaken by Regional Coordinators, who each are responsible for a quality assessment and selection of the data contributions and the compilation of the Regional DTM using the GLOBE software. This process is now underway and the new Regional DTMs are planned to be ready by end March 2018.

A new EMODnet Bathymetry portal has been launched at the existing domain www.emodnet-bathymetry.eu. It includes an upgraded design and layout, responsive design, and adoption of the new overall EMODnet style. Also the associated services have been upgraded, adopting the new EMODnet styling and responsive design.

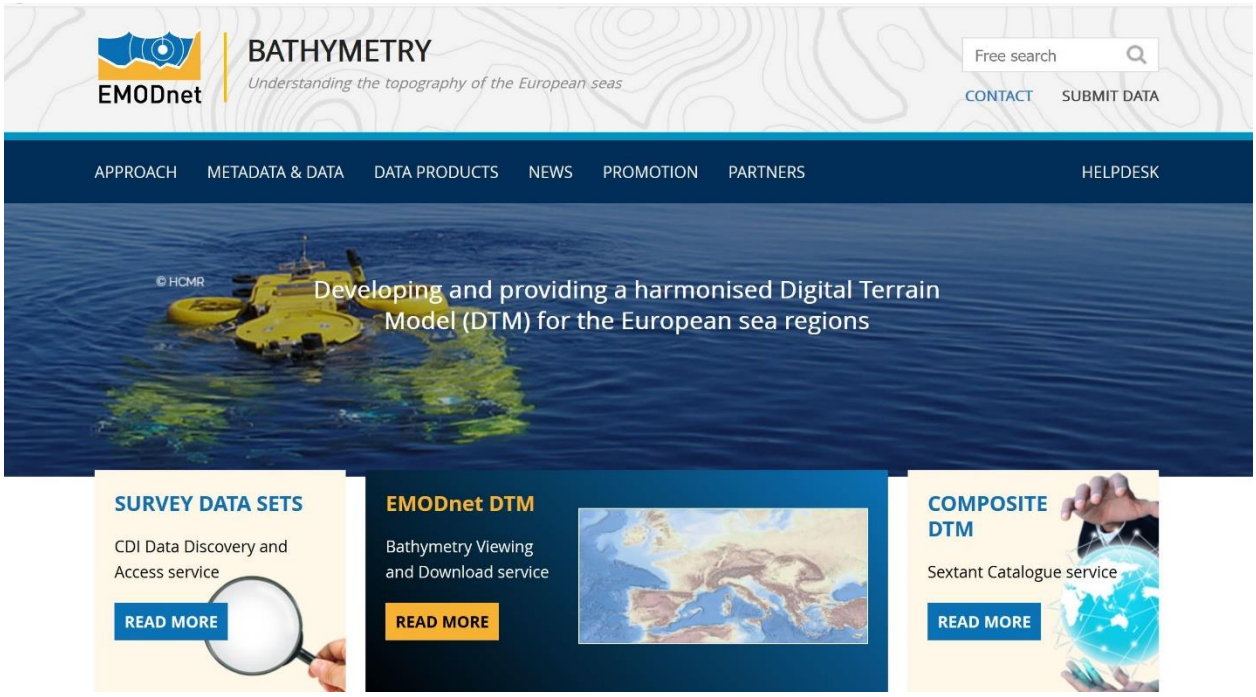

Image: Homepage (part) of the upgraded and restyled EMODnet Bathymetry portal

GGSGC and Coronis have made progress with the development of a 3D viewing capability in the data portal. It is planned that this will be ready and tested in time for delivery of the new EMODnet HRSM DTM around mid 2018.

For establishing the best-estimate European coastlines and European legal baselines, Deltares together with Shom has been compiling an inventory of existing and ratified baselines and registered claims / disputes under UNCLOS. Responsible institutes have also been contacted to collect official coastline information, if existing. This collating is well underway. Deltares has made good progress with developing and implementing a methodology dedicated to the automatic extraction of a coastline from high-resolution bathymetry and from optical satellite images (typically Sentinel-2 and Landsat-8). For this purpose a large number of satellite images are retrieved and corrected where needed. By linking the satellite images to information about the sea-level at the time and place that the image was taken, one can derive coastlines. Coastline contours will be computed for various levels, such as LAT (Lowest Astronomical Tide), MSL (Mean-Sea-Level), and MHW (Mean-High-Water). The sea-level data will be derived from the Global Tide Surge Model (GTSM) of Deltares. The model will also facilitate to provide the next version of the EMODnet DTM both relative to LAT and MSL.

2. Highlights of the reporting period

- The contract was awarded by EASME to the EMODnet High Resolution Seabed Mapping (HRSM) Consortium and signed by both parties on 20/12/2016.
- The Consortium Agreement between Shom as coordinator and all full partners of the EMODnet High Resolution Seabed Mapping (HRSM) Consortium has been agreed and signed by all parties on 28/06/2017. Also all bilateral Subcontracts between Shom and subcontractors in the Consortium have been agreed and signed.
- The EMODnet Bathymetry portal has been upgraded with a modern and responsive design and the contents has been updated to reflect the scope of the new HRSM project. The upgraded portal has been launched at 27 March 2017 at the existing domain to ensure continuity: www.emodnet-bathymetry.eu. In October 2017 the Bathymetry portal and associated services have been restyled following the latest EMODnet style guide.
- At the kick-off meeting a training was given to all data providers, followed by preparing and circulating detailed guidelines concerning how to pre-process survey data sets and composite DTMs using the GLOBE software considering the new common target grid resolution for the overall EMODnet DTM of 1/16 arc minutes.
- The formulation of the **EMODnet DTM Quality Index** has been revised and derived from this a guideline has been drafted and circulated to all data providers concerning extra metadata attributes that should be provided when describing survey data sets by CDI format and composite DTMs by Sextant format.
- Almost all the data producers have made great progress with producing and populating their expected contribution (new metadata and formatted datasets) according to the agreed methodology and using the latest tools. Since the new project start the total number of CDIs has increased from **14791 to 26875 records.** The total number of Composite DTM entries in the Sextant Products Catalogue has increased from **78 to 115.** The number of data providers has increased from **28 to 39.**
- Partner EOMAP has generated 18 Composite DTMs from Landsat satellite data for coastal and near shore zones in the Mediterranean of Spain, Greece and Libya, and included metadata in the Sextant Products Catalogue.
- The Regional Coordinators have started with the process for generating their Regional DTMs, selecting and including the pregridded data sets as received from the data providers.
- Partner Deltares has made good progress with generalising the method and tools for determining the European coastline at a number of tidal references, combining survey data, satellite images, and a tidal model.

- Partner GGSGc and CORONIS have made good progress with the method and software for preparing a TIN model from the EMODnet DTM that will be instrumental for supporting stable 3D viewing for the planned new release of EMODnet DTM.
- The EMODnet HRSM project has been presented at several external events such as EGU 2017 Conference, International Hydrographic Organization (IHO) Assembly meeting, JRC workshop "Global Reference Grid Systems for Big Geospatial Data", AGU 2017 Conference, and GEBCO meeting.
- The EMODnet portal and services continue to be popular among researchers and industry users and the statistics are increasing. Nowadays the webportal is visited on average by 10.000 unique visitors per month and circa 10.000 DTM tiles are downloaded per 3 months. Also the OGC web services (machine-to-machine) are very popular with more than 250.000 visitors in the first project year.
- Using Google Scholar more than 60 references to EMODnet Bathymetry can be found for accepted papers and edited books during the first project year.

3. Summary of the work done

Organisation wise, the first year of the EMODnet High Resolution Seabed Mapping (HRSM) project was dedicated to managing the expansion of the consortium from 24 members in the predecessor EMODnet Bathymetry project to now 41 active members. This included establishing an agreed Consortium Agreement with all partners and individual subcontracts with each subcontractor. It also included working on shaping again a team with good understanding of the project targets and approach as well as with the joined will to undertake the planned activities. This was achieved by organizing in the first year 2 plenary meetings with all consortium members, including training sessions to make all aware and to give all hands-on instructions and training with the EMODnet HRSM methodology, tools and services. Moreover several mailings were undertaken by the coordinating team of Shom and MARIS to inform and to encourage data providers in the consortium to get into action and make progress.

The first part of the project was also dedicated to improving, adapting and validating the methodology, procedures and software tools for processing bathymetric survey data sets and Composite DTM data sets from data providers into Regional DTMs. This was required because the common resolution of the overall EMODnet DTM will increase from a grid size of 1/8 minute * 1/8 minute to a grid size of 1/16 minute * 1/16 minute. Moreover an improved formulation was required for the later determination of the Quality Index on the EMODnet DTM. This implicated adding extra metadata to the existing CDI respectively Sextant metadata formats for bathymetric survey data respectively Composite DTMs. Therefore a lot of effort has been spent in particular by Shom, IFREMER, MARIS, and GGSGC with help of others for upgrading the DTM production methodology and the Quality Index determination. This has resulted in updated Guidelines [1] [2] which have been circulated and transferred to the consortium members. Moreover the GLOBE software for pre-processing and pre-gridding of input data sets by data providers and later generation of the Regional DTMs by regional coordinators has been upgraded by IFREMER. In the previous project the GLOBE software was used only by the regional coordinators while it was optional for data providers. In the HRSM project it is strongly advised to all data providers as the best tool for pre-processing and pre-gridding their data contributions (both survey data and Composite DTMs) to the EMODnet grid and minimum required resolution of 1/16 minute * 1/16 minute. This way there will be a harmonized process in all steps from data input to Regional DTMs. The GLOBE software is made available by IFREMER to all consortium members under a free user license.

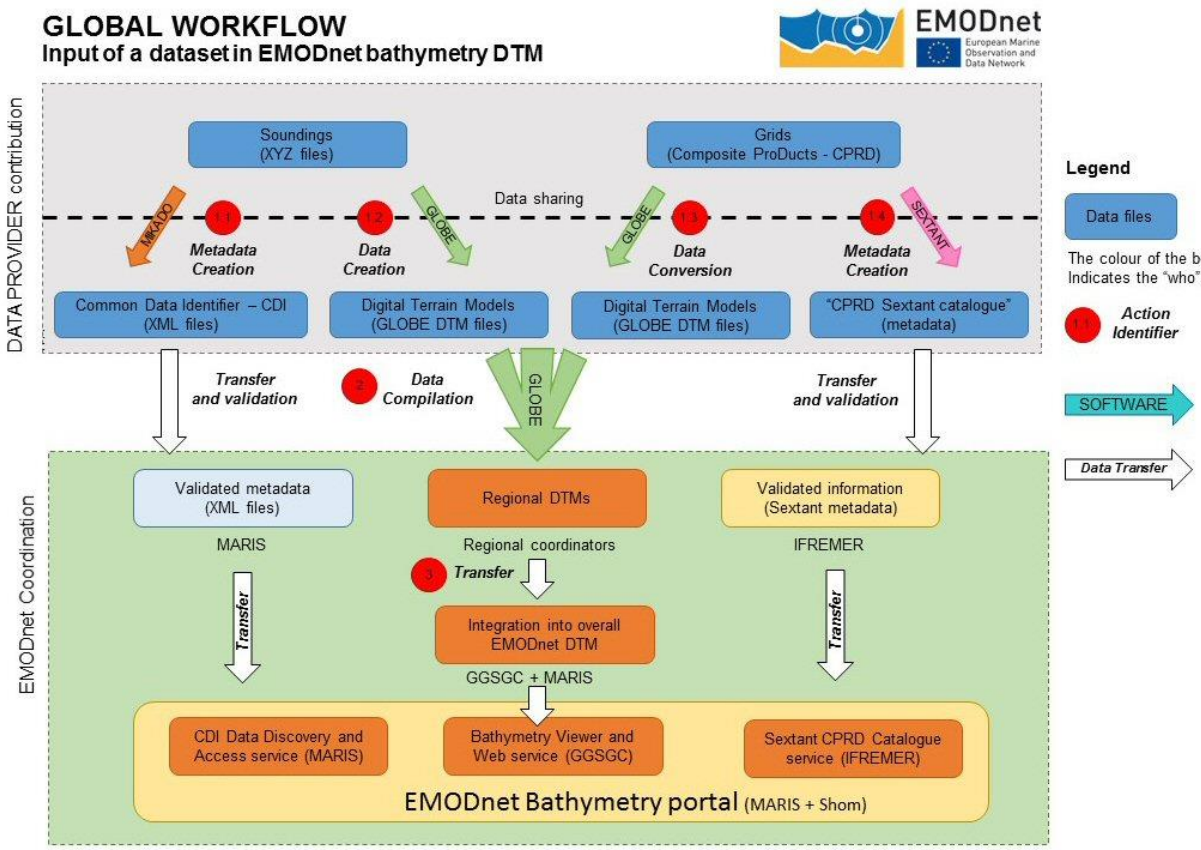

Image: Workflow for EMODnet HRSM

As indicated earlier the upscaling of the consortium has required extra efforts for making all data providers, in particular the new ones, acquainted with the EMODnet HRSM approach in a relative short time period, and capable of implementing the approach. One element of the approach includes gathering and describing survey data sets respectively Composite DTM data sets, as locally managed by partners, with standard metadata formats in the SeaDataNet CDI Data Discovery & Access service respectively the SeaDataNet Sextant catalogue service. Both these services are supported by software tools & services which had to be explained to new partners and thereafter taken into operation by new partners with support and guidance by technical partners such as MARIS and IFREMER, and with support of several old partners. Furthermore all partners had to learn use of the GLOBE software and become fully acquainted with the EMODnet processing methodology and DTM standards.

The 2 plenary project meetings with considerable attention for explanation and demonstration of the EMODnet approaches, including software and services, followed by active guidance and support by email communication has worked. Moreover a few new partners were coupled with experienced partners who gave them extra guidance next to the support of MARIS and IFREMER. Also extensive minutes and action lists have been made and circulated of the two plenary project meetings to inform all partners and to provide useful reference, while all presentations and documents have been made

available through the project Extranet. Extra communication about progress and planning of actions has been done by email.

The generation of Regional DTMs is again divided over regional sea basin subgroups, each with a Regional Coordinator and a number of contributing data providers. Each Regional Coordinator will be responsible for a quality assessment and selection of the data contributions and the compilation of the Regional DTM using the GLOBE software. This process is now underway and the new Regional DTMs are planned to be ready by end March 2018. But in the first year the Regional Coordinators have also contributed to encouraging and supporting the data providers for their region to make progress with the data and metadata gathering activities.

Image: Division of EMODnet DTM coverage over Regional DTMs

All these support and training activities have resulted in the situation that in the 4th quarter of the project year a major acceleration was achieved in gathering and making bathymetric data sets ready for transfer and use by the Regional Coordinators. A major increase has been achieved of the total number

of CDIs from **14791 to 26875** records and Composite DTM entries from **78 to 115.** The latter also includes 18 satellite derived Composite DTMs generated by partner EOMAP for the Mediterranean coastal zones of Spain, Greece and Libya. The total number of data providers has increased from **28 to 39.** Also arrangements have been put into place for new partners connecting to the CDI infrastructure for handling user requests for data sets. The metadata compilation and data pregridding has nearly been finished and includes already most of the data providers. There is some delay in populating metadata for the new Arctic region, led by the University of Stockholm; however they are also in charge of the Regional Coordination for the Arctic region and this way will meet the deadline for the Regional DTM and the supporting metadata population.

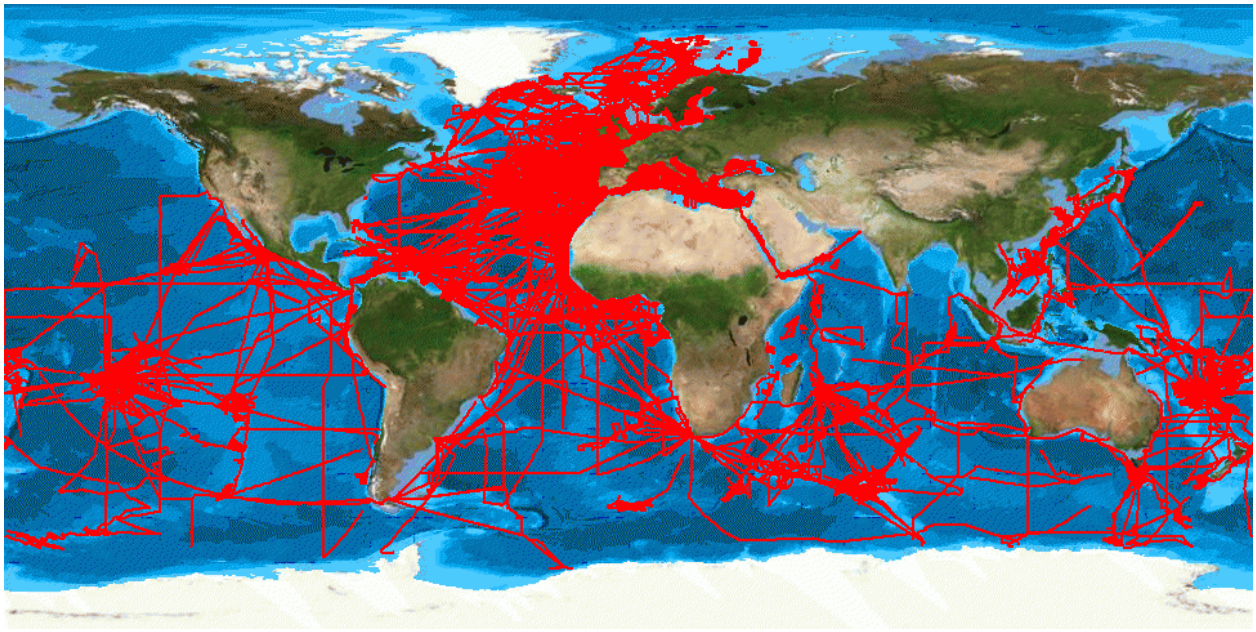

Image: Map of all entries in the CDI catalogue service

The overall integration of the Regional DTMs into the EMODnet DTM will be the responsibility of GGSGC with support of MARIS and this will take place in the 2nd quarter of 2018. The step from Regional DTM to overall EMODnet DTM is not only an integration but also a final QA – QC to achieve a high quality bathymetry product that can be made public by the Bathymetry Viewing service at the portal for viewing and for downloading.

The new EMODnet DTM will have a common resolution of 1/16 minute * 1/16 minute overall. This will be published at the portal in the Bathymetry Viewing and Downloading service as one layer and users can download tiles from this layer in a range of formats. In addition, higher resolution DTMs will be produced as hotspots and for the near coastal areas and coastal zones, where possible. These DTMs with different resolutions will be published as another layer and users will be able to download each individual DTM at its high resolution. Also users viewing the common DTM layer will be able to drill down

to higher resolutions, where available, in a dynamic way, without having to activate the high resolution layer.

A new EMODnet Bathymetry portal has been launched at the existing domain www.emodnet-bathymetry.eu on 27 March 2017. The contents has been updated to reflect the scope and challenges of new High resolution Seabed Mapping (HRSM) phase and its extended consortium compared to the previous EMODnet Bathymetry phase. The design and layout of the portal have been upgraded to provide a modern look and include responsive design for dynamic support of the portal on multiple platforms. In the 3rd and 4th project quarters the look & feel of the portal and associated services have been upgraded, adopting the new EMODnet styling, and adopting responsive design. The Sextant catalogue service for composite DTMs has been upgraded by IFREMER and is now operational, embedded by API. For the CDI Data Discovery and Access service new screens have been designed and implemented by MARIS. For the Bathymetry Viewing and Download service new screens have been designed and implemented by GGSGC.

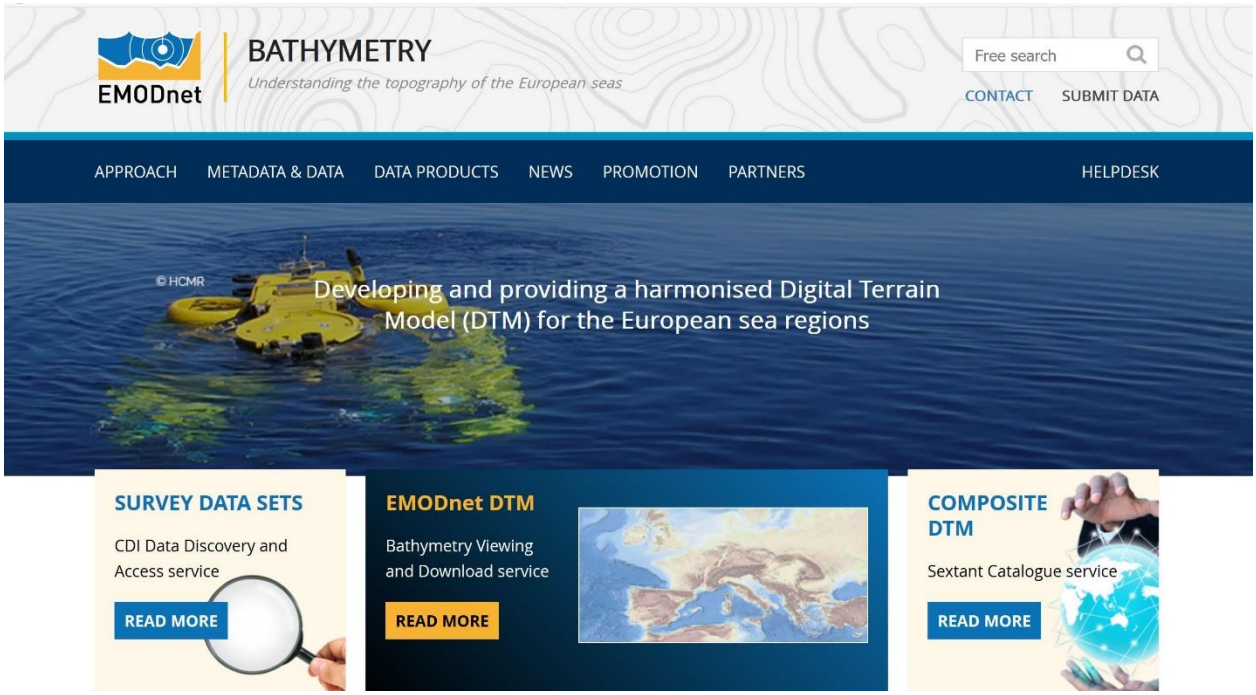

Image: Homepage (part) of the upgraded and restyled EMODnet Bathymetry portal

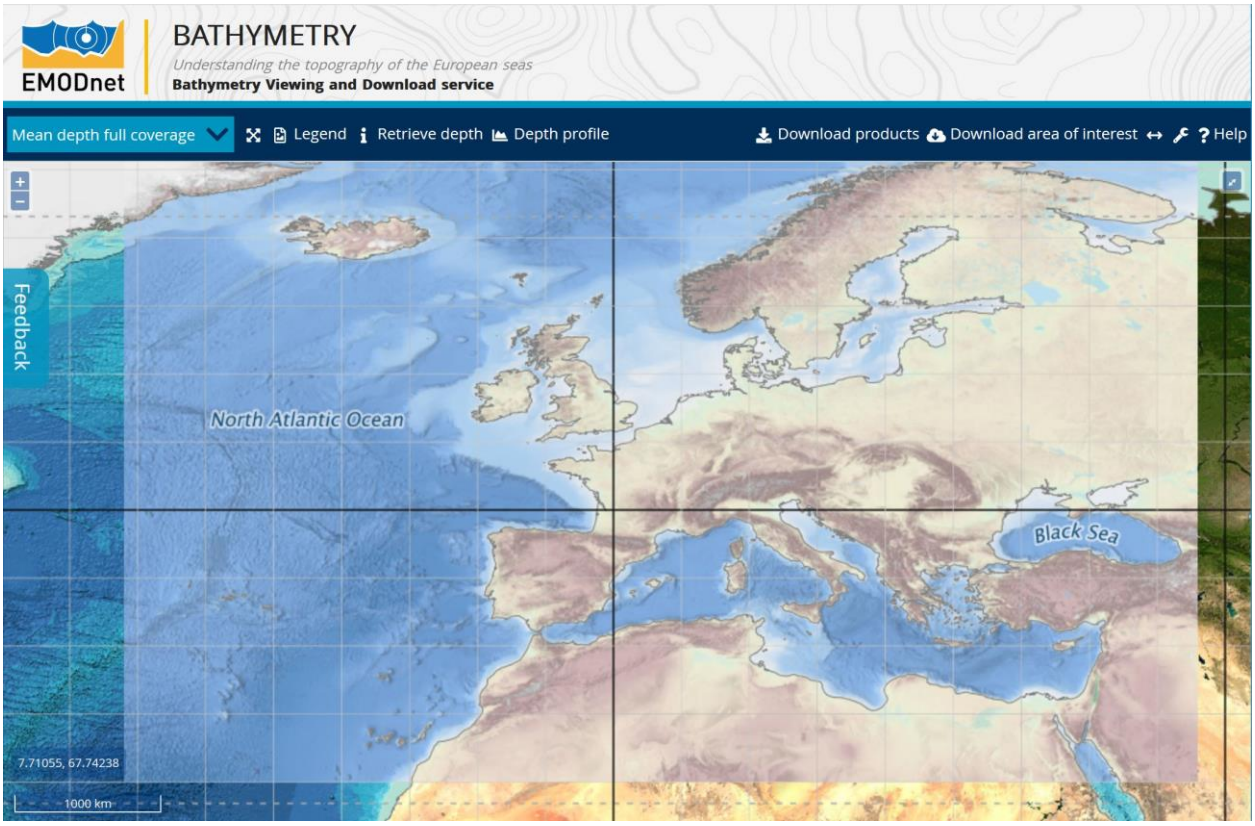

Image: Restyled Bathymetry Viewing and Download service

GGSGC and Coronis have made progress with the development of a 3D viewing capability in the data portal. The viewer will be based on Cesium. Current open source implementations of Cesium all make use of a height map (raster based) tile structure. Although workable, the performance on an average computer is not optimal and in areas below sea level, artifacts (tile joints) may be visible.

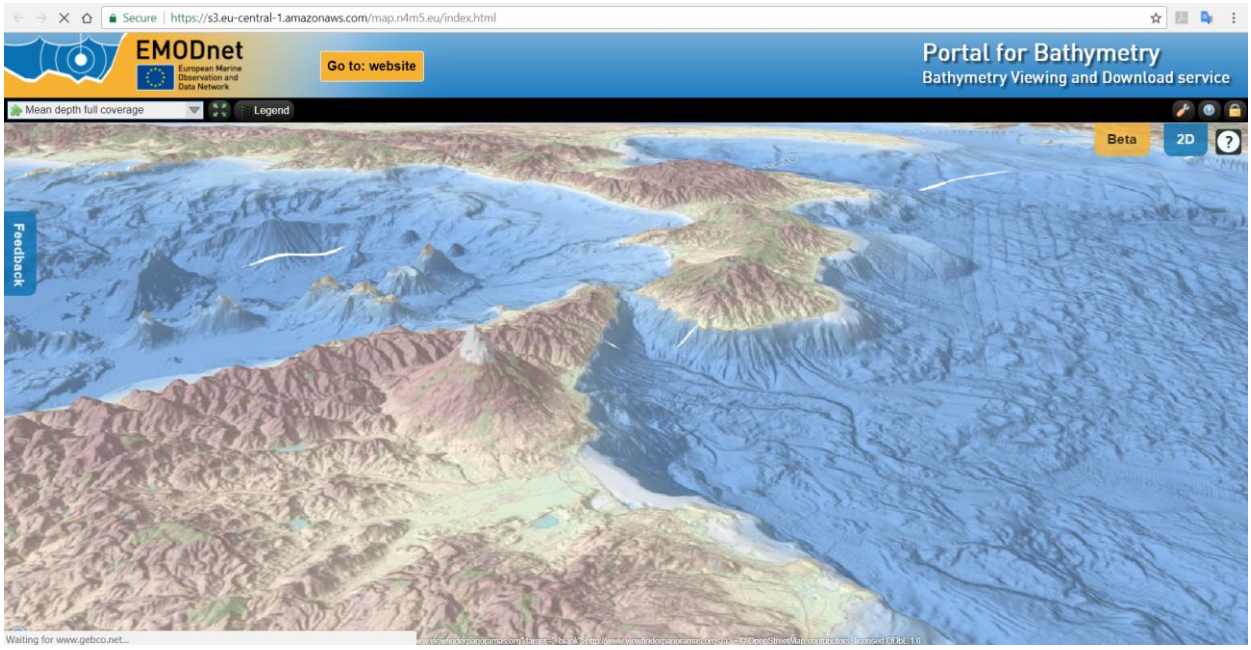

Image: Cesium 3D viewer using a height map data structure

To overcome these issues it has been decided to develop a data structure based on a triangulated irregular network (TIN). Having a TIN instead of a regular grid enables faster representation of the complexity of the map (i.e. the number and size of triangles). There is no open-source tool available nowadays that is able to create tiles in quantized mesh format out of a raster format such as used in EMODnet. The challenge for Coronis is to develop this software itself. This will provide the advantage of having full control over the way terrains are simplified, and also opens the door to trying different approaches for simplifying the terrain. Moreover the resulting software can become part of the overall HRSM workflow. It is planned that the software will be ready and tested in time for delivery of the new EMODnet HRSM DTM, which then will be launched together with its new 3D viewing as an extra function of the Bathymetry Viewing and Download service.

Two other challenges in the EMODnet HRSM project are i) to establish best-estimate European digital coastlines for a range of vertical levels and ii) to gather legal baselines based upon national information. For that purpose Deltares together with Shom has been collating from the consortium members existing national information concerning the national baselines in order to compile an inventory of existing and ratified baselines and registered claims / disputes under UNCLOS. Most countries have also defined an official coastline. This collating is well underway. Determining coastlines and intertidal zones is based primarly on the intersection of bathymetric DTM and topographic DEM with modeled tidal levels. Deltares has made good progress with developing and implementing a methodology dedicated to the automatic extraction of a coastline from high-resolution bathymetry and from optical satellite images (typically Sentinel-2 and Landsat-8). Coastline contours will be computed for various levels, such as LAT (Lowest Astronomical Tide), MSL (Mean-Sea-Level), and MHW (Mean-High-Water). The sea-level data

will be derived from the Global Tide Surge Model (GTSM) of Deltares. The production on the Satellite Derived Coastline (SDC) is done by dividing the European waters in tiles, running water occurrence algorithm in Google Earth Engine and link the water occurrence to different vertical references. Activities are also undertaken for improving the Global Tide Surge Model (GTSM) of Deltares. Among others a refinement of the Grid is deployed for capturing better the topography in waters near the coast: 1.25km at European coasts (2.5km at other coasts). Further developments are planned for ongoing recalibration of the model and computation of various tidal levels, such as LAT, MSL, MHW. The next version of the EMODnet DTM will therefore become available both relative to LAT and MSL. The conversion will be performed with the LAT-MSL differences as computed with GTSM.

Thanks to the success of the previous EMODnet Bathymetry phase there was already a lot of interest from users for the portal which has been further developed. Promotion is made by consortium members in a variety of conferences, papers and other outreaching activities. The web portal is kept up-to-date and statistics about use of portal and services are collected, and questions were received and answered by the helpdesk. The web statistics are detailed in chapter 10 and are very good with more than 10.000 unique visitors per month to the webportal and circa 10.000 DTM tiles downloads every 3 months. Also there are many feedbacks and questions received through the Helpdesk which all demonstrate a great interest and appreciation by users from research and industry sectors. There is also international interest and cooperation. This includes relationships concerning standards such as: ISO, OGC, INSPIRE, SeaDataNet, IHO, IOC and ODIP. It also includes collection and sharing of metadata, data and DTMs such as GEBCO, IBCAO, BSBD, NSBD, and NOAA/NCEI.. Benefiting from the previous EMODnet Bathymetry activities, EMODnet HRSM is also well engaged in multiple active international collaborations (International Hydrographic Organisation (IHO), General Bathymetric Chart of the Ocean (GEBCO), US National Oceanographic and Atmospheric Agency (NOAA) through the Atlanctic Ocean Research Aliance (AORA)). This has been expanded with cooperation with the *International Bathymetric Chart of the Arctic Ocean* (IBCAO) as part of the HRSM approach for the arctic waters. See also the accompanying report on interoperability and international collaboration [3].

More details about the project progress per work package will be given in Chapter 7.

4. Challenges encountered

The acceptance and signing of the Consortium Agreement has taken more time than anticipated due to legal discussions with some new members. Also the subcontracts have taken more time than expected. This delay had a side effect that a number of new data providers did not start with their metadata and data population and pre-processing activities until the Consortium Agreement or their subcontract was agreed and signed. The data gathering and metadata population activities are on the critical path of the project planning because most other activities depend on these results. Therefore the coordinating team has sent out multiple group emails to encourage / urge data providers to start their activities. This was followed by bilateral direct mails encouraging data providers to start and make progress within the agreed planning. Momentum has come after the summer in the 3rd and 4th project quarters and most data providers have now made their expected progress. Also the second plenary meeting in October 2017 has motivated data providers to accelerate their actions for gathering and pre-processing data and information for WP1, WP2 and WP4. There only remains a delay with delivery by the data providers from Croatia, Slovenia and Denmark which now seems to be under control. More detail about this is given in Chapter 10 Indicator 3.

5. Allocation of project resources

The following table gives an indication of the efforts in % of the total project efforts for the various work packages in the first year:

- WP0: Project Management
- WP1: Bathymetric data collection and metadata compilation for all maritime basins
- WP2: QC/QA, data processing and producing Digital Terrain Models for the basins
- WP3: Integration and inclusion of the DTM's into the portal
- WP4: Technical Development & Operation of portal, tools and services
- WP5: Coastlines, legal baselines and vertical reference levels
- WP6: Helpdesk, cooperation and outreach

Partner	WP0	WP1	WP2	WP3	WP4	WP5	WP6	TOTAL %
SHOM	1.30	0.96	0.90	0.06	0.13	0.64	0.57	4.56
MARIS	0.70	0.84	0.21	0.14	0.89	0.11	0.31	3.20
IFREMER	0.11	0.74	1.18	0.05	1.98	0.07	0.16	4.28
NERC-NOC	0.05	0.38	0.83	0.08	0.00	0.30	0.02	1.66
NERC-BODC	0.05	0.28	0.15	0.08	0.00	0.05	0.05	0.66
NERC-BGS	0.05	0.37	0.18	0.00	0.00	0.17	0.02	0.79
CNR-ISMAR	0.05	0.73	0.59	0.04	0.00	0.26	0.10	1.75
CNR-IAMC	0.05	0.57	0.09	0.00	0.00	0.11	0.01	0.83
CNR-IGAG	0.05	0.42	0.09	0.00	0.00	0.11	0.01	0.68
OGS	0.05	0.59	0.07	0.00	0.00	0.10	0.02	0.83
IEO	0.05	0.56	0.04	0.00	0.00	0.16	0.01	0.81
GSI	0.05	0.54	0.13	0.00	0.00	0.27	0.05	1.04
IHPT	0.05	0.42	0.21	0.00	0.00	0.13	0.01	0.82
IPMA	0.05	0.64	0.37	0.02	0.00	0.15	0.02	1.24
HCMR	0.05	0.48	0.38	0.02	0.00	0.22	0.01	1.17
IO-BAS	0.05	0.31	0.39	0.02	0.00	0.14	0.02	0.93
BSH	0.05	0.65	0.60	0.04	0.00	0.34	0.03	1.72
GRID	0.05	0.57	0.52	0.03	0.00	0.23	0.02	1.42
MDK	0.05	0.44	0.09	0.00	0.00	0.20	0.01	0.79
GGSGC	0.11	0.00	0.12	0.42	1.20	0.12	0.02	1.98
OceanWise	0.05	0.70	0.23	0.00	0.00	0.31	0.04	1.33
CSIC	0.05	1.16	0.08	0.00	0.00	0.13	0.01	1.43
NHS	0.05	0.46	0.08	0.00	0.00	0.20	0.01	0.79
NIOZ	0.05	0.30	0.16	0.00	0.00	0.02	0.03	0.56
SMA	0.05	0.50	0.79	0.07	0.00	0.26	0.04	1.70

Partner	WP0	WP1	WP2	WP3	WP4	WP5	WP6	TOTAL %
IIM	0.05	0.55	0.11	0.00	0.00	0.31	0.01	1.04
MAL	0.05	0.21	0.07	0.00	0.00	0.17	0.01	0.50
MARUM	0.05	1.54	0.09	0.00	0.00	0.11	0.03	1.81
DDNI	0.05	0.22	0.05	0.00	0.00	0.17	0.01	0.50
GIS	0.05	0.14	0.02	0.00	0.00	0.16	0.01	0.37
EOMAP	0.05	0.40	0.20	0.00	0.00	0.74	0.03	1.42
SU	0.05	0.49	0.82	0.00	0.00	0.14	0.12	1.61
Deltares	0.11	0.00	0.22	0.00	0.53	2.12	0.18	3.15
RNLN	0.05	0.17	0.17	0.00	0.00	0.32	0.03	0.72
Jardfeingi	0.05	0.18	0.09	0.00	0.00	0.07	0.01	0.39
GeoEcoMar	0.05	0.15	0.05	0.00	0.00	0.12	0.01	0.37
CORONIS	0.09	0.00	0.00	0.00	0.76	0.00	0.01	0.86
MR	0.05	0.15	0.04	0.00	0.00	0.13	0.01	0.37
UoM	0.05	0.13	0.07	0.00	0.00	0.01	0.02	0.27
CONISMA	0.05	0.30	0.10	0.00	0.00	0.18	0.01	0.64
NIMRD	0.05	0.16	0.05	0.00	0.00	0.10	0.01	0.38
HHI	0.05	0.20	0.02	0.00	0.00	0.18	0.01	0.45
IGME	0.05	0.46	0.09	0.00	0.00	0.18	0.01	0.80
IOLR	0.05	0.33	0.12	0.00	0.00	0.14	0.02	0.66
GST	0.05	0.25	0.13	0.00	0.00	0.19	0.02	0.63
TOTALS PER WP (%)	**4.19**	**19.64**	**11.02**	**1.05**	**5.49**	**10.33**	**2.16**	**53.88**

6. Meetings held

Date	Location	Topic	Short Description
2017-01-13	Brussels, Belgium	Kick-off meeting EC - HRSM consortium	Mutual presentations from DG-MARE, EASME and Coordinators of the HRSM consortium of the objectives and contractual terms of the contract. (Minutes of the meeting are available at the extranet)
2017-01-26 to 2017-01-27	Paris, France	HRSM Technical Core Group meeting	Session with work package leaders and coordinators intended to initiate actions and to prepare the plenary meeting (Project Kick-off and Training session, see below). (Minutes of the meeting are available at the extranet)
2017-02-14 To 2017-02-15	Brussels, Belgium	EMODnet Steering Committee	Meeting held by the EMODnet secretariat. Objectives and status of the HRSM contract were presented. (Minutes of the meeting are available at the EMODnet Secretariate).
2017-03-19	Venice, Italy	HRSM Steering Committee	Session with Work Packages leaders and Coordinators discussing internal organization and procedure, International relations and closely related projects. (Minutes of the meeting are being drafted).
2017-03-19 To 2017-03-22	Venice, Italy	Project Kick off	Plenary session with representatives of all the members of the HRSM consortium. (Minutes of the meeting are being drafted).
2017-03-21 To 2017-03-22	Venice, Italy	Training Session	Software training held by IFREMER for all the members involved in the metadata, data and DTM production.
2017-03-01 To 2017-06-30	Brest, France	Tuning between Shom and IFREMER	Drafting of guidelines for data pre-processing and DTM Quality Index formulation.
2017-07-04 to 2017-07-07	Genua, Italy	EMODnet Technical Group meeting	Shom and MARIS have participated to discuss plans for new key indicators, central statistics and revamping of EMODnet portal styling.
2017-07-01 to 2017-09-30	Brest, France	Bilateral phone meetings	Discussion with respect to Quality Index use in the production of the DTM.

Date	Location	Topic	Short Description
2017-09-13 to 2017-09-15	Rome, Italy	EMODnet Steering Committee meeting	Shom and MARIS have participated to give a project progress update and to contribute to various discussions
2017-09-21 to 2017-09-22	Brest, France	Technical Core Meeting	Shom, MARIS, Ifremer, GGSGc, Deltares met to discuss project progress, individual Work package progress and to prepare next plenary meeting (October 2017)
2017-10-25 to 2017-10-26	Heraklion, Greece	EMODnet HRSM Plenary Meeting	Full project group meeting to monitor and discuss progress of project activities.
2017-11-15 to 2017-11-17	Antwerp, Belgium	EMODnet 'Open Sea Lab' hackaton	Participation of GGSGC and Shom to provide support and information about the various EMODnet HRSM products and services as well as to learn from users about their experiences.

7. Work package updates

WP0 – Project Management

The EMODnet HRSM project, successor to the EMODnet Bathymetry project, has been awarded by EASME on 24 November 2016 to the consortium, led by Shom. The contract was signed by both parties on the 20 December 2016 after arranging requested evidences. The kick-off meeting between coordinators (Shom and MARIS) of the consortium, EASME and DG-MARE took place in Brussels on 13 January 2017, where scope of the technical tender, deliverables, administrative and financial maters have been acknowledged by all the parties. A consortium agreement (for full partners) and subcontractor agreements (for subcontractors) were drafted, introduced and following feedback amended. The Consortium Agreement has been finalized and signed by all partners in the Consortium in the 2nd project quarter; this also concerns the subcontracts which have been agreed and signed by all subcontractors. Only the subcontract with the Danish Geodata Agency – Danish Hydrographic Office (GST) took even more time due to their data policy and business modus. GST has signed it in the 3rd project quarter which is important as GST contributes data relevant for the North Sea and Baltic regions. The Technical Core Group, composed of Coordinators and Work package leaders, have met 26 – 27 January 2017 in Paris – France, hosted by Shom, to prepare the project kick-off meeting and to discuss updating of the methodology, technology and production processes as used in the previous EMODnet Bathymetry project considering the new scope of the HRSM contract. Minutes and action list of the meeting have been prepared and included in the extranet for sharing with all project members. The HRSM kick-off meeting including all consortium members took place 19 – 22 March 2017 in Venice – Italy, hosted by CNR-ISMAR, with presentations of Coordinators, WP leaders, Regional DTM leaders and specific experts to introduce and discuss the workplan and expected actions. All presentations have been included in the extranet together with minutes and list of actions. The minutes give a detailed action plan for the first year of the project. At the kick-off meeting also all have been trained with the software (Mikado, Sextant, Globe) used in the project for the production of metadata, pre-processing of bathymetric data sets, and production of regional DTMs. The training was undertaken to refresh capabilities of existing members and to introduce the methodology and software tools to new members. The Technical Core Group met again 21 – 22 September 2017 in Brest – France, hosted by Shom, to prepare the next plenary meeting, to monitor the evolution of metadata and data provision, and to plan next steps. Shom and MARIS have participated in the EMODnet Steering Committee 13 – 15 September 2017, presenting the project progress and contributing to discussions. The 2nd EMODnet HRSM plenary meeting took place 25 – 26 October 2017 in Heraklion – Greece, hosted by HCMR. The meeting was dedicated to refreshing the understanding of all data providers about the methodology and tools to be applied for preparing the metadata entries for the CDI and Sextant catalogue services and preprocessing the associated data sets. The progress of gathering and preparing data sets was discussed per region,

coordinated by its Regional Coordinator, and with input by all data providers. This also included instructions about updating and enriching existing metadata in order to facilitate the later calculation of the EMODnet DTM Quality Indicator per gridcell. Other topics at the meeting included progress with the technical developments for the portal and services, the methodology for determining coastlines using both in-situ and satellite data as well as tidal model results, and international cooperation. Following the meeting an action list was prepared and circulated to all consortium members urging to meet the deadlines. The coordinator (Shom) and technical coordinator (MARIS) prepared 4 quarterly progress reports of which the first 3 have been accepted by the EU (EASME and DG MARE), while the last one is still under review. Shom and MARIS have also together drafted this 1st Annual Report and the separate report on Interoperability and International Cooperation [3].

WP0 contributes to the following task as shared with WP4 and WP6:

- Task 9: Monitoring of performance

This task has progressed well as described in the progress of WP0, WP4 and WP6.

WP1 – Bathymetric data collection and metadata compilation for all maritime basins

During the project kick-off meeting, all the partners holding bathymetric data have presented their planned contribution along with potential new datasets that will be added. They have been instructed and trained in the software tools and services made available by the project and to be used for the production of metadata (Mikado), pre-processing of their data sets (GLOBE) and production of regional DTMs (GLOBE). Prior to the kick-off meeting the GLOBE software has been updated to suit the updated methodology for pre-processing bathymetric survey data sets. See also WP2. All data providers were encouraged to familiarize themselves with the software tools and services and to start the process of preparing their datasets and related metadata entries for the CDI and Sextant catalogue services. In the 2nd project quarter a team of Shom, IFREMER, GGSGC, MARIS and RNLN have upgraded the formulation of the Quality Index for the EMODnet DTM. This resulted in requirements for extra metadata attributes to be supplied by data providers. Therefore a guideline has been drafted and circulated concerning the Quality Index including the specifications of new metadata elements to provide for metadata files associated with new entries, but also for already existing ones. Furthermore a guideline has been drafted and circulated to data providers describing how to pre-process the data submissions to regional DTM coordinators using the GLOBE software. This way it is strived that all survey data and composite DTMs will be pre-gridded and pre-processed in the standard EMODnet DTM methodology. After further encouragement from Shom and MARIS before and after the summer period, all data providers have started in the 3rd project quarter preparing their expected contributions in terms of metadata and data for the project. This concerns updating existing metadata entries, preparing and submitting new metadata entries for the CDI and Sextant catalogues, and pre-processing related data sets. They follow

the methodology for data gathering, metadata generation and population as agreed and instructed at the kick-off meeting and make use of the provided software (Mikado and Sextant). Many new data providers required extra guidance and substantial support by MARIS and Ifremer. In the 4th project quarter a major acceleration was achieved in gathering and making bathymetric data sets ready for transfer and use by the Regional Coordinators. The actual process gained great momentum following the 2nd Plenary Meeting where all data providers were again informed and instructed about the methodology to apply for preparing and updating metadata entries and pregridding associated data sets. Moreover almost daily support has been given by MARIS for guiding the CDI catalogue population process, including regular updates and encouragements to data providers about the status of progress compared to expectations. Also support and guidance was given by IFREMER for the Sextant catalogue population. This has resulted in a major increase of the total number of CDIs from **14791 to 26875** records and Composite DTM entries from **78 to 115.** The latter also includes 18 satellite derived Composite DTMs generated by partner EOMAP for the Mediterranean coastal zones of Spain, Greece and Libya. The total number of data providers has increased from **28 to 39.** The metadata compilation and data pregridding has nearly been finished and includes already most of the data providers. More details can be found in the key indicators in Chapter 10. There is some delay in populating metadata for the new Arctic region, led by the University of Stockholm which is in principle related to the volume of new entries for this region along with the fact that University of Stockholm is a new contributor. However they are also in charge of the Regional Coordination for the Arctic region and this way will meet the deadline for the Regional DTM and the supporting metadata population. The following image gives a map of the identified data sets for the Arctic waters which are being processed.

WP1 contributes to the following tasks as shared with WP2:

- Task 1: Bathymetric surveys

WP1 also contributes to the following tasks as shared with WP2 and WP5:

- Task 3: Coastline data

WP1 also contributes to the following tasks as shared with WP6:

- Task 7: International interoperability

WP1 also contributes to the following tasks as shared with WP3 and WP4:

- Task 8: INSPIRE compliance

Task 1 and 3 have progressed well as described in the progress of WP1, WP2 and WP5. Task 7 and 8 have also progressed. This is documented in detail in the separate report on interoperability and international collaboration [3].

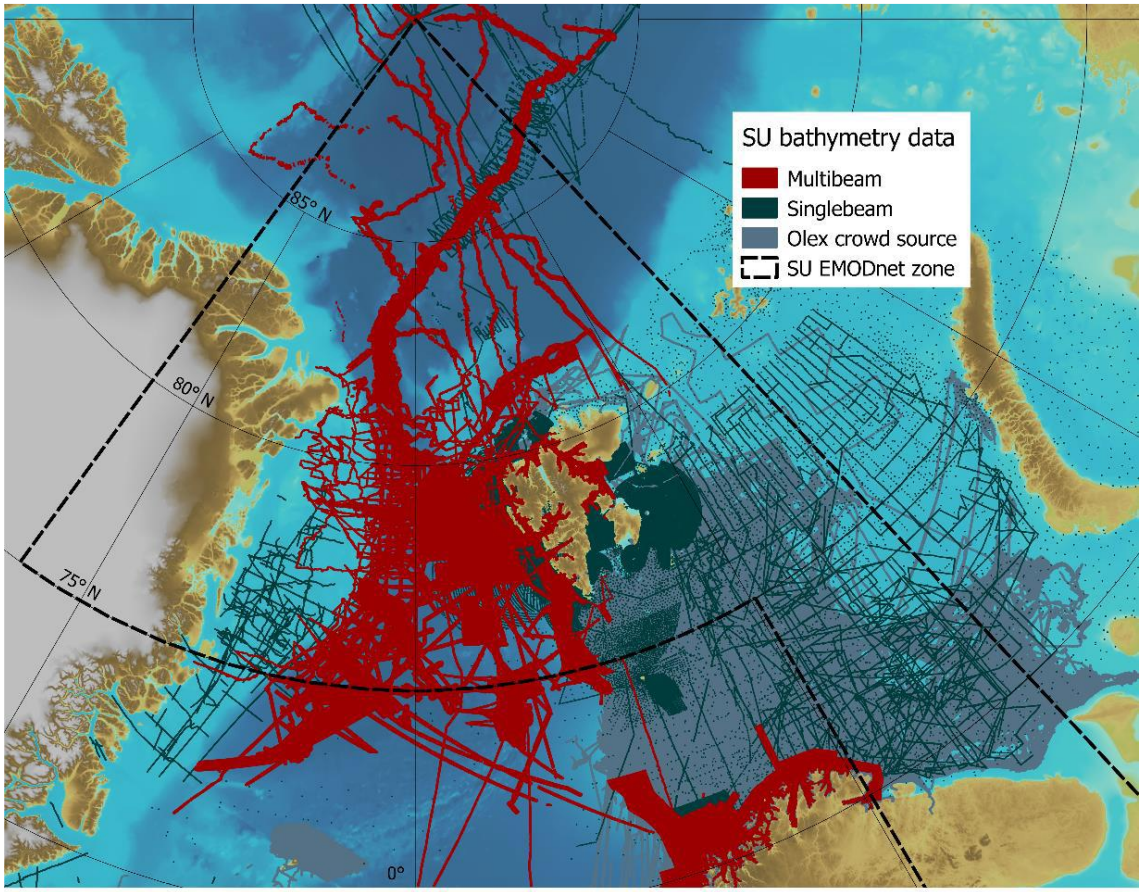

Image: Map of data sets as gathered for IBCAO (Arctic region) and under processing for EMODnet by University of Stockholm.

WP2 – QA-QC, data processing and producing Digital Terrain Models for the basins

The global methodology for the generation of the EMODnet grid remains similar to the one applied in the previous EMODnet Bathymetry phase. However at the project kick-off meeting the Workpackage leader has introduced improvements of the methodology that are needed to incorporate elements related to the higher resolution, refining the quality indicator and the extention towards higher latitudes (Arctic waters). Following this brainstorming session a team of Shom and IFREMER have upgraded the EMODnet methodology for generating the regional DTMs considering the new target resolution of 1/16 arc minute for the overall EMODnet DTM and insets with higher resolution, where possible. Moreover IFREMER has upgraded the GLOBE software to make it ready for data providers (see WP1) and regional coordinators (WP2). Sources of data might have different quality (various sounders, various positioning system, age of the survey …). Therefore new fields have been added to the metadata (see also WP1) in order to qualify these differences. These metadata will support regional Coordinators to select better which datasets to prefer in case of multiple choices. Moreover this is instrumental for producing later

the composite Quality Indicator for each DTM gridcell. In the 4th project quarter the data providers have made very good progress with pre-gridding and pre-processing all their dataset contributions, using the GLOBE software, in order to serve the Regional Coordinators. This way all survey data and composite DTMs will have an internal interoperability when they are handed over. The hand-over to Regional Coordinators is well progressing and Regional Coordinators are in contact with individual data providers for their region to stimulate and tune the pre-processing of datasets and making these available to them for the regional DTM production. End of January 2018 a meeting is planned in Haarlem – Netherlands between the core project team and the Regional Coordinators to monitor progress with the hand-over and Regional DTM production process and to discuss possible issues and required tuning. The process for producing the Regional DTMs runs till March 2018.

WP2 concerns the following task as formulated in the tender and as shared with WP1:

- Task 1: Bathymetric surveys

WP2 also concerns the following tasks as shared with WP1 and WP5:

- Task 2: Digital Terrain Model
- Task 3: Coastline data

All tasks have progressed well as can be derived from the WP1, WP2 and WP5 progress reporting.

WP3 – Integration and inclusion of the DTMs into the portal

The integration of the Regional DTMs into the overall EMODnet DTM will be performed by partner GGSGC with support of Regional Coordinators and MARIS. The actual integration will start in March 2018, but GGSGC already has been working on upgrading its software workbench taking into account the larger area and higher grid resolution implicating a challenge of 4 times the data volume compared to the previous EMODnet project. The existing workbench was still relying on manual process management. In other words, the individual steps in the process were all automated but the process as a whole was controlled via a checklist. This work method is no longer feasible for EMODnet HRSM given the huge data volume. In the previous project processing was done based on 4 tiles. To keep things manageable, the number of tiles for EMODnet HRSM is increased to 64. Additional software was developed to allow for a complete automated process in batch with necessary processing ½ arc minute overlap between the tiles. This development of automated process control is also relevant for the future integration of the software into the Collaborative Virtual Environment (CVE) as planned in WP4. User interaction is minimized; however it stays necessary to some degree for QA/QC purposes. Another preparatory activity by GGSGC has been up-sampling the existing EMODnet DTM and GEBCO to the new target resolution of 1/16 arc minute. At the kick-off meeting it was agreed to use the existing EMODnet DTM as basis to be enriched with the existing and new bathymetric data sets (surveys and Composite DTMs) with their higher pre-gridded resolution. The up-sampling also concerns the areas of the existing EMODnet DTM that have been completed with GEBCO derived data. This is done because there is a

greater confidence in the coherence and quality of the existing integrated DTM product than returning to using EMODnet and existing GEBCO next to each other. The increase in resolution requires the existing DTM to be up-sampled from 1/8 to 1/16 of an arc minute without losing existing CDI and DTM references in the data. Furthermore, the interpolated (or resampled) data cells should inherit the CDI or DTM reference from the cell that contributed to the resample process. The up-sampling itself is performed using an Overhauser spline algorithm that uses a moving 4x4 grid in the 1/8 arc minute source to calculate each cell in the 1/16 up-sampled result. Overhauser is used because it is known to respect the controlling data points better than any other spline algorithm (see image below).

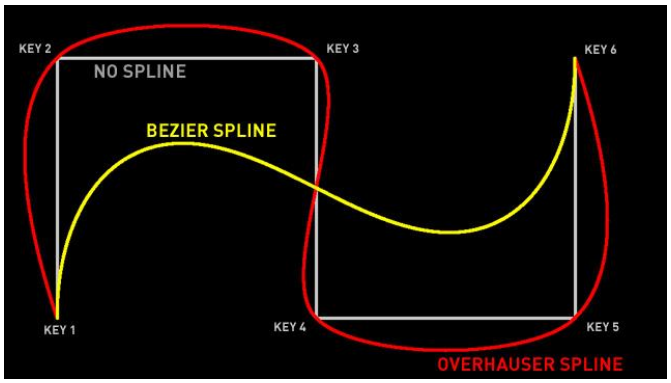

Image: Overhauser spline versus Bezier spline alternative.

The new HRSM area of interest covers a larger area than the existing EMODnet DTM. The basis for the new coverage has to be GEBCO. For this the GEBCO data is up-sampled from a 1/2 arc minute resolution to a 1/16 arc minute. As the new area extends all the way to the North Pole, special attention was required for the pole area as GEBCO data is non-projected. Up-sampling the area around the North Pole requires a re-projection of the GEBCO data to a polar projection (EPSG 3996). Later in the process this area will be covered with the Arctic Regional DTM which will be a refined version of IBCAO prepared following EMODnet methodology and including CDI and CDTM referencing.

WP3 contributes to the following task as formulated in the tender and as shared with WP2 and WP5:

- Task 2: Digital Terrain Model

WP3 also contributes to the following task as shared with WP4:

- Task 4: Machine-to-machine connections to data and data products

WP3 also contributes to the following task as shared with WP1 and WP4:

- Task 8: INSPIRE compliance (see

All tasks have progressed well as can be derived from the WP1, WP2, WP3, and WP4 progress reporting and the separate report on international interoperability [3].

WP4 – Technical Development & Operation of portal, tools and services:

A new EMODnet Bathymetry portal has been launched at the existing domain www.emodnet-bathymetry.eu on 27 March 2017. The contents has been updated to reflect the scope and challenges

of new High resolution Seabed Mapping (HRSM) phase and its extended consortium compared to the previous EMODnet Bathymetry phase. The design and layout of the portal have been upgraded to provide a modern look and include responsive design for dynamic support of the portal on multiple platforms. In the 3rd and 4th project quarters the look & feel of the portal and associated services have been upgraded, adopting the new EMODnet styling, and adopting responsive design. The Sextant catalogue service for composite DTMs has been upgraded by IFREMER and is now operational, embedded by API. For the CDI Data Discovery and Access service new screens have been designed and implemented by MARIS. For the Bathymetry Viewing and Download service new screens have been designed and implemented by GGSGC. Moreover, as part of preparations for the Open Sea Lab hackaton, MARIS and GGSGc have preparing and included in the portal improved instructions for the existing machine-to-machine services. As part of the technical core meeting, held at Ifremer and Shom, Brest - France, half a day was devoted to discussing the status of possibly migrating the hosting of the Bathymetry Viewing and Download service to the Datarmor hosting and high performance computing facilities at Ifremer in Brest – France (as part of Task 5). The ambition behind this migration is that the DTM viewing and download service and the planned Collaborative Virtual Environment (CVE) might be centralised on the same hosting facility. GGSGc will stay overall responsible for the development and management of the Bathymetry Viewing and Download service. In the 3rd project quarter IFREMER with support of GGSGc had already configured a mirror of the Bathymetry Viewing and Download service at Datarmor (see http://portal.emodnet-bathy.ifremer.fr/). Testing the performance and uptime of the configuration is ongoing, and if positive, also a number of additions have to be made such as a staging and a production environment in order to support new developments. Moreover practical arrangements are needed between GGSGc, IFREMER and MARIS for maintenance, operation and further developments, respecting the different responsibilities. Operational migration will take place once all is satisfactory arranged. Concerning the Collaborative Virtual Environment (CVE), IFREMER has made an initial analysis of the use cases with respect to the various roles (data provider, basin coordinator, final integration, administrator) associated with the workflow for the EMODnet DTM production. In the 4th quarter further progress has been made with the functional and technical analysis. This is done in synergy with the analyses that are performed in the EU SeaDataCloud project for specifying a generic architecture for a Virtual Research Environment that can provide a platform for hosting a series of workflows for different applications. Recently EU SeaDataCloud has finalised the VRE Specification Deliverable which has studied existing VRE's worldwide, analysed in detail a workflow and tools for a SeaDataCloud use case (T&S climatology using ODV and DIVA software), and specified the SeaDataCloud VRE architecture. This Deliverable provides an excellent basis for the EMODnet HRSM CVE development which as pilot will focus on the use case of giving access and means to Regional Coordinators of two adjacent regions and the overall Integrator. Among other functions the Regional Coordinators should be able to find and retrieve relevant data sets from the CDI and Sextant catalogue services and store these temporarily in in a cloud data pool; they should be able to import selected data sets into online GLOBE for building a Regional DTM, including functions for viewing and comparing with the previous overall

DTM version; and the Integrator together with Regional Coordinators should be able to analyse and elaborate the overlap zone where the two regions meet and the overall consistency of the resulting integrated DTM. The HRSM pilot workflow is being described in greater detail and the first prototypes for specific process steps will be developed in the coming months. As reported under WP3 GGSGC has also made progress with upgrading its integration software workbench that will be made part of the pilot CVE. GGSGC and Coronis have worked on the development of a 3D viewing capability in the data portal. The viewer will be based on Cesium. Current open source implementations of Cesium all make use of a height map (raster based) tile structure. Although workable, the performance on an average computer is not optimal and in areas below sea level, artifacts (tile joints) may be visible.

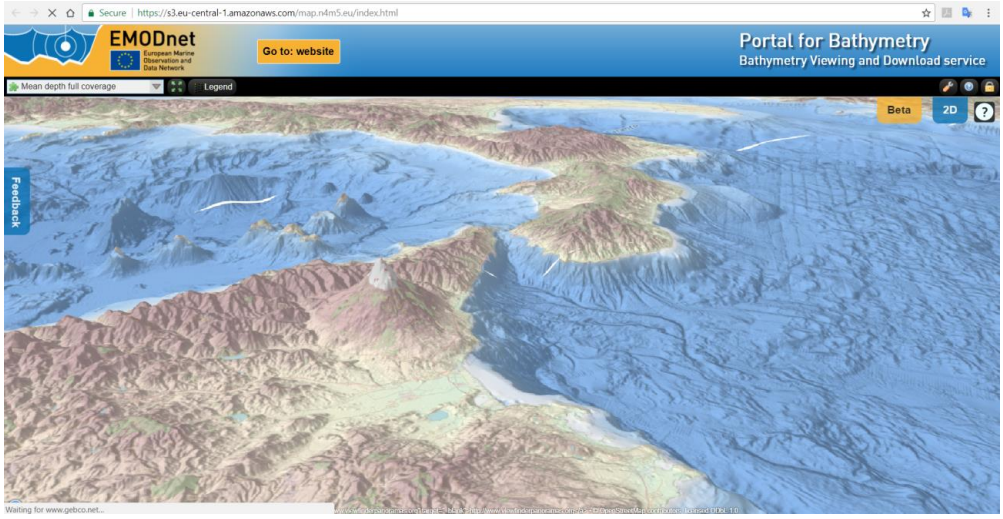

Image: Cesium 3D viewer using a height map data structure

To overcome these issues there are two options: either to acquire an expensive commercial off the shelf solution as a black box with no control or to develop a data structure based on a triangulated irregular network (TIN). After consulting with Coronis it was decided to go for the second option and to use the extensive knowhow of Coronis in the field of TIN data structures.

Having a TIN instead of a regular grid is a better representation of the data, as the complexity of the map (i.e. the number and size of triangles) adapts to the variations of elevations in the scene. The challenge for Coronis is to translate the EMODnet DTMs to the quantized mesh format. However, there is no open-source tool available nowadays that is able to create tiles in quantized mesh format out of a raster format such as used in EMODnet. Therefore Coronis main challenge is to develop this software itself. This provides the advantage of having full control over the way terrains are simplified, and also opens the door to trying different approaches for simplifying the terrain. Moreover the resulting software can become part of the overall HRSM workflow and thus also of the CVE in a later stage. In the meantime Coronis has made good progress with the analyses how to solve the challenges in practice, also considering computing capacities, and the related software development. Surface mesh simplification

methods aim at reducing the complexity of a mesh (i.e., number of triangles) while keeping the global shape as much as possible. An example of such procedure is shown below.

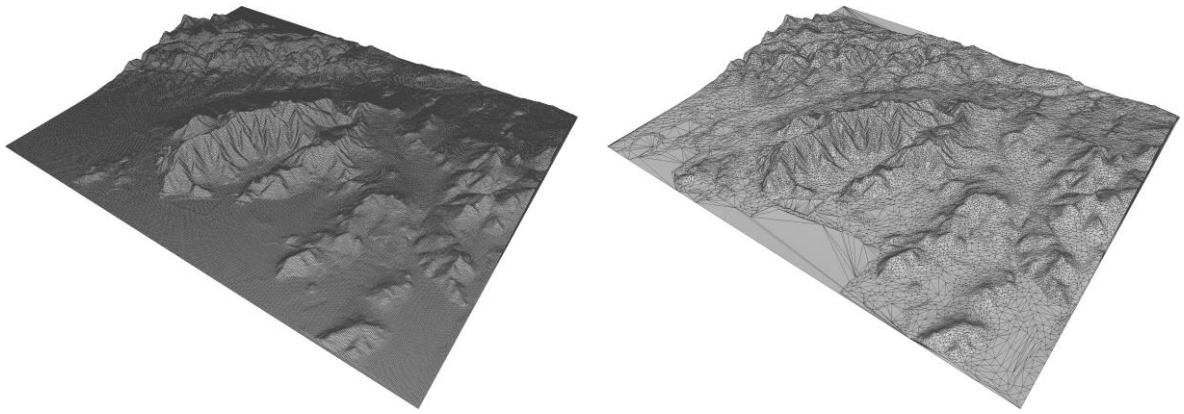

Image: On the left, the original mesh resulting from lifting a regularly-gridded DTM to 3D (342,620 triangles). On the right, the simplified surface (68,524 triangles).

Surface mesh simplification has been a hot topic in the computer graphics and computational geometry communities for many years. After surveying the many approaches available for this task, Coronis has selected the method of Lindstrom and Turk because of its better memory efficiency and because it ensures the resulting surface to be manifold. It is planned that the software will be ready and tested in time for delivery of the new EMODnet HRSM DTM, which then will be launched together with its new 3D viewing as an extra function of the Bathymetry Viewing and Download service.

WP4 contributes to the following task as formulated in the tender and as shared with WP3:

- Task 4: Machine-to-machine connections to data and data products

WP4 also contributes to the following task as shared with WP6:

- Task 5: Web portal

WP4 also contributes to the following task as shared with WP1 and WP3:

- Task 8: INSPIRE compliance

WP4 also contributes to the following task as shared with WP0 and WP6:

- Task 9: Monitoring of performance

All tasks have progressed well as can be derived from the WP0, WP1, WP3, WP4 and WP6 progress reporting and the separate report on international interoperability [3].

WP5 – Coastlines, legal baselines and vertical reference levels:

At the kick-off meeting the Workpackage leader (Deltares) has requested all the data producers to provide topographic/bathymetric data at the best resolution available for coastal areas (as deliverables

of WP1). Considering legal baselines, each data contributor has been asked to provide national sources of information (file or preferably web service). Following these requests and consecutive encouragements, data providers have been identifying and providing relevant input. Deltares together with Shom has been collating received existing national information concerning the national baselines in order to compile an inventory of existing and ratified baselines and registered claims / disputes under UNCLOS. The result of the workpackage for this part will provide an inventory of existing baselines without attempting to resolve existing legal disputes as this is out of scope and capability of EMODnet. Most countries have also defined an official coastline. Similar to the Legal Baseline, responsible institutes have been contacted to collect these data for all countries in Europe that are not land-locked. The present status of the compilation is illustrated below. More contributions are expected in 2018.

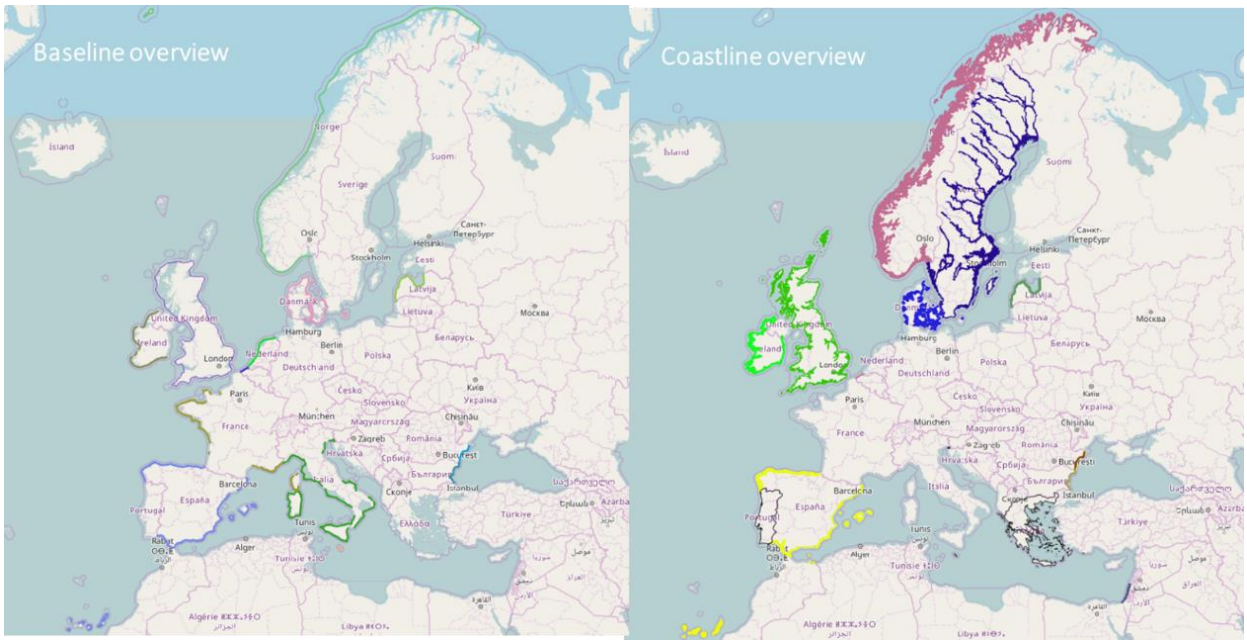

Image: Overview of collected national legal baseline data-sets and coastline data-sets (end December 2017)

Nr	Country	Baseline	Coastline
1	Albania	N/A	N/A
2	Belgium	Available	Available
3	Bulgaria	Available	Available
4	Croatia	N/A	N/A
5	Cyprus	N/A	N/A
6	Denmark	Available	Available
7	Estonia	N/A	N/A
8	Finland	N/A	N/A
9	France	Available	N/A
10	Georgia	N/A	N/A

Nr	Country	Baseline	Coastline
11	Germany	N/A	N/A
12	Greece	Available	Available
13	Iceland	N/A	N/A
14	Ireland	Available	Available
15	Israel	N/A	Available
16	Italy	Available	N/A
17	Latvia	Available	Available
18	Lithuania	N/A	N/A
19	Malta	Available	Available
20	Monaco	N/A	N/A
21	Montenegro	N/A	N/A
22	Netherlands	Available	N/A
23	Norway	Available	Available
24	Poland	N/A	N/A
25	Portugal	N/A	Available
26	Romania	Available	Available
27	Russia	N/A	N/A
28	Slovenia	N/A	Available
29	Spain	Available	Available
30	Sweden	N/A	Available
31	Turkey	N/A	N/A
32	Ukraine	N/A	N/A
33	United Kingdom	Available	Available

Table: Status of collected national legal baseline data-sets and coastline data-sets (end December 2017)

Formal definition of coastline is suffering from lack of concensus, which is mainly due to the use of the information to be done. Pragmatically, the workpackage leader and EMODnet coordinators have decided that the estimation of a usefull coastline (an tidal areas) would be determined primarly on the intersection of the DTM composed by both the bathymetric and topographic DEM with modeled tidal levels. Moreover, Deltares has made good progress with developing and implementing a methodology dedicated to the automatic extraction of a coastline from high-resolution bathymetry and from optical satellite images (typically Sentinel-2 and Landsat-8). Since these coastline data will be computed (where possible) for the entire European coastline, this data can be used for comparison and as a more homogeneous dataset. For this purpose a large number of satellite images are retrieved and corrected where needed. Cells are classified as land or water (Donchyts 2016). This results in cells (10 meter grid) that are always wet, always dry or inter-tidal. The relative frequency can be used to link the horizontal and vertical levels. By linking the satellite images to information about the sea-level at the time and place that the image was taken, one can derive coastlines. Coastline contours will be computed for

various levels, such as LAT (Lowest Astronomical Tide), MSL (Mean-Sea-Level), and MHW (Mean-High-Water). The sea-level data will be derived from the Global Tide Surge Model (GTSM) of Deltares. The production on the Satellite Derived Coastline (SDC) is done by dividing the European waters in tiles, running water occurrence algorithm in Google Earth Engine and link the water occurrence to different vertical references. The present status of the tiles production is presented in the figure below.

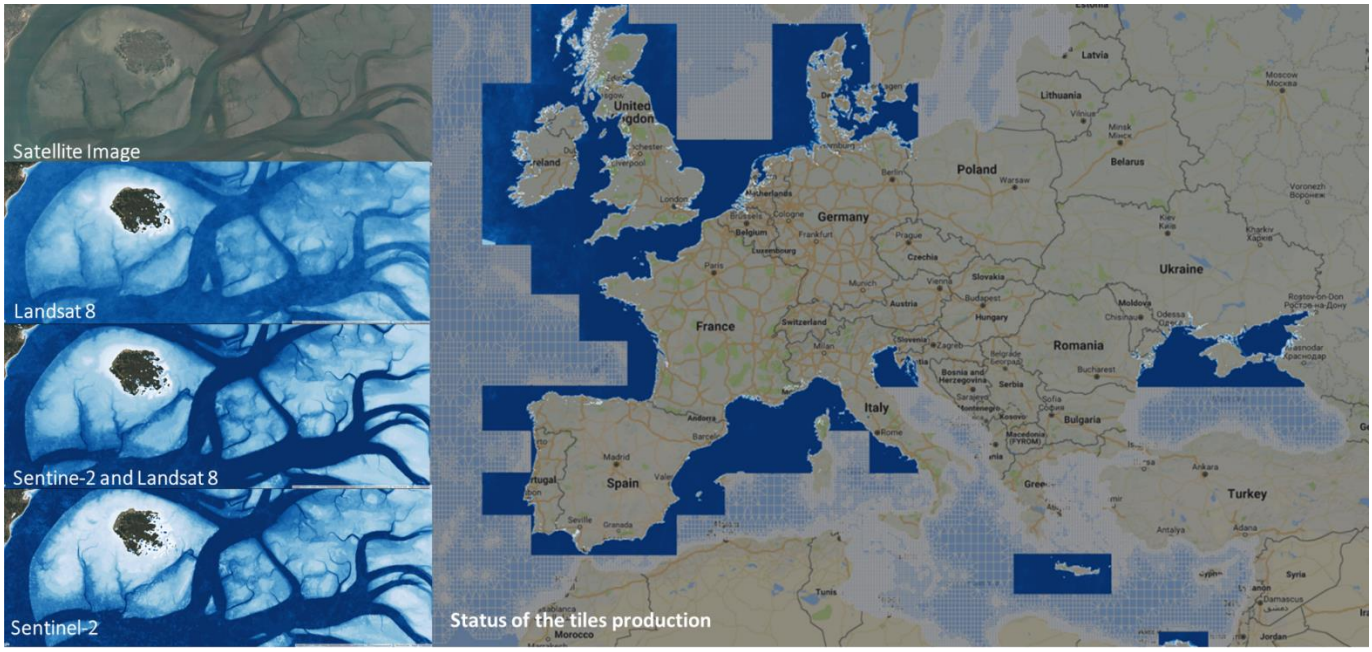

Image: Water index (left) and production status (right)

Activities are also undertaken for improving the Global Tide Surge Model (GTSM). The model is built on a spherical, flexible mesh with a resolution of 5 km in near-shore coastal waters. The tidal information is crucial for the vertical datum harmonization of data. To adapt GTSM for the purposes of EMODnet among others a refinement of the Grid is deployed for capturing better the bathymetry in waters near the coast: 1.25km at European coasts (2.5km at other coasts).

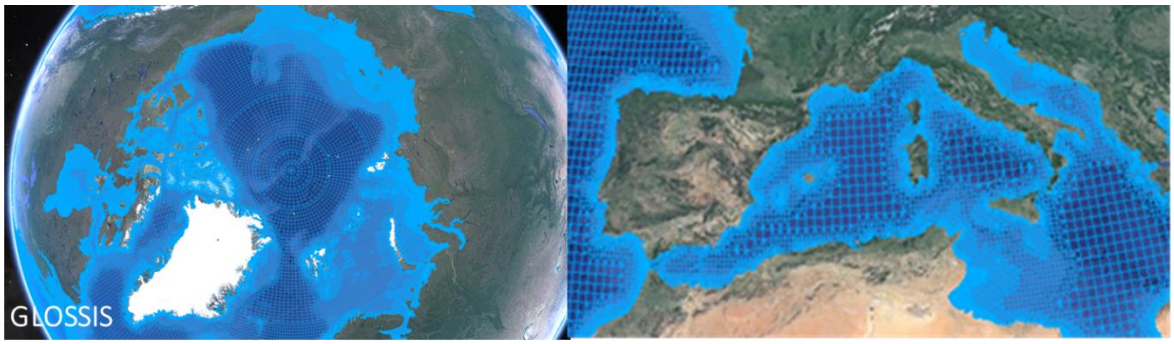

Image: Global Tide Surge Model (GTSM) of Deltares

Further developments are planned for ongoing recalibration of the model and computation of various tidal levels, such as LAT, MSL, MHW. An added value to this methodology is that it will enable to provide the EMODnet grid to various other vertical level (Mean Sea Level) for example on top of the officially (suggest by IHO) accepted LAT. For various users of EMODnet (such as hydrodynamic modellers) MSL is a more convenient vertical reference. The next version of the EMODnet DTM will therefore become available both relative to LAT and MSL. The conversion will be performed with the LAT-MSL differences as computed with GTSM.

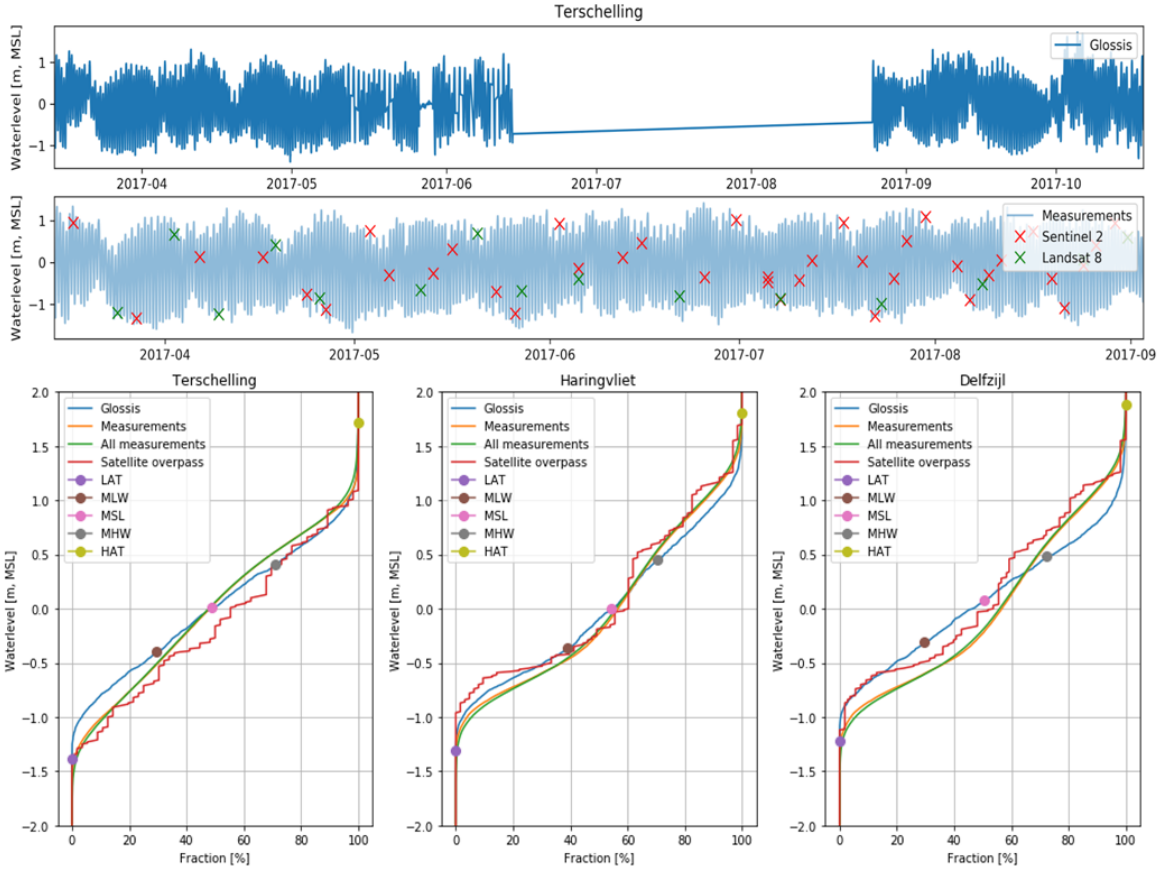

Image: Comparison of the satellite derive coastline with model output, measurement stations and computed Lowest Astronomical Tide, Mean low Water, Mean Sea Level, Mean High Water and High Astronomical tide.

WP5 contributes to the following task as formulated in the tender and as shared with WP2 and WP3:

- Task 2: Digital terrain model

WP5 also contributes to the following task as formulated in the tender and as shared with WP1 and WP2:

- Task 3: Coastline data

All tasks have progressed well as can be derived from the WP1, WP2, WP3 and WP5 progress reporting.

WP6 – Outreach, helpdesk and evaluation

Thanks to the success of the previous EMODnet Bathymetry phase there are lot of interest and lots of users for the portal. The new HRSM project has benefitted from this for its outreaching activities which promote both the EMODnet Bathymetry DTM results along side with the new challenges and progress of activities of the High Resolution Seabed Mapping (HRSM) Consortium. Chapter 9 gives a list of participations of consortium members in conferences, papers and other outreaching activities. For example, the International Hydrographic Organization (IHO) held its Assembly in Monaco, 24 – 28 April 2017. Thirteen partners of the EMODnet HRSM consortium were present. EMODnet HRSM was cited on multiple occasions as a successful regional project involving both hydrographic offices and research institutes with complementing approaches in terms of data coverage and methodologies (acquisition, processing and validation). The Seabed 2030 initiative (https://seabed2030.gebco.net/), led by the IHO-IOC GEBCO, under the financial sponsorships of the Nippon Foundation and launched on the 6/6/2017, recognised EMODnet Bathymetry as a worldwide key actor of bathymetric data production (https://seabed2030.gebco.net/documents/seabed_2030_roadmap_v10_low.pdf). Another important event was the EMODnet Open Sea Lab Hackaton which was very valuable for the EMODnet HRSM Consortium members, as they were able to experience and evaluate how the EMODnet Bathymetry data are used. The web portal was maintained, statistics about use of portal and services were collected and several questions were received and answered by the helpdesk. The web statistics are detailed in chapter 10 and are very good. The user questions received and answered through the helpdesk are detailed in chapters 8 and 14. International interoperability is ensured in a number of ways. First of all, the EMODnet HRSM consortium consists of organisations that have international networks and are well acquainted with international cooperation also aiming at international interoperability. This includes relationships concerning standards such as: ISO, OGC, INSPIRE, SeaDataNet, IHO, IOC and ODIP. It also includes collection and sharing of metadata, data and DTMs such as GEBCO, IBCAO, BSBD, NSBD, and NOAA/NCEI. Both levels results in formats and controlled terms that are applied to the metadata and datasets in EMODnet HRSM and which are therefore interoperable with international practices. It also comes back in the web services that are based upon OGC standards and tools which are broadly used by international communities. Another element ensuring coherence and interoperability is the fact that bathymetry data are collected in-situ by remote sensing techniques and instruments which are used by the global community of hydrographers and bathymetric researchers, with relatively similar principles, methodologies and practices. This implicates that the original collected data sets are comparable in formats. Finally there is a long tradition on a global scale, such as through IHO and the GEBCO project, to share bathymetry methods and resulting datasets which also results in international interoperability. Benefiting from the previous EMODnet Bathymetry activities, EMODnet HRSM is well engaged in multiple active international collaborations (International Hydrographic Organisation (IHO), General Bathymetric Chart of the Ocean (GEBCO), US National Oceanographic and Atmospheric Agency (NOAA)

through the Atlanctic Ocean Research Aliance (AORA)). This has been expanded with cooperation with the *International Bathymetric Chart of the Arctic Ocean* (IBCAO) as part of the HRSM approach for the arctic waters. Further details about international cooperation are detailed as part of the separate "EMODnet HRSM report on interoperability and international collaboration" [3].

WP6 combines the following task as formulated in the tender:

- Task 6: Helpdesk

WP6 contributes to the following task as formulated in the tender and as shared with WP4:

- Task 5: Web portal

WP6 also contributes to the following task as formulated in the tender and as shared with WP1:

- Task 7: International interoperability

WP6 also contributes to the following task as formulated in the tender and as shared with WP4:

- Task 9: Monitoring of performance

All tasks have progressed well as can be derived from the WP1, WP4, and WP6 progress reporting and the separate report on interoperability and international collaboration [3].

8. User Feedback

Quite a number of feedback forms were received through the Helpdesk. These were support messages for the project, and questions about technical issues and citation. Messages were answered where needed. The table below gives an overview of feedback events, while details on questions and answers are given in Chapter 15 Annex 1. Due to privacy law no personal names or email addresses are mentioned. In some cases use of general email providers like Yahoo, Hotmail and Gmail makes it difficult to identify the organization of users.

Date	Country	Organization	Type of user feedback	Response time to address user request
2017-01-10	Greece	HCMR	How to download small area as XYZ	One day later
2017-02-08	France	Aix-Marseille Université	Problem with downloading DTM tiles	Same day
2017-02-14	??	??	Problem with downloading DTM tiles	Next day
2017-03-08	Iceland	ISOR	Question about wrecks	Two days later
2017-03-23	Ireland	UCC	Question about WCS service	One day later
2017-03-27	Ireland	UCC	Question about MSL – LAT conversions	Same day
2017-04-03	Netherlands	UNESCO-IHE	Question about historic data sets	Three days later
2017-04-07	United Kingdom	FUGRO	Question about using EMODnet DTM in publication.	Three days later
2017-04-12	Denmark	GEUS	Question about shaded WMS	Three days later
2017-04-13	??	??	Question about vertical reference.	Two days later
2017-04-14	Spain	??	Downloading DTM for Mediterranean.	One day later
2017-05-08	United Kingdom	FUGRO	Continuation of earlier communication about using EMODnet DTM in publication and sharing FUGRO data.	Not applicable
2017-05-15	??	??	Reference level for bathymetry	Two days later
2017-06-14	Spain	IGME	How to download the DTM	Two days later

Date	Country	Organization	Type of user feedback	Response time to address user request
2017-06-30	Romania	DDNI	Change of website URL and email for DDNI in EDMO	Two days later
2017-8-31	??	??	Question about using LAT	Immediately
2017-8-31	Belgium	RBINS	Question about how to download the DTM	A few days later
2017-9-5	United Kingdom	GeoCento	Question about OpenSearch / API's for EOBroker project	Next day
2017-9-15	United Kingdom	UK MetOffice	Question about anomalies near coasts	10 days later in order to have a good answer
2017-10-6	United Kingdom	Fugro	Question about Israel EEZ data	Same day
2017-10-9	United Kingdom	Coventry University	Question about format	Same day
2017-10-10	United Kingdom	BP	Question about portal issue	Same day
2017-10-19	??	??	Question about area of interest	Two days later
2017-10-30	Belgium	IMDC	Question about vertical reference	Three days later
2017-10-24	United Kingdom	ERILAW	Question about REST service for site for diving in Greece	A week later. Had to check first.
2017-11-07	Germany	Student	Question about waterdepth profiles	Same day
2017-12-06	Netherlands	Periplus	Question about OGC web services	Same day
2017-12-07	Cyprus	CUT	Wants to use DTM in EU project for Augmented Reality	Same day
2017-12-12	Oman	Mirath Petrogas	Search for survey companies	One week later
2017-12-19	United Kingdom	Cardiff University	In search of current data.	Next day

9. Outreach and communication activities

See also WP6 report in Chapter 7.

Date	Media	Title	Short description and/or link to the activity
2017-03-01	Press release at Hydro International website	*UK Input into EMODnet Phase 3 High Resolution Seabed Mapping Project*	Web link : Press release by OceanWise
2017-03-08	Presentation at 7th ODIP II Workshop, Hobart - Australia	EMODnet – Bathymetry	Web link : Presentation by MARIS
2017-03-08	Article in EOS magazine	Airline Flight Paths over the Unmapped Ocean	Web link : Article by Shom together with NOAA
2017-04-24	Presentation at EGU 2017 Conference, Vienna, Austria	EMODnet High Resolution Seabed Mapping – further developing a high resolution digital bathymetry for European seas	Web link: Presentation by MARIS
2017-04-24 to 2017-04-28	Presence of 13 members of the consortium at the IHO Assembly		Refer to https://www.iho.int/mtg_docs/conf/19IHC2017/letters/A1_WP1_01_EN.pdf
2017-05-30 To 2017-05-31	Emodnet Geology Kick Off meeting	EMODNet High Resolution Seabed Mapping (HRSM)	Technical presentation done in order to introduce potential collaboration between both thematic portals
2017-05	Short insert in the French review Geomètre	Portal.emodnet-bathymetry.eu	Géomètre – Revue des géomètres-experts n°2147 – Mai 2017
2017-06-21	Oral presentation at the 16th International User Conference, CARIS 2017	Data Dissemination and Interpretation at the British Geological Survey	Technical presentation done by BGS in front of the community of users of the bathymetric softwares CARIS
2017-06-21	Oral presentation at the 16th International	Coastal and Marine Spatial Data Infrastructure in Flanders, Belgium	Technical presentation done by MDK in front of the community of users of the bathymetric softwares CARIS

Date	Media	Title	Short description and/or link to the activity
	User Conference, CARIS 2017		
2017-06-01	Popular journal "le Marin"	L'hydrographie vers un partage de données	http://www.lemarin.fr/archives/search/shom/Le%20Marin/2017-06-01/2017-06-01
2017-09-29	General public presentation	"Nuit européenne des chercheur(e)s"	Demonstration of Shom's activities to the general public including the bathymetry of european waters as part of EMODnet Bathymetry – Horizon 2020 Marie Curie Sklodowska – Grant Agreement N°722266.
2017-09-27	Oral presentation	IHO EU Network Working Group	Oral presentation of the general objectives and recent progresses of the EMODnet High Resolution Seabed Mapping to
2017-09-13 To 2017-09-15	Oral presentation	8th EMODnet Steering Committee	Oral presentation giving recent updates to the other thematic lots, Check Point lots and the EMODnet Secretariat.
2017-07-11 To 2017-07-12	Oral presentation, discussion and portal demonstration	Workshop on "Global Reference Grid Systems for Big Geospatial Data"	Invited to provide input in terms of technical descriptions and need in terms of representation of marine environmental data and more especially bathymetric data.
2017-10-19	Oral presentation	SeaDataCloud Plenary Meeting, Athens - Greece	Presentation by MARIS giving overview and latest progress of the EMODnet HRSM project and portal
2017-11-13	Oral presentation	GEBCO Guiding Committees – Busan – South Korea	Presentation by Shom at the technical committees of the GEBCO annual meeting.
2017-11-15	Participation	EMODnet 'Open Sea Lab' hackaton, Antwerp - Belgium	Participation of GGSGc and Shom on behalf of EMODnet HRSM to give support and information about EMODnet HRSM products and services.
2017-11-15	Oral presentation	IODE – ODIP Best Practices workshop, Paris, France	Presentation by MARIS about SeaDataNet, EMODnet and AtlantOS, also highlighting EMODnet HRSM.
2017-11-16	Oral presentation	Hydro'17 – Rotterdam – The Netherlands	Presentation by RNLN and Shom at the international hydrographic conference HYDRO'17. Two presentations given during this conference referenced the EMODnet Bathymetry portal and product.
2017-12-5	Oral presentation	5th Crowd Source Bathymetry Working Group - Monaco	Presentation by Shom to the members of the IHO - CSBWG, with highlights on the evaluation of the quality of source data and metadata management.
2017-12-6	Demonstration	International Hydrographic Organization - Monaco	Demonstration of the EMODnet Bathymetry portal and EMODnet HRSM current project to the new board of

Date	Media	Title	Short description and/or link to the activity
			Directors of the International Hydrographic Organisation
2017-12-13	Oral presentation	AGU Fall meeting, New Orleans - USA	Presentation by MARIS and Shom at the American Geophysical Union annual conference giving overview and latest progress of the EMODnet HRSM project and portal

10. Updates on Progress Indicators

Indicator 1 - Volume of data made available through the portal

The total number of CDIs for bathymetric survey data sets has increased from **14791 to 26875.**

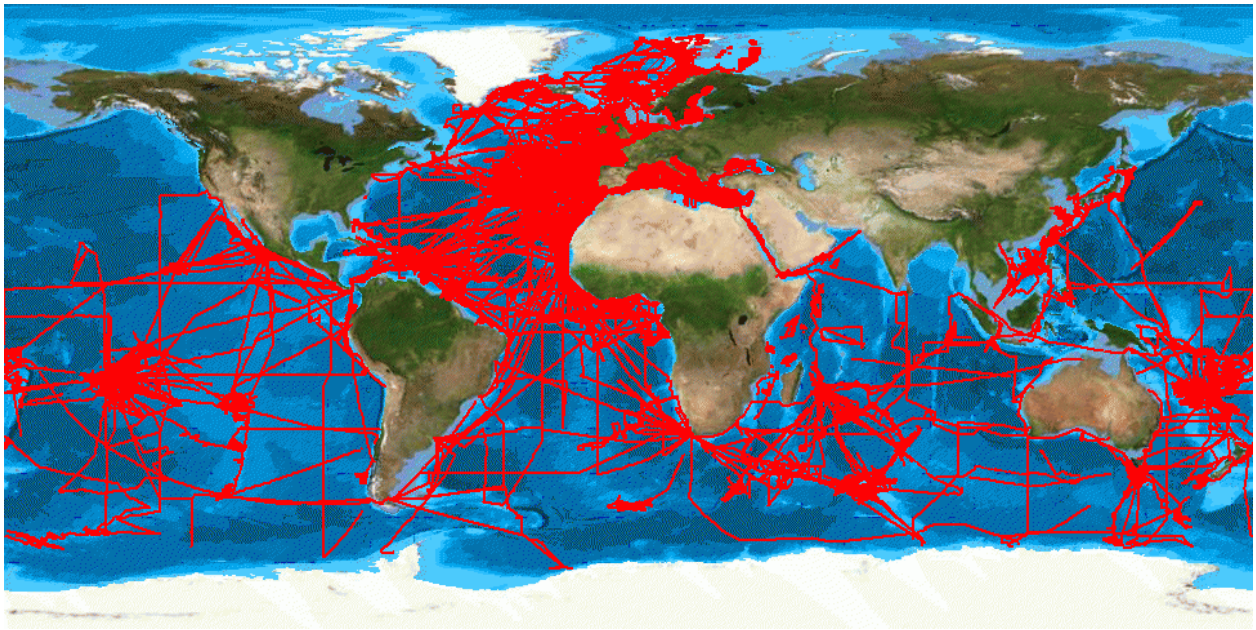

Image: Map of all entries in the CDI catalogue service

The total in production covers the whole globe. Specifically relevant for European waters (Lat Long box**: N80, W-30 ; N20, E45)** has increased from **11505 to 23223.**

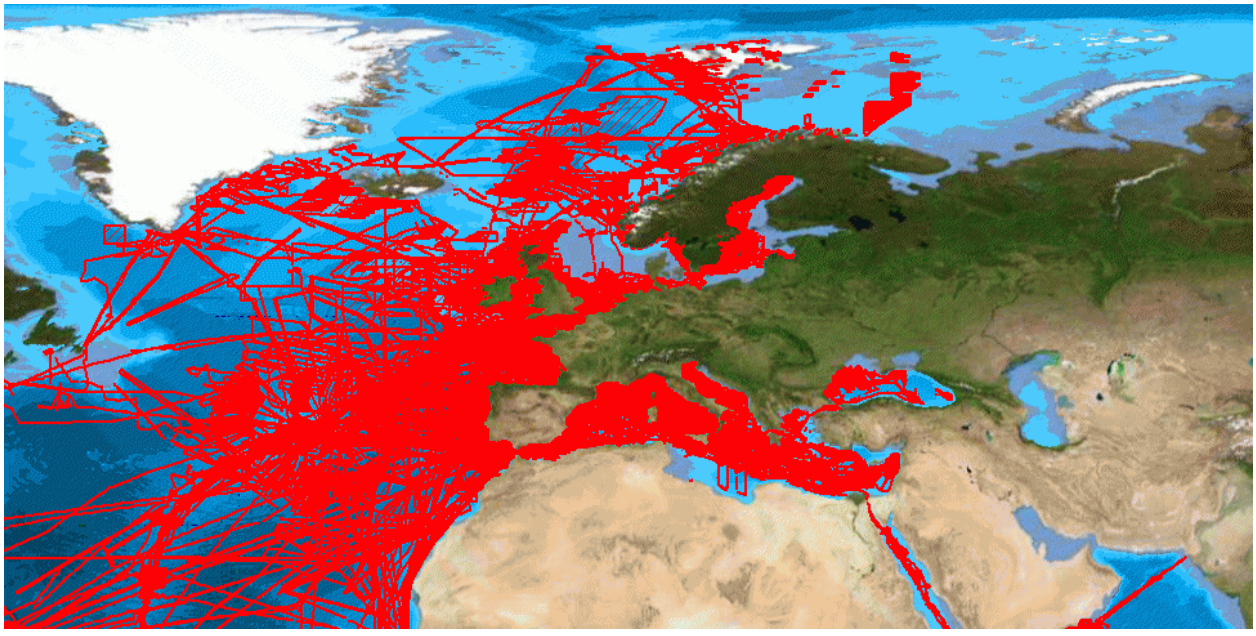

Image: Map of entries in the CDI catalogue service for European marine waters

Of these **1774** are unrestricted, while all other require negotiation. Bathymetric survey data are costly to acquire and by most data providers treated with access restrictions which are indicated as part of the CDI metadata. Users can submit requests for access by means of the shopping mechanism in the CDI Data Discovery and Access service. This way data providers are informed about the requests and will contact the users by email or telephone for further discussing their requests. Most of the time this leads to positive decisions and delivery of data sets through the CDI Data Discovery and Access service or directly by e-mail by-passing the CDI service. It can also be that no agreement can be reached and then users will not get access to the requested data sets. Anyway the negotiation is an issue between the users and the data providers whereby the CDI service and in particular its Request Status Manager (RSM) service can serve as an instrument, but it can be by-passed. So as EMODnet Bathymetry there is no absolute complete insight in all transactions.

Next to survey data as described in the CDI Data Discovery and Access service, there are also **Composite DTM's** used as source data. These are described with metadata in the Sextant catalogue service. The table below gives a list of the present Composite DTM entries.

Composite DTM	DTM provider	Country	Type of data	Resolution
EMODnet Regional DTM of the Belgium Continental Shelf	Flemish Hydrographic Office	Belgium	single beam and multi-beam	125 m
EMODnet Regional DTM of the Belgium Continental Shelf Version 5	Flemish Hydrographic Office	Belgium	single beam and multi-beam	60 m
EMODnet Regional DTM of the Belgium Continental Shelf Version 6	Flemish Hydrographic Office	Belgium	single beam and multi-beam	60 m
Bulgarian Black Sea South Shore	IO-BAS	Bulgaria	single-beam echosounders	58 m
Regional DTM of Denmark continental shelf	Danish Maritime Agency	Denmark	Single beam	50 m

Composite DTM	DTM provider	Country	Type of data	Resolution
Estonia DTM	Estonian Maritime Administration	Estonia	Single beam	50 m
EMODnet Digital Bathymetry (DTM)	EMODnet Bathymetry consortium	Europe	single and multibeam echosounders; altimetry	250 m
Bathymetry_Bay of Biscay	IFREMER	France	Single beam and multi-beam	1000 m
MULTIBEAM GRIDDED DATA FROM CIRCEE CRUISE	IFREMER	France	multi-beam echosounders	50 m
Regional DTM of German continental shelf	BSH	Germany	from German Hydrographic Office	50 m
Baltic Sea – German zone	BSH	Germany	Single beam and multi-beam	.375 arc minutes
DGMW Jade Model A	BSH	Germany	Single beam and multi-beam	1 m
North Sea - German approaches	BSH	Germany	Single beam	115 m
DGMW Baltrum/Langeoog	BSH	Germany	single-beam echosounders	1 m
DGMW Elbe Model A	BSH	Germany	single-beam echosounders	1 m

Composite DTM	DTM provider	Country	Type of data	Resolution
DGMW Ems Model A	BSH	Germany	single-beam echosounders	1 m
DGMW Juist/Norderney	BSH	Germany	single-beam echosounders	1 m
DGMW Langeoog/Spiekeroog Model A	BSH	Germany	single-beam echosounders	1 m
DGMW Weser Model A	BSH	Germany	single-beam echosounders	1 m
Satellite Derived Bathymetry Crete - Greece	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry South Aegean- Greece	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Tobruk - Libya	EOMAP	Germany	LandSat 8 satellite	30 m
Satellite Derived Bathymetry Andalusia, Murcia, Com. Valencia- Spain	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Peloponnese, South Aegean, Attica, West Greece - Greece	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Andalusia II- Spain	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Attica, Central Greece, Thessaly - Greece	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Central Macedonia, Mount Athos, East Macedonia and Thrace - Greece	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry South Aegean, Karpathos, Rhodos & Cos, - Greece	EOMAP	Germany	LandSat 8 satellite	15 m

Composite DTM	DTM provider	Country	Type of data	Resolution
Satellite Derived Bathymetry Balearic Islands - Spain	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Melilla - Spain	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Attica & Peloponnese - Greece	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Ceuta - Spain	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Catalonia - Spain	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry North Aegean & East Macedonia and Thrace - Greece	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Andalusia- Spain	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry Com. Valencia- Spain	EOMAP	Germany	LandSat 8 satellite	15 m
Satellite Derived Bathymetry North Aegean, Chios, Lesvos, Psara, Antipsara - Greece	EOMAP	Germany	LandSat 8 satellite	15 m
Gridded bathymetry from multibeam echosounder ELAC BottomChart MkII data of the cruise POS317/3 (2004)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM120 data of the cruise M72/1 (2007)	MARUM	Germany	single-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM120 data of the cruise M72/2 (2007)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM120 data of the cruise M72/3a and M72/3b (2007)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM120 data of the cruise M72/4 (2007)	MARUM	Germany	multi-beam echosounders	125 m

Composite DTM	DTM provider	Country	Type of data	Resolution
Gridded bathymetry from multibeam echosounder EM120 data of the cruise M72/5 (2007)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM120 data of the cruise MSM15/1 (2011)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM120 data of the cruise MSM15/2 (2011)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM122 data of the cruise M84/2, off Eregli (2011)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM122 data of the cruise M84/2, off Georgia (2011)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM122 data of the cruise M84/2, off Kerch and the eastern Crimea (2011)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM122 data of the cruise M84/2, off Samsun (2011)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM122 data of the cruise MSM33 (2013)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM122 data of the cruise MSM34/1 (2013)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM122 data of the cruise MSM34/2 (2013)	MARUM	Germany	multi-beam echosounders	125 m

Composite DTM	DTM provider	Country	Type of data	Resolution
Gridded bathymetry from multibeam echosounder EM122 data of the cruise MSM35 (2015)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM12S data of the cruise TTR6/2 (1996)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder EM710 data of the cruise M72/1 (2007)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder HS-DS2 data of the cruise M51/4 (2001)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder HS-DS2 data of the cruise M52/1 (2002)	MARUM	Germany	multi-beam echosounders	125 m
Gridded bathymetry from multibeam echosounder ELAC BottomChart MkII data of the cruise POS317/4 (2004)	MARUM	Germany	multi-beam echosounders	125 m
Cyprus-Compilation	Geological Survey of Israel	Israel	Composite 25 m grids from single beam	0.25 minutes
Joint Israel National Bathymetric Survey Data	Geological Survey of Israel	Israel	Multi-beam	0,25 minutes
Nile-Delta-UKHO-UKHD-Soundings	Geological Survey of Israel	Israel	Soundings from UKHO – single beam	0.1 minutes
Libya-Italian-HDNO-0.25min	Geological Survey of Israel	Israel	Italian surveys – single beam	0.25 minutes

Composite DTM	DTM provider	Country	Type of data	Resolution
Adriatic_singlebeam	CNR-ISMAR	Italy	Single beam	200 m
Adriatic_Emilia-Romagna	CNR-ISMAR	Italy	Single beam and multi-beam	10 m
Regional DTM of NL continental shelf	Hydrographic office of NL	Netherlands	Single beam and multi-beam	125 m
REGIONAL DTM OF NETHERLANDS CONTINENTAL SHELF version 2017	Hydrographic office of NL	Netherlands	multi-beam echosounders	12 - 20 m
Regional DTM for Norway area	Norwegian Hydrographic service	Norway	Electronic charts NHS	unclear
NHS 50m grid from multi-beam surveys	Norwegian Hydrographic service	Norway	multi-beam	50 m
NHS 50m grid	Norwegian Hydrographic service	Norway	multi-beam	50 m
Norway coastal 50 m composite DTM	Norwegian Hydrographic service	Norway	single beam and multi-beam	50 m
Svalbard_data_2016	Norwegian Hydrographic service	Norway	multi-beam echosounders	10 m
West Continental Shelf of Portugal	EMEPC	Portugal	Multi-beam	500 m
West Central Continental Shelf Portugal	IPMA	Portugal	(EMEPC sources)	250m
EMEPC Central_Continental_Shelf_Portugal	IPMA (EMEPC sources)	Portugal	Multi-beam	500 m

Composite DTM	DTM provider	Country	Type of data	Resolution
Danube Delta marine zone (3339_001)	SC Marine Research	Romania	Side scan sonar	225 m
Danube Delta marine zone (3339_002)	SC Marine Research	Romania	Side scan sonar	225 m
Balear Islands Margin	IEO	Spain	Single beam and multi-beam	250 m
Catalan Margin	IEO	Spain	Multi-beam	100 m
Strait of Gibraltar	IEO	Spain	Single beam and multi-beam	100 m
Alboran Sea	IEO	Spain	Multi-beam	250 m
Cantabric Sea	IEO	Spain	Single beam and multi-beam	200 m
Golfo de Vera (Spain) Margin	IEO	Spain	Multi-beam	200 m
Levante margin	IEO	Spain	Single beam and multi-beam	100 m
South Alboran Sea	IEO	Spain	From IBCM: single beam and multi-beam	unclear
ZEE_GALICIA	IEO	Spain	multi-beam	460 m
Murcia Margin	IEO	Spain	multi-beam	100 m
Formentera Island South Margin	IEO	Spain	multi-beam	200 m
ECOMARG	IEO	Spain	multi-beam	200 m

Composite DTM	DTM provider	Country	Type of data	Resolution
Gulf of Cádiz (353_291106)	IEO	Spain	Single beam and multi-beam	200 m
Gulf of Cádiz (353_291219)	IEO	Spain	multi-beam	200 m
Gulf of Cádiz (353_291218)	IEO	Spain	multi-beam	200 m
Balear Islands South Margin	IEO	Spain	multi-beam	200 m
PAIS_VASCO	IEO	Spain	multi-beam	250 m
Canal Menorca Margin	IEO	Spain	multi-beam	250 m
MARCONI	IEO	Spain	multi-beam	100 m
Catalan margin Coast Brava	IEO	Spain	multi-beam	100 m
Ecocartografia IBIZA - FORMENTERA	IEO	Spain	multi-beam	225 m
Ecocartografia MENORCA	IEO	Spain	multi-beam	225 m
Espace-Medit-Continental-Shelf	IEO	Spain	multi-beam	225 m
353_291717 - La Palma Island Margin Eco-cartography	IEO	Spain	multi-beam	225 m
353_291715 - Formentera Island Margin Spain	IEO	Spain	multi-beam	100 m
353_291702 - MARCONI CANTABRIAN SEA SPAIN	IEO	Spain	single-beam echosounders	100 m
353_291701 - Cantabrian Sea Spain	IEO	Spain	single and multibeam echosounders	100 m

Composite DTM	DTM provider	Country	Type of data	Resolution
353_291711-Strait of Gibraltar	IEO	Spain	single and multibeam echosounders	100 m
353_291721 - Lanzarote Island Margin Eco-cartography	IEO	Spain	multibeam echosounders	100 m
353_291709 - Valencian Community Margin Eco-cartography	IEO	Spain	multibeam echosounders	100 m
353_291708 - Mediterranean South Margin Spain	IEO	Spain	single and multibeam echosounders	100 m
353_291705 - Canal Menorca Margin	IEO	Spain	multibeam echosounders	100 m
353_291707 - Murcia Margin Spain	IEO	Spain	multibeam echosounders	100 m
353_291704 - Cabrera Island Natural Park Spain	IEO	Spain	multibeam echosounders	100 m
353_291716 - El Hierro Island Margin Eco-cartography	IEO	Spain	multibeam echosounders	100 m
353_291718 - La Gomera Island Margin Eco-cartography	IEO	Spain	multibeam echosounders	100 m

Composite DTM	DTM provider	Country	Type of data	Resolution
353_291720 - Fuerteventura Island Margin Eco-cartography	IEO	Spain	multibeam echosounders	100 m
Mediterráneo zona MED93S	IHM	Spain	single-beam echosounders	231.5 m
Baltic Sea Bathymetry Database	Baltic sea Hydrographic Commission	Sweden	Multiple sources	500 m

Table: Overview of data providers and Composite DTM entries in Sextant Catalogue

Indicator 2 - Organisations supplying each type of data based on (formal) sharing agreements and broken down into country and organisation type (e.g. government, industry, science).

Data Centre	Country	No of CDIs	No restrictions	Restrictions
Shom	France	5811	0	5811
Swedish Maritime Administration	Sweden	5774	0	5774
Rijkswaterstaat Central Information Services	Netherlands	2702	0	2702
OceanWise Limited	United Kingdom	2108	0	2108
Norwegian Hydrographic Service (NHS)	Norway	1222	0	1222
Italian Navy Hydrographic Office	Italy	1073	0	1073
German Oceanographic Datacentre (NODC)	Germany	1004	1004	0
IFREMER / IDM / SISMER - Scientific Information Systems for the SEA	France	744	292	452
Maritime Administration of Latvia	Latvia	580	0	580
Royal Netherlands Navy, Hydrographic Service	Netherlands	331	0	331
Flemish Ministry of Mobility and Public Works; Agency for Maritime and Coastal Services; Coastal Division	Belgium	318	0	318
IHPT, Hydrographic Institute	Portugal	296	0	296
Geological Survey Ireland	Ireland	266	266	0
CNR, Institute of Marine Science (ISMAR) - Bologna	Italy	107	0	107

Data Centre	Country	No of CDIs	No restrictions	Restrictions
British Oceanographic Data Centre	United Kingdom	100	98	2
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	Greece	94	0	94
Management Unit of North Sea and Scheldt Estuary Mathematical Models, Belgian Marine Data Centre	Belgium	93	93	0
IEO/Spanish Oceanographic Institute	Spain	87	21	66
Portuguese Institute of Ocean and Atmosphere	Portugal	76	0	76
British Geological Survey, Edinburgh	United Kingdom	62	0	62
Hydrographic Institute of the Navy	Spain	58	0	58
Marum - Center for Marine Environmental Sciences, University of Bremen	Germany	35	0	35
CONISMA, National Interuniversity Consortium for Marine Science	Italy	33	0	33
CNR, Institute for the Marine and Coastal Environment (IAMC) - Napoli	Italy	30	0	30
NIOZ Royal Netherlands Institute for Sea Research	Netherlands	30	0	30
Marine Technology Unit. Mediterranean Marine and Environmental Research Centre	Spain	30	0	30
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Infrastructures Division	Italy	25	0	25
Bulgarian National Oceanographic Data Centre(BGODC), Institute of Oceanology	Bulgaria	24	0	24
CNR, Institute of Environmental Geology and Geoengineering (IGAG)	Italy	20	0	20
GRID-Arendal	Norway	14	0	14
National Institute of Marine Geology and Geoecology	Romania	14	0	14
Jardfeingi, the Faroe Islands Earth and Energy Directorate	Faroe Islands	13	0	13
SC Marine Research SRL	Romania	10	0	10
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Division of Oceanography	Italy	10	0	10
IGME, Geological Survey of Spain	Spain	8	0	8
National Institute for Marine Research and Development "Grigore Antipa"	Romania	7	0	7
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	Malta	6	0	6

Data Centre	Country	No of CDIs	No restrictions	Restrictions
Institute of Marine Sciences. Mediterranean Marine and Environmental Research Centre (CMIMA-ICM-CSIC). Department of Marine Science.	Spain	6	0	6
Israel Oceanographic and Limnological Research (IOLR)	Israel	2	0	2
TOTAL		**23223**	**1774**	**21449**

Table: Overview of data centres and number of CDI entries for European marine waters

Most centres are government and research institutes. Industry parties are: OceanWise and SC Marine Research SRL. The increase in the first project year is given in the next table.

Data Centre	Country	No of CDIs end 2017	No of CDIs end 2016	Difference
Shom	France	5811	4650	1161
Swedish Maritime Administration	Sweden	5774	0	5774
Rijkswaterstaat Central Information Services	Netherlands	2702	2165	537
OceanWise Limited	United Kingdom	2108	2066	42
Norwegian Hydrographic Service (NHS)	Norway	1222	0	1222
Italian Navy Hydrographic Office	Italy	1073	0	1073
German Oceanographic Datacentre (NODC)	Germany	1004	256	748
IFREMER / IDM / SISMER - Scientific Information Systems for the SEA	France	744	716	28
Maritime Administration of Latvia	Latvia	580	0	580
Royal Netherlands Navy, Hydrographic Service	Netherlands	331	313	18
Flemish Ministry of Mobility and Public Works; Agency for Maritime and Coastal Services; Coastal Division	Belgium	318	197	121
IHPT, Hydrographic Institute	Portugal	296	275	21
Geological Survey Ireland	Ireland	266	223	43
CNR, Institute of Marine Science (ISMAR) - Bologna	Italy	107	73	34
British Oceanographic Data Centre	United Kingdom	100	100	0
Hellenic Centre for Marine Research, Hellenic National Oceanographic Data Centre (HCMR/HNODC)	Greece	94	76	18

Data Centre	Country	No of CDIs end 2017	No of CDIs end 2016	Difference
Management Unit of North Sea and Scheldt Estuary Mathematical Models, Belgian Marine Data Centre	Belgium	93	93	0
IEO/Spanish Oceanographic Institute	Spain	87	66	21
Portuguese Institute of Ocean and Atmosphere	Portugal	76	53	23
British Geological Survey, Edinburgh	United Kingdom	62	0	62
Hydrographic Institute of the Navy	Spain	58	58	0
Marum - Center for Marine Environmental Sciences, University of Bremen	Germany	35	0	35
CONISMA, National Interuniversity Consortium for Marine Science	Italy	33	0	33
CNR, Institute for the Marine and Coastal Environment (IAMC) - Napoli	Italy	30	0	30
NIOZ Royal Netherlands Institute for Sea Research	Netherlands	30	30	0
Marine Technology Unit. Mediterranean Marine and Environmental Research Centre	Spain	30	6	24
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Infrastructures Division	Italy	25	23	2
Bulgarian National Oceanographic Data Centre(BGODC), Institute of Oceanology	Bulgaria	24	20	4
CNR, Institute of Environmental Geology and Geoengineering (IGAG)	Italy	20	0	20
GRID-Arendal	Norway	14	10	4
National Institute of Marine Geology and Geoecology	Romania	14	9	5
Jardfeingi, the Faroe Islands Earth and Energy Directorate	Faroe Islands	13	5	8
SC Marine Research SRL	Romania	10	3	7
OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale), Division of Oceanography	Italy	10	10	0
IGME, Geological Survey of Spain	Spain	8	0	8
National Institute for Marine Research and Development "Grigore Antipa"	Romania	7	0	7
International Ocean Institute - Malta Operational Centre (University Of Malta) / Physical Oceanography Unit	Malta	6	4	2
Institute of Marine Sciences. Mediterranean Marine and Environmental Research Centre (CMIMA-ICM-CSIC). Department of Marine Science.	Spain	6	5	1

Data Centre	Country	No of CDIs end 2017	No of CDIs end 2016	Difference
Israel Oceanographic and Limnological Research (IOLR)	Israel	2	0	2
				0
TOTALS		**23223**	**11505**	**11718**

Table: Overview of data centres and increase in number of CDI entries for European marine waters in the first project year

The number of entries for Composite DTMs in the Sextant Catalogue service has increased in the first project year from **78 to 115**. The increase in the first project year is given in the next table.

Data Centre	Country	Sextant entries end Dec 2017	Sextant entries end Dec 2016	Sextant entries increase
Flemish Ministry of Mobility and Public Works; Agency for Maritime and Coastal Services; Coastal Division	Belgium	3	1	2
Bulgarian National Oceanographic Data Centre(BGODC), Institute of Oceanology	Bulgaria	1	1	0
Danish Maritime Agency	Denmark	1	1	0
Estonian Maritime Administration	Estonia	1	1	0
IFREMER / IDM / SISMER - Scientific Information Systems for the SEA	France	2	1	1
German Oceanographic Datacentre (NODC) / BSH	Germany	10	9	1
MARUM	Germany	21	20	1
Geological Survey of Israel	Israel	4	4	0
Institute of Marine Science (ISMAR) - Bologna	Italy	2	2	0
Royal Netherlands Navy, Hydrographic Service	Netherlands	2	1	1
Norwegian Hydrographic service	Norway	5	5	0
Portuguese Institute of Ocean and Atmosphere	Portugal	2	2	0
EMEPC	Portugal	1	1	0
SC Marine Research SRL	Romania	2	2	0
IEO/Spanish Oceanographic Institute	Spain	37	24	13
Hydrographic Institute of the Navy	Spain	1	1	0
Baltic sea Hydrographic Commission	Sweden	1	1	0
EOMAP	Germany	18	0	18
EMODnet Bathymetry consortium	Europe	1	1	0

Data Centre	Country	Sextant entries end Dec 2017	Sextant entries end Dec 2016	Sextant entries increase
TOTAL		**115**	**78**	**37**

Table: Overview of data providers and increase in number of Sextant entries in the first project year

Indicator 3 - Organisations that have been approached to supply with no result, including type of data sought and reason why it has not been supplied.

The Croatian Hydrographic Service (HHI) has requested some flexibility with respect to resolution and distribution of their data in order to comply with their national policy on geographic data. A statement document between the Croatian Subcontractor and the Coordinator of EMODnet HRSM has been drafted and will be signed by both parties. Thereafter HHI will undertake immediate action to deliver metadata and data.

There has been regular communication with the Geodetic Institute of Slovenia (GIS) as partner in EMODnet HRSM to undertake the agreed actions for gathering, preparing and delivering metadata and data sets. Recently this has resulted in contributions for both the CDI and Sextant catalogues, which have been prepared by GIS with support of CNR-ISMAR and MARIS.

There is delay in the delivery and metadata production by the Danish Geodata Agency (GST). They have signed their subcontract as last party and thereby have missed the kick-off and training meeting at the begin of the project. Shom and MARIS are urging GST to make progress and support is given by MARIS respectively IFREMER concerning CDI respectively Sextant catalogues. There is expectation that GST will deliver in the coming weeks.

Indicator 4 - Volume of each type of data and of each data product downloaded from the portal

The numbers are given for the first reporting year of 20 December 2016 – 20 December 2017:

Number of CDI requests:

Period	No of CDI basket transactions	No of CDIs requested	Different users	Different data centres
20 December 2016 – 31 March 2017	13	3325	13	21
1 April 2017 – 30 June 2017	22	2846	14	16
1 July 2017 – 30 September 2017	12	327	10	11
1 October 2017 – 20 December 2017	30	497	24	19
Totals	**77**	**6975**	**61**	**67**

Table: Overview of CDI requests in the first project year

Data products – DTM downloads:

The EMODnet DTM covers all European seas and can be downloaded as 16 tiles in a number of formats: EMODnet csv, EMODnet excl GEBCO csv, ESRI ASCII, GeoTiff, NetCDF, SD, and XYZ file.

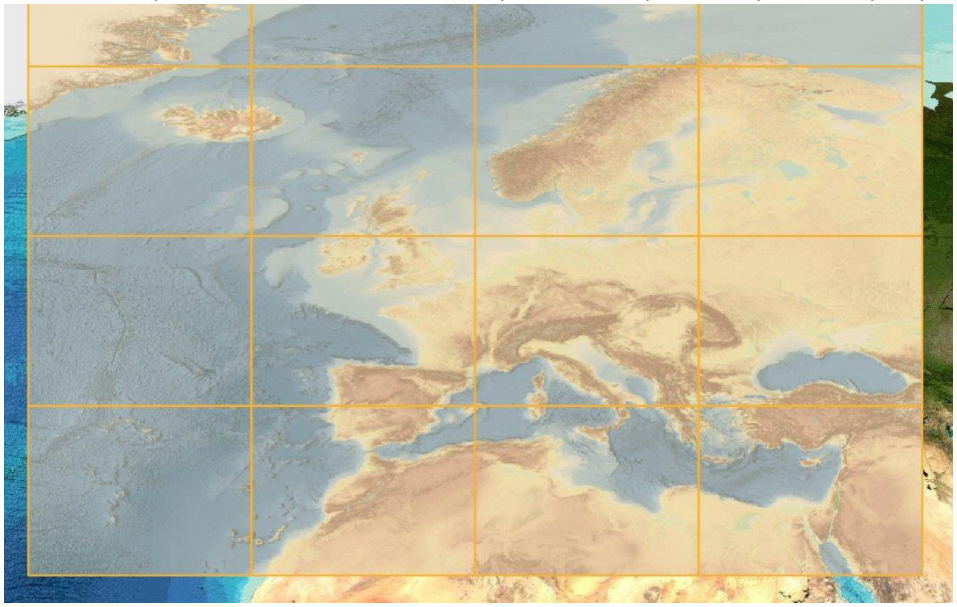

Image: Overview of tiles for downloading the EMODnet DTM in multiple formats

Tile	20 December 2016 – 31 March 2017	1 April 2017 – 30 June 2017	1 July 2017 – 30 September 2017	1 October 2017 – 20 December 2017
A1	87	52	64	88
A2	127	106	85	85
A3	221	111	77	85
A4	316	147	96	138
Area of interest	8482	5789	5062	5905
B1	101	63	47	63
B2	495	320	330	378
B3	939	749	714	756
B4	526	394	262	282
C1	156	71	53	86
C2	479	289	289	265
C3	846	494	476	549
C4	488	349	336	347
D1	101	54	46	76
D2	124	96	111	79
D3	387	266	219	462
D4	452	341	302	276
	-	-	-	-
	14327	**9691**	**8569**	**9920**

Table: Overview of number of downloaded DTM tiles

This also includes the Web Coverage Service (WCS) by which users can draw and download their own 'area of interest'.

Format	20 December 2016 – 31 March 2017	1 April 2017 – 30 June 2017	1 July 2017 – 30 September 2017	1 October 2017 – 20 December 2017
32 bit float GeoTiff	2555	1284	1173	1364
EMO	295	207	181	245
EMO (without GEBCO data)	137	108	81	100

Format	20 December 2016 – 31 March 2017	1 April 2017 – 30 June 2017	1 July 2017 – 30 September 2017	1 October 2017 – 20 December 2017
ESRI ASCII	6355	4469	3888	4548
GeoTiff	1915	1153	1071	1058
NetCDF	600	580	374	518
RGB GeoTiff	1266	1035	1002	1118
SD	225	164	129	212
XYZ	979	691	670	757
	-	-	-	-
	14327	**9691**	**8569**	**9920**

Table: Overview of formats of downloaded DTM tiles

Indicator 5 - Organisations that have downloaded each data type

organisation	country
?	Bangladesh
DEME Group	Belgium
Ghent University	Belgium
?	Croatia
?	France
ACRI-HE	France
IUEM	France
LEGOS	France
?	Germany
Christian-Albrechts Universität zu Kiel	Germany
Friedrich-Schiller-Universität Jena - IGW	Germany
GEOMAR	Germany
GMX	Germany
Kiel University	Germany
University of Heidelberg	Germany
?	Greece
National Observatory of Athens	Greece
Private	Greece
Iceland GeoSurvey	Iceland
Geospatial Information Agency	Indonesia
Geological Survey of Ireland	Ireland
Marine Institute	Ireland

organisation	country
Arpacal	Italy
C-Map Italy Srl	Italy
Istituto Idrografico della Marina	Italy
Arcadis	Netherlands
Boskalis	Netherlands
CGI	Netherlands
Deltares	Netherlands
MARIS	Netherlands
NARWAL	Netherlands
Oceans of Energy	Netherlands
TNO	Netherlands
UNESCO-IHE	Netherlands
?	Portugal
Faculdade de Ciências da Universidade de Lisboa	Portugal
UNIVERSITY OF THE AZORES	Portugal
ARGONGRA	Spain
IDEN	Spain
Movistar	Spain
private	Spain
Spanish Meteorological Agency	Spain
TURSIOPS	Spain
Universitat Politècnica de Catalunya	Spain
UPCT	Spain
Coastal Science Ltd	United Kingdom
Durham University	United Kingdom
Environment Agency	United Kingdom
Marine Biological Association	United Kingdom
NERC	United Kingdom
private	United Kingdom
QUB	United Kingdom
RPS	United Kingdom
UK National Oceanography Centre	United Kingdom
JO	United States
L-3 Communications	United States
NGA	United States

Table: Overview of organisations that have requested data from the CDI service in the first project year

Note: There is no registration for users that download EMODnet DTM tiles.

Indicator 6 - Using user statistics to determine the main pages utilised and to identify preferred user navigations routes

Bathymetry main portal:

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Dec-16	7,642	9,872	45,334	112,210	3.81 GB
Jan-17	9,040	11,446	43,137	117,990	5.12 GB
Feb-17	5,991	7,692	48,989	127,782	4.78 GB
Mar-17	7,395	9,451	44,866	138,578	5.22 GB
Apr-17	7,013	8,395	29,746	77,222	3.09 GB
May-17	7,058	8,729	47,399	153,443	3.98 GB
Jun-17	7,122	8,682	78,472	191,738	4.72 GB
Jul-17	7,669	9,105	76,228	159,438	6.09 GB
Aug-17	9,560	10,976	72,012	108,401	2.29 GB
Sep-17	10,945	12,399	73,670	132,839	4.22 GB
Oct 2017	12,609	14,754	96,437	205,244	5.42 GB
Nov 2017	15,067	17,695	95,944	171,951	4.44 GB
Dec 2017	13,697	15,896	86,935	164,026	3.97 GB

Table: Web statistics of EMODnet Bathymetry portal

Unique visitors are users that browse to the portal by internet. The list of visitors is sorted for unique visitors within a monthly period. The number of visits are the number of times that users browse to the portal. Considering the above statistics it seems that visitors browse to the portal on average 1.2 time per month. During a visit they browse through various pages of the portal. Again considering the statistics above one could say that circa 5.7 pages on average are viewed by the average visitor. Each page can consist of objects such as text and images. These are counted as hits when viewed, so one page can concern multiple hits. Bandwidth indicates the volume of bytes that goes from the server by internet to the web browser of the users for displaying the portal pages.

Visiting hosts	Pages	Hits	Bandwidth
ec2-54-246-219-198.eu-west-1.compute.amazonaws.com	334,484	607,614	9.37 GB
a83-163-127-252.adsl.xs4all.nl	17,444	51,211	1.77 GB
ec2-52-3-105-23.compute-1.amazonaws.com	14,823	16,201	233.12 MB
unknown.shom.fr	7,774	15,785	481.74 MB

Visiting hosts	Pages	Hits	Bandwidth
ec2-52-3-127-144.compute-1.amazonaws.com	4,705	5,849	107.43 MB
54.246.219.198	4,209	4,209	26.19 MB
cable-77-221-24-113.dynamic.vinet.ba	2,548	2,560	40.89 MB
a82-95-67-170.adsl.xs4all.nl	2,307	4,039	84.78 MB
82-95-102-52.ip.xs4all.nl	2,184	5,483	158.94 MB
fw1.marum.de	2,154	4,304	3.03 GB
lja.lv	2,123	3,999	427.56 MB
84-199-92-60.ifiber.telenet-ops.be	1,934	3,059	57.85 MB
64.241.197.104.bc.googleusercontent.com	1,671	2,144	43.11 MB
sarspam03.dcenr.gov.ie	1,621	4,580	656.08 MB
93-63-226-141.ip29.fastwebnet.it	1,613	3,409	252.53 MB
telecoms-lirex.lirex.net	1,609	3,494	117.52 MB
hidra.hhi.hr	1,478	3,982	659.16 MB
user.vliz.be	1,467	5,327	220.32 MB
br144-080.ifremer.fr	1,456	4,102	127.66 MB
www.xrtest2.com	1,385	1,385	10.29 MB
ibv2.statoil.com	1,383	2,595	39.28 MB
150.178.42.5	1,297	4,172	143.00 MB
broadband.actcorp.in	1,240	1,600	24.48 MB
ec2-54-172-241-121.compute-1.amazonaws.com	1,218	1,873	46.82 MB
a83-162-208-60.adsl.xs4all.nl	1,194	5,007	91.68 MB
static.kpn.net	994	2,874	80.29 MB
243.85-84-173.dynamic.clientes.euskaltel.es	981	1,046	7.67 MB
151-0-137-10.ip281.fastwebnet.it	936	3,822	469.41 MB
proxy.bsh.de	905	4,673	383.05 MB

Visiting hosts	Pages	Hits	Bandwidth
nat.bo.ismar.cnr.it	857	2,590	477.16 MB
gateway.hrwallingford.co.uk	856	2,333	55.46 MB
217.169.225.110	812	2,446	174.13 MB
195.171.4.200	800	1,935	39.06 MB
net-188-219-205-42.cust.vodafonedsl.it	772	1,130	20.25 MB
115.85.broadband15.iol.cz	751	854	6.15 MB
cable-77-221-21-61.dynamic.telemach.ba	738	742	11.81 MB
pc26.iup.uni-heidelberg.de	733	912	11.53 MB
85-18-36-49.ip.fastwebnet.it	731	1,901	77.93 MB
195.212.43.102	720	1,039	11.79 MB
188.64.156.195	717	1,812	207.70 MB
192.171.135.252	690	857	7.22 MB

Table: Top 40 of visiting hosts in 2017

Domains/ Countries		Pages	Hits	Bandwidth
Commercial	com	389,521	702,723	12.29 GB
Unknown	ip	148,125	371,264	13.3 GB
Network	net	54,866	131,498	3.46 GB
Netherlands	nl	31,121	91,066	2.98 GB
France	fr	22,356	62,861	2.29 GB
Italy	it	22,096	65,494	3.57 GB
Spain	es	14,738	41,610	1023.7 GB
Germany	de	13,177	38,297	4.55 GB
Greece	gr	11,092	34,083	1.13 GB
United Kingdom	uk	8,638	31,162	1.05 GB
Others		83107	190056	8.66 GB

Table: Top 10 of visiting domains/countries in 2017

Bathymetry DTM viewer service:

Month	Unique visitors	Pages	Hits	Bandwidth
December 2016	3800	17719	23131	94.05 Gb

Month	Unique visitors	Pages	Hits	Bandwidth
January 2017	3631	16263	21612	131.62 Gb
February 2017	4391	10079	16298	161.01 Gb
March 2017	4666	11181	17537	149.75 Gb
April 2017	3654	8921	14172	109.66 Gb
May 2017	4137	14626	21406	108.79 Gb
June 2017	3809	9450	1436	168.54 Gb
July 2017	3189	6801	10820	89,71 Gb
Aug 2017	3884	7614	11768	119,78 Gb
Sept 2017	3808	7342	11476	103.45 Gb
Oct 2017	3,918	7,470	12,157	136.29 GB
Nov 2017	4,072	7,447	11,789	134.60 GB
Dec 2017	3,093	6,340	9,912	62.73 GB

Table: Web statistics of Bathymetry Viewing and Download service

Visting Hosts	Country	Hits	Visitors
60.red-192-148-213.customer.static.ccgg.telefonica.net	Spain	61,175	1,921
u-152-61-128-50.xr.usgs.gov	United States	3,010	430
ec2-52-3-105-23.compute-1.amazonaws.com	United States	810	406
lpr83-2-78-239-25-91.fbx.proxad.net	France	392	327
unknown.shom.fr	France	572	303
129.10.159.27	United States	534	210
google-proxy-66-249-93-7.google.com	United States	218	207
google-proxy-66-249-93-3.google.com	United States	211	197
google-proxy-66-249-93-5.google.com	United States	208	193
fw1.marum.de	Germany	308	166
static.kpn.net	Netherlands	357	166
webdefence.cluster-x.websense.net	Netherlands	260	160
u-152-61-192-232.xr.usgs.gov	United States	1,088	159
Nautilus.MathStat.Dal.Ca	Canada	1,112	159
ec2-52-3-127-144.compute-1.amazonaws.com	United States	264	155

Visting Hosts	Country	Hits	Visitors
google-proxy-66-249-93-40.google.com	United States	143	137
google-proxy-66-249-93-35.google.com	United States	140	135
ip-192-169-243-214.ip.secureserver.net	United States	937	134
ip-166-62-120-219.ip.secureserver.net	United States	936	134
a83-163-127-252.adsl.xs4all.nl	Netherlands	513	131
google-proxy-66-249-93-38.google.com	United States	134	127
br167-092.ifremer.fr	France	282	122
static-5-51-41-68.ftth.abo.bbox.fr	France	711	117
nat.bo.ismar.cnr.it	Italy	203	116
9.red-212-170-218.customer.static.ccgg.telefonica.net	Spain	181	114
user.vliz.be	Belgium	213	113
17-142-150-32.applebot.apple.com	United States	207	109
mail.rvpetro.ru	Russian Federation	112	105
lja.lv	Latvia	148	100
ec2-52-27-2-86.us-west-2.compute.amazonaws.com	United States	115	97
bolegweb.geof.unizg.hr	Croatia	182	91
proxy.acri.fr	France	140	88
195.251.37.190	Greece	170	88
ec2-50-112-194-65.us-west-2.compute.amazonaws.com	United States	104	87
flab14.agro.auth.gr	Greece	476	85
proxy.dam.intra.cea.fr	France	166	84
176-140-30-79.abo.bbox.fr	France	463	82
150-70-173-12.trendmicro.com	Japan	83	82
enterprisesearch.siteimprove.com	Denmark	80	80
nat-service.aws.kontera.com	United States	273	79
proxy.aemet.es	Spain	255	79
106-179-static.pacwan.net	France	169	78
a83-162-208-60.adsl.xs4all.nl	Netherlands	915	74
193.136.242.245	Portugal	144	74
141.163.104.116	United Kingdom	188	74
81-174-35-146.v4.ngi.it	Italy	230	73
112.144.108.93.rev.vodafone.pt	Portugal	203	70
62.61.142.22.generic-hostname.arrownet.dk	Denmark	147	70
91.236.215.6	Netherlands	126	70
host107-87-static.225-95-b.business.telecomitalia.it	Italy	217	68

Visting Hosts	Country	Hits	Visitors
Total		**80,225**	**8,526**

Table: Top 50 hosts visiting Bathymetry Viewing and Download service in first year

Domain / Country	Ext	Hits	Visitors	Bandwidth (KB)
Unknown		42,658	17,937	577,536,282
Network	(.net)	80,406	9,649	234,246,952
Commercial	(.com)	17,240	9,082	154,079,863
Italy	(.it)	8,181	3,232	238,682,649
France	(.fr)	7,218	3,116	142,699,957
Greece	(.gr)	6,099	2,272	56,712,127
Spain	(.es)	4,820	1,868	98,811,854
UnitedKingdom	(.uk)	3,208	1,566	87,698,380
Germany	(.de)	3,992	1,552	80,418,767
Netherlands	(.nl)	4,436	1,506	49,988,199
Others		25,766	9,189	1,720,875,030
Totals		**204,024**	**60,969**	**3,441,750,060**

Table: Top 10 domains / countries visiting Bathymetry Viewing and Download service in first year

Indicator 7 - List of what the downloaded data has been used for (divided into categories e.g. Government planning, pollution assessment and (commercial) environmental assessment, etc.)

There is no registration for what purpose users are using the downloaded survey datasets and the downloaded DTM tiles. However generally speaking bathymetry is an important parameter for many applications. Detailed and accurate mapping of the seabed and shallow sub-seabed environment is important for a large number of research, policy, and commercial groups. In particular, the acquisition of swath bathymetry data has become a fundamental dataset for multiple scientific disciplines including physical oceanography, marine geology, and benthic ecology. High-resolution bathymetry data provides an opportunity to characterize the processes which formed and actively govern the physical seabed environment, as well as to provide the necessary boundary conditions for numerical modellers to investigate both active (e.g. oceanographic) and past (e.g. glacial) environmental phenomena. The bathymetry data are also highly complementary to seismic and high-resolution sub-bottom profiler data, together providing a 3-D characterization of the shallow sub-seabed environment.

Bathymetry is also an important parameter next to geological and geophysical parameters for companies involved in the planning and construction of offshore windmill farms which need high resolution geophysical and soil information for calculating the stability of the sea bed conditions. The dredging industry needs high resolution bathymetric, geophysical and soil information of the seabed for quantity and quality of the resources and the presence of obstacles in the sea bed for i.e. deepening and widening

of shipping routes, beach nourishment and coastal extensions. The oil- and gas industry needs, besides 3D-multichannel seismics for oil- and gas exploration, bathymetric and geophysical information for the stability of platforms and planning of pipeline routes. Companies involved with ecological issues for the determination of habitats in the offshore, need images collected with side scan sonar and multibeam for morphological and characterization of the sea bed.

Indicator 8 – List of web-services made available and user organisations connected through these web-services

The GIS layers in the Bathymetry Viewing and Download service can be shared as OGC services with other EMODnet portals and beyond. Also WMS layers from other EMODnet portals and external services can be added to the Bathymetry Viewer and Download service. The OGC services can be found at the following URLs:

WMS: http://ows.emodnet-bathymetry.eu/wms
WFS: http://ows.emodnet-bathymetry.eu/wfs
WMTS: http://ows.emodnet-bathymetry.eu/wmts
WCS: http://ows.emodnet-bathymetry.eu/wcs

More detailed info about the web services is given at: http://portal.emodnet-bathymetry.eu/services/

These URLs are advertised in the HELP section of the Viewing Service and also at the main portal. The web services concern WMS, WFS, WMTS and WCS and are applied by various users. These services are very popular with more than 254.000 users in the first project period as can be seen from its statistics in the tables below.

Page Views	
Total Page Views	34,800,350
Average Page Views per Day	71,458
Average Page Views per Visitor	136.65
Visitors	
Total Visitors	254,665
Average Visitors per Day	522
Total Unique Ips	36,942

Table: Web statistics of Bathymetry Viewing web services in first project year

The total number of pageviews is more than 34 million, but these is somewhat misleading as a full page can be composed of multiple views. The top visiting countries and sites are indicated below.

Country	Hits	Visitors	Bandwidth(KB)
UnitedStates	17,930,202	162,714	353,330,425
Spain	7,546,940	20,660	101,478,104
France	3,314,253	17,608	212,854,215
Japan	97,473	10,755	2,526,115
China	127,191	5,330	2,814,533
UnitedKingdom	546,945	4,804	52,415,044
Germany	620,406	3,965	16,206,035
Ireland	568,318	3,499	13,142,576
Netherlands	414,165	3,019	34,611,225
Italy	225,031	2,428	8,905,681
Others	3,409,426	19,883	798,283,953
Total	**34,800,350**	**254,665**	**1,596,567,906**

Table: Top 10 countries visiting Web Services in first year

11. Additional user statistics

List of publications referencing to EMODnet Bathymetry

The following references to EMODnet Bathymetry can be found using Google Scholar on the 18/01/2018. References are given for accepted papers and edited books for the first project year. This list is not exhaustive.

Date	Publication	Title	Reference
January 2017	Continental Shelf Research (Peer reviewed article)	Authigenic carbonate mounds from active methane seeps on the southern Aquitaine Shelf (Bay of Biscay, France): Evidence for anaerobic oxidation of biogenic methane and submarine groundwater discharge during formation	http://www.sciencedirect.com/science/article/pii/S0278434316301273
February 2017	Quaternary Science Reviews (Peer reviewed article)	Sea-level rise and potential drowning of the Italian coastal plains: Flooding risk scenarios for 2100	http://www.sciencedirect.com/science/article/pii/S0277379116307430
February 2017	Marine Ornitology (Peer reviewed article)	Status and diet of the European Shag (Mediterranean subspecies) Phalacrocorax Aristitelis desmarestii in the Libyan sea (South Crete) during the breeding season	http://www.marineornithology.org/PDF/45_1/45_1_1-9.pdf
February 2017	Biogeochemistry (Peer reviewed article)	Predicting the standing stock of organic carbon in surface sediments of the North–West European continental shelf	http://link.springer.com/article/10.1007/s10533-017-0310-4
February 2017	Thesis report	Estudio sobre la viabilidad económica de un parque eólico Offshore en España	http://oa.upm.es/45981/1/TFG_JOSE_IGNACIO_DIAZ_VILLAMOR.pdf
March 2017	Earth Science Reviews (Peer reviewed article)	The configuration, sensitivity and rapid retreat of the Late Weichselian Icelandic ice sheet	http://www.sciencedirect.com/science/article/pii/S001282521630246X

Date	Publication	Title	Reference
March 2017	Book	Morphodynamics of Mediterranean Mixed Sand and Gravel Coasts	
March 2017	Earth and Planetary Science Letters (Peer reviewed article)	Active tectonics of the Calabrian subduction revealed by new multi-beam bathymetric data and high-resolution seismic profiles in the Ionian Sea (Central Mediterranean)	http://www.sciencedirect.com/science/article/pii/S0012821X16307336
March 2017	EOS Earth & Space Science News (Peer reviewed opinion article)	Airline Flight Paths over the Unmapped Ocean	https://eos.org/opinions/airline-flight-paths-over-the-unmapped-ocean
April 2017	Information Systems (peer reviewed article)	A survey of official online sources of high-quality free-of-charge geospatial data for maritime geographic information systems applications	http://www.sciencedirect.com/science/article/pii/S0306437916304185
April 2017	Palaeogeography, Palaeoclimatology, Palaeoecology (Peer reviewed article)	Fish otoliths in superficial sediments of the Mediterranean Sea	http://www.sciencedirect.com/science/article/pii/S0031018216305156
April 2017	Ocean Dynamics (Peer reviewed article)	Numerical modeling of space-time wave extremes using WAVEWATCH III	http://link.springer.com/article/10.1007/s10236-016-1025-0
2017	Book	Atlas of Bedforms in the Western Mediterranean	DOI 10.1007/978-3-319-33940-5
April 2017	Journal of Applied Ecology. (Peer review journal)	Seals and shipping: quantifying population risk and individual exposure to vessel noise.	http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12911/full
April 2017	Proceeding of the Royal Society	Statistical simulation of landslide-induced tsunamis at the Rockall Bank, NE Atlantic.	http://rspa.royalsocietypublishing.org/content/473/2200/20170026

Date	Publication	Title	Reference
	(Peer review journal)		
April 2017	AIMS ENERGY (Peer review journal)	Assessment of offshore wind power potential in the Aegean and Ionian Seas based on high-resolution hindcast model results	https://www.researchgate.net/profile/Takvor_Soukissian/publication/315464558_Assessment_of_offshore_wind_power_potential_in_the_Aegean_and_Ionian_Seas_based_on_high-resolution_hindcast_model_results/links/58d8eb9f92851c44d4ae3363/Assessment-of-offshore-wind-power-potential-in-the-Aegean-and-Ionian-Seas-based-on-high-resolution-hindcast-model-results.pdf
May 2017	Natural Hazards (Peer review journal)	Tsunami hazards in the Catalan Coast, a low-intensity seismic activity area	doi:10.1007/s11069-017-2918-z
May 2017	Wind Engineering (Peer review journal)	Assessment of levelized cost of electricity of offshore wind energy in Egypt	http://journals.sagepub.com/doi/abs/10.1177/0309524X17706846
May 2017	Uder the Sea: Archaeology and Palaeolandscapes of the Continental Shelf (Book Chapter)	Palaeotopography and Transgression Velocity on the Continental Shelf	https://link.springer.com/chapter/10.1007/978-3-319-53160-1_3
May 2017	Stochastic Environmetal Research and Risk Assessment (Peer review journal)	Source characterisation by mixing long-running tsunami wave numerical simulations and historical observations within a metamodel-aided ABC setting	https://link.springer.com/article/10.1007/s00477-017-1423-y
May 2017	Submerged Landscapes of the European Continental Shelf: Quaternary Paleoenvironments	Standard Core Variables for Continental Shelf Prehistoric Research and Their Availability	https://books.google.fr/books?hl=fr&lr=&id=x5jCDgAAQBAJ&oi=fnd&pg=PA83&dq=%22emodnet+bathymetry%22+-habitat&ots=Xfquy7b5qv&sig=tl28lW1-MoeCiKXii0mIceHBjEc#v=onepage&q=%22emodnet%20bathymetry%22%20-habitat&f=false

Date	Publication	Title	Reference
	(Book Chapter)		
May 2017	Coastal Engineering (Peer review journal)	Implementation and validation of a multi-domain coastal hazard forecasting system in an open bay.	https://doi.org/10.1016/j.coastaleng.2017.08.008
June 2017	Renewable and Sustainable Energy Reviews. (Peer review journal)	Feasibility study of an offshore wind farm in the Aegean Sea, Turkey	http://www.sciencedirect.com/science/article/pii/S1364032117310055
June 2017	Geo-Marine Letters (Peer review journal)	Morphology of the last subaerial unconformity on a shelf: insights into transgressive ravinement and incised valley occurrence in the Gulf of Cádiz.	https://link.springer.com/article/10.1007/s00367-017-0511-9
July 2017	Environmental Science & Technology (Peer review journal)	Shallow gas migration along hydrocarbon wells–An unconsidered, anthropogenic source of biogenic methane in the North Sea.	10.1021/acs.est.7b02732
July 2017	Bulletin of the Geological Society of Greece (Peer review journal)	Deformation pattern in the western North Aegean trough: Preliminary results.	http://dx.doi.org/10.12681/bgsg.11708
July 2017	Geomorphology (Peer review journal)	Seabed geodiversity in a glaciated shelf area, the Baltic Sea.	https://doi.org/10.1016/j.geomorph.2017.07.014
July 2017	Submarine geomorphology (Book section)	Submarine Canyons and Gullies.	Amblas, D., Ceramicola, S., Gerber, T. P., Canals, M., Chiocci, F. L., Dowdeswell, J. A., ... & Iacono, C. L. (2018). In Submarine Geomorphology (pp. 251-272). Springer, Cham.

Date	Publication	Title	Reference
July 2017	Frontiers in Marine Science (Peer review journal)	Habitat Suitability Modeling to Identify the Potential Nursery Grounds of the Atlantic Mackerel and Its Relation to Oceanographic Conditions in the Mediterranean Sea.	Giannoulaki, M., Pyrounaki, M. M., Bourdeix, J. H., Ben Abdallah, L., Bonanno, A., Basilone, G., ... & Valavanis, V. D. (2017).
July 2017	Coastal Engineering (Peer review paper)	Tsunami taxonomy and detection from recent Mediterranean tide gauge data.	https://doi.org/10.1016/j.coastaleng.2017.06.007
July 2017	Frontiers in Marine Science (Peer review paper)	Habitat Suitability Modeling to Identify the Potential Nursery Grounds of the Atlantic Mackerel and Its Relation to Oceanographic Conditions in the Mediterranean Sea.	
July 2017	Coastal Engeeniring (Peer review paper)	Tsunami taxonomy and detection from recent Mediterranean tide gauge data.	
July 2017	Geoscientific Model Development Discussion (peer reviewed paper	AMM15: A new High resolution NEMO configuration for operational simulation of the European North West Shelf	https://www.geosci-model-dev-discuss.net/gmd-2017-127/gmd-2017-127.pdf
August 2017	Biogeography	The importance of temporal resolution for niche modelling in dynamic marine environments.	https://doi.org/10.1111/jbi.13080
August 2017	Marine Micropaleontology . (Peer review journal)	Comparison of qualitative and quantitative dinoflagellate cyst approaches in reconstructing glacial-interglacial climate variability at West Iberian Margin IODP 'Shackleton'Site U1385.	https://doi.org/10.1016/j.marmicro.2017.08.003
August2017	Marine and Petroleum Geology	Intra-salt deformation: Implications for the evolution of the Messinian	https://doi.org/10.1016/j.marpetgeo.2017.08.027

Date	Publication	Title	Reference
	(peer review paper)	evaporites in the Levant Basin, eastern Mediterranean.	
August 2017	Earth System Science Data Discussion (Peer review journal)	A synthetic map of the northwest European Shelf sedimentary environment for applications in marine science.	https://doi.org/10.5194/essd-2017-88
August 2017	Science of the total environment (Peer review journal)	Multi-objective spatial tools to inform maritime spatial planning in the Adriatic Sea.	https://doi.org/10.1016/j.scitotenv.2017.07.264
September 2017	Tectonophysics (Peer review journal)	Long-term in situ observations at the Athina mud volcano, Eastern Mediterranean: Taking the pulse of mud volcanism	https://doi.org/10.1016/j.tecto.2017.09.010
September 2017	Nature Scientific report (Peer review journal)	Fine-scale harbour seal usage for informed marine spatial planning.	10.1038/s41598-017-11174-4
September 2017	Natural Scientific Data (Peer review journal)	Fish and fishery historical data since the 19th century in the Adriatic Sea, Mediterranean.	10.1038/sdata.2017.104
October 2017	Advances in Space Research (peer review journal)	Validation of CryoSat-2 SIRAL sea level data in the eastern continental shelf of the Gulf of Cadiz (Spain)	https://doi.org/10.1016/j.asr.2017.10.042
October 2017	Ecology and evolution (peer review journal)	Taking movement data to new depths: Inferring prey availability and patch profitability from seabird foraging behavior	DOI: 10.1002/ece3.3551
October 2017	(Doctoral Thesis)	Seabed landscapes of the Baltic Sea: Geological characterization of the seabed environment with spatial analysis techniques	http://urn.fi/URN:ISBN:978-952-217-386-7

Date	Publication	Title	Reference
October 2017	(Bachelor Thesis)	Wave propagation patterns along the northern catalan coast	http://hdl.handle.net/2117/108165
October 2017	12th International Conference on Parallel Processing and Applied Mathematics (Oral presentation)	Using GPGPU accelerated interpolation algorithms for marine bathymetry processing with on-premises and cloud based computational resources	http://www.dma.unina.it/mamhyp/mamhip17/montella.pdf (oral presentation given as part of H2020 RAPID (H2020-ICT-644312) project)
November 2017	Tectonophysics (peer review journal)	Long-term in situ observations at the Athina mud volcano, Eastern Mediterranean: Taking the pulse of mud volcanism	https://doi.org/10.1016/j.tecto.2017.09.010
November 2017	(Proceeding International conference)	Strike - slip deformation behind the Hellenic subduction: The Amorgos Shear Zone, South Aegean Sea	8th International INQUA Meeting on Paleoseismology, Active Tectonics and Archeoseismology (PATA), 13 – 16 November, 2017, New Zealand
November 2017	Climate of the past (peer review journal)	Atlantic Water advection vs. glacier dynamics in northern Spitsbergen since early deglaciation	https://doi.org/10.5194/cp-13-1717-2017
November 2017	Geoscientific Model (peer review journal)	The UKC2 regional coupled environmental prediction system	https://doi.org/10.5194/gmd-11-1-2018
November 2017	The Black Sea (Book Chapter)	Geophysics of the Black Sea Basin.	In: The Black Sea. Springer Geography. Springer, Cham (https://doi.org/10.1007/978-3-319-70855-3_4)
November 2017	Frontiers in Ecology and Evolution (peer review journal)	Early Engagement of Stakeholders with Individual-Based Modeling Can Inform Research for Improving Invasive Species Management: The Round Goby as a Case Study	https://doi.org/10.3389/fevo.2017.00149
November 2017	Science Advances (peer review journal)	The Mediterranean Overflow in the Gulf of Cadiz: A rugged journey	DOI: 10.1126/sciadv.aao0609

Date	Publication	Title	Reference
November 2017	Nature communications (peer review journal)	Volcanism in slab tear faults is larger than in island-arcs and back-arcs	doi:10.1038/s41467-017-01626-w
November 2017	Scientific Reports (peer review journal)	Intrinsic and extrinsic factors drive ontogeny of early-life at-sea behaviour in a marine top predator	doi:10.1038/s41598-017-15859-8
November 2017	Marine Geology (peer review journal)	Massive Mn carbonate formation in the Landsort Deep (Baltic Sea): Hydrographic conditions, temporal succession, and Mn budget calculations	https://doi.org/10.1016/j.margeo.2017.10.010
November 2017	(Report)	AQUASPACE - Ecosystem Approach to making Space for Aquaculture - Deliverable 3.3 AquaSpace tool to support MSP.	http://www.aquaspace-h2020.eu/wp-content/uploads/2017/10/D3.3-AquaSpace-tool-to-support-MSP-tool-manual-2nd-version.pdf (EU Horizon 2020 project grant no. 633476)
November 2017	Geochemistry, Geophysics, Geosystems (peer review journal)	Gravity-Driven Deposits in an Active Margin (Ionian Sea) Over the Last 330,000 Years	DOI: 10.1002/2017GC006950
December 2017	Geomorphology (peer review journal)	Long-term variability of supratidal coasltal boulder activation in Brittany (France).	https://doi.org/10.1016/j.geomorph.2017.12.028
December 2017	Natural Hazards and Earth System Sciences (peer review journal)	Tsunami run-up estimation based on a hybrid numerical flume and a parametrization of real topobathymetric profiles	https://doi.org/10.5194/nhess-2017-445
December 2017	Global and Planetary Change (peer review journal)	The dyke swarms of the Old Volcanic Edifice of La Gomera (Canary Islands): Implications for the origin and evolution of volcanic rifts in oceanic island volcanoes	https://doi.org/10.1016/j.gloplacha.2017.12.004
December 2017	Comptes rendus Geosciences (peer review journal)	Pockmarks on the South Aquitaine Margin continental slope: The seabed expression of past fluid	https://doi.org/10.1016/j.crte.2017.10.003

Date	Publication	Title	Reference
		circulation and former bottom currents	
December 2017	Quaternary International (peer review journal)	Reconstruction of LGM faunal patterns using Species Distribution Modelling. The archaeological record of the Solutrean in Iberia	https://doi.org/10.1016/j.quaint.2017.10.042

12. Recommendations for follow-up actions by EU

- The EMODnet HRSM contract has a 2 year duration and it has been communicated by the EU that an extension with another 2 years without a full tender procedure is possible. However details about the procedure and its timing are lacking while we are now halfway the existing contract. For contigency and planning purposes it is recommended that the EU provides information on short term about the intended procedure.
- Promote the EMODnet Bathymetry infrastructure as a repository for all european bathymetric data and more especially those financed by european funds. This could take the form of citing EMODnet Bathymetry in contractual documents (tenders or calls for proposal) which concern bathymetry data acquisition and/or management.
- Discuss strategies to motivate non EU data providers, especially for north Africa, but also Russian Federation.

13. List of acronyms

Acronyms as used in this report are defined in the following list:

BSBD, Baltic Sea Bathymetry Database.

BSHC, Baltic Sea Hydrographic Commission.

CDI, Common Data Index, provides a highly detailed description of the survey data, answering to the questions: where, when, how and who collected the data, and how to get them. One CDI describes a survey by means of a polygon or survey track. The CDI service also includes a shopping service for requesting access to selected data sets and for downloading as data files, if access has been granted by the data owners.

CPRD, Composite DTM data sets, giving a gridded bathymetry. In practice it was found that Hydrographic Offices (HO's) do not want or can not deliver primary surveys but composite data sets from the Digital Terrain Models that they maintain themselves for producing and maintaining their nautical charts following international IHO procedures. Composite DTM's are DTM's that have been generated by the data provider itself at a specific resolution and making use of survey data sets as managed by that data provider. These Composite DTM's might contain grid cells for which no survey data were available and which are then possibly completed by interpolation or other manipulation. Overall the EMODnet project prefers to get access to survey data sets, where possible, and not the derived Composite DTM's. However in practice this is not (yet) always possible and using the Composite DTM's can then be considered as the next best option. In addition, Composite DTM providers are encouraged to describe anyway their survey data sets in the CDI Data Discovery and Access service in order to give better insight in the real survey coverage. This is followed up by an increasing number of providers, but not always possible for historic reasons.

CVE, Collaborative Virtual Environment, also known as Virtual Research Environment

DEM, Digital Elevation Model. It is a digital model or 3D representation of a terrain's surface. In the context of EMODnet HRSM it is used to describe the land elevation, while the bathymetry is described with a Digital Terrain Model (see next).

DTM, Digital Terrain Model, is a resulting grid data set with attributes for lat, lon, minimum depth, maximum depth, average water depth, standard deviation, number of values, number of elementary surfaces, smoothed average water depth, depth smoothed offset, CDI reference, and Composite DTM reference / GEBCO_2014 reference.

GEBCO, the General Bathymetric Chart of the Oceans (GEBCO) consists of an international group of experts who work on the development of a range of bathymetric data sets and data products, including

gridded bathymetric data sets, the GEBCO Digital Atlas, the GEBCO world map and the GEBCO Gazetteer of Undersea Feature Names. GEBCO operates under the joint auspices of the the International Hydrographic Organization (IHO) and the Intergovernmental Oceanographic Commission (IOC) (of UNESCO). GEBCO 30" gridded data is used by the EMODnet project to complete area coverage in case there are no survey data or Composite DTM data sets available to the partners. GEBCO is represented in the EMODnet HRSM consortium by its editor, NERC-BODC.

GTSM, Global Tide Surge Model developed and operated by Deltares.

IBCAO, the International Bathymetric Chart of the Arctic Ocean is an initiative to develop a Digital Terrain Model (DTM) based upon all available bathymetric data north of 64° North, for use by mapmakers, researchers, institutions, and others whose work requires a detailed and accurate knowledge of the depth and the shape of the Arctic seabed. Initiated in 1997, this undertaking has been endorsed by the Intergovernmental Oceanographic Commission (IOC), the International Arctic Science Committee (IASC), the International Hydrographic Organization (IHO), the General Bathymetric Chart of the Oceans (GEBCO), and the US National Centers for Environmental Information (NCEI). IBCAO is represented in the EMODnet HRSM consortium by its coordinator, the University of Stockholm.

Sextant, catalogue service used to provide details about Composite DTM data sets. It allows to discover any Composite DTM's as available and used for the EMODnet DTM instead of bathymetry survey data sets. The location is given by a Lat-Lon box in a map and descriptions are given of each Composite DTM with information for what, when, how, and who. The Sextant entries are linked as references in the EMODnet DTM grid cells, where appropriate, to indicate the source data. The Sextant service for EMODnet HRSM does not give a shopping service, but includes contact links for requesting access to the Composite DTM's.

SeaDataNet, is the pan-European infrastructure for ocean & marine data management sponsored within FP7 (grant agreement 283607, 1/10/2011-30/9/2015) connecting at present more than 100 national oceanographic data centres and marine data centres from 35 countries riparian to all European seas.

SeaDataCloud, is the successor project to SeaDataNet II for further developing the technical basis of the SeaDataNet infrastructure, funded by HORIZON 2020 (grant agreement 730960, 1/11/2016-31/10/2020).

TIN, triangulated irregular network, a way to model the EMODnet DTM using triangles in different sizes to support 3D viewing.

VRE, Virtual Research Environment, also known as Collaborative Virtual Environment

WCS, Web Coverage Service is an OGC standard defining Web-based retrieval of coverages i.e. digital geospatial information representing space/time-varying phenomena.

WFS, Web Feature Service is an OGC standard allowing requests for geographical features across the web using platform-independent calls.

WMS, Web Map Service is a standard OGC protocol for serving geo- referenced map images over the Internet.

WMST, Web Map Tile Service is a standard OGC protocol for serving pre-rendered georeferenced map tiles over the Internet.

14. References

[1] Methodology and Guidelines for processing original input data into DTMs for possible integration in EMODnet Regional DTMs, Service Contract No. EASME/EMFF/2015/1.3.1.7/SI2.742125, EMODnet Bathymetry Internal document, 16 pages

[2] High Resolution Seabed Mapping WP1: Data provider contribution Completing metadata elements for the generation of the Quality Index for the EMODnet DTM Service Contract No. EASME/EMFF/2015/1.3.1.7/SI2.742125, EMODnet Bathymetry internal document, 22 pages.

[3] Interoperability and International Collaboration; Service Contract No. EASME/EMFF/2015/1.3.1.7/SI2.742125, EMODnet Bathymetry; Public Report, 33 pages.

15. Annex 1: Feedback from and to users

Subject: Re: EMODnet question
Date: Tue, 14 Feb 2017 10:09:14 +0100
From: Aix-Marseille Université - France
To: EMODnet Bathymetry Helpdesk

Thank you for getting back to me. Yes it is the EMODnet tile B2. I tried downloading different formats and in the end the ASCII files worked so that's good.
Thank you so much for getting back to me.

Regards.

Wed, Feb 8, 2017 at 7:31 PM:

Can you be more specific what it was you downloaded. The GEBCO basemap is not downloadable so I assume you tried to download EMODnet tile B2 but I need to know in which format in order to understand your problem.
Thanks
Helpdesk

Subject: Re: Emodnet-Hydrography Feedback form)
Date: Wed, 11 Jan 2017 11:30:08 +0200
From: HCMR – Greece
To: EMODnet Bathymetry Helpdesk

Good morning from Greece
Thank you for your fast response.
Yes i will try the ASCII file way.
With best regards

On 01/11/2017 10:26 AM:

You can use the function 'Download area of interest' in the right upper corner of the Bathymetry Viewing & Downloading service screen to indicate a small area and to download it in any of the following formats:
* ESRI ASCII file
* 32 bit float GeoTiff file
* RGB GeoTiff file
This corresponds to the formats supported by the OGC WCS service. The ESRI ASCII comes closest to XYZ.

Alternative is to download one of more XYZ tiles and then to load these into a hydrographic software (e.g. Generic Mapping Tools (GMT) - http://www.soest.hawaii.edu/gmt/) and then extract the area of interest.
Hope this helps.
Kind regards
Helpdesk

On 1/10/2017 22:17:

Name:	HCMR – Greece
Feedback:	Dir sirs I would like to be informed if i can download s small region as .xyz format. Thanks in advance

==========

Van: ?? - ??
Datum: 14 februari 2017 15:49:42 CET
Aan: EMODnet Bathymetry Helpdesk
Onderwerp: Emodnet-Hydrography Feedback form

Feedback:	Hi EMODnet team, great data source you built! Unfortunately when I select "download products", I don't see the tiles and consequently cannot download them. Downloading is also not working when selecting an area of interest. (I know the standard functionality from a second computer) Do you have any hint if some of my settings/programmes might influence the usability of your side? Best regards Julian
Date:	Wed, 15 Feb 2017 10:09:26 +0100

Can you provide me some details on the configuration you are working on. OS, browser, behind firewall or not etc. That will help us better understand what could cause your problem.

Thanks
Helpdesk

From: ?? - ??
Date: 23 February 2017 at 16:55:38 GMT+1
To: EMODnet Bathymetry Helpdesk
Subject: Re: EMODnet issue

thanks for your quick response!
I checked again and now can download your bathymetry data with my second computer as well.
Thanks for the great data you provide!

Best regards
==========

Subject: Re: Emodnet-Hydrography Feedback form
Date: Fri, 10 Mar 2017 13:11:07 +0100
From: EMODnet Bathymetry Helpdesk
To: ISOR - Iceland

I am sorry, but the wrecks layer is not available for download. It is provided to us via OceanWise. If you are interested, you might contact them: richard.farren@oceanwise.eu

Regards
Helpdesk

On 3/8/2017 22:56:

Name: ISOR - Iceland
Feedback: Is it not possible to download the Wrecks information ?

==========

Subject: Emodnet-Hydrography Feedback form
Date: Thu, 23 Mar 2017 11:45:24 +0100
From: EMODnet Bathymetry Helpdesk
Name: UCC - Ireland
Feedback: Dear Sir/Madame, I am trying to use the functionality :"Download area of interest" -> "Download as ESRI ASCII file". It seems not to work. Could you please advise on this? Thank you.

Subject: EMODnet question
Date: Fri, 24 Mar 2017 11:14:23 +0100
From: EMODnet Bathymetry Helpdesk
To: UCC - Ireland

Thanks for your feedback on using the EMODnet portal. The most likely cause of this problem is that you try to select a too large area. For larger areas it is better to download the pre-generated products (use the download products button). If you do wish to download an area of interest try starting with a small area just to see if it works for you. This way we can exclude potential problems with firewalls and browser compatibility. Let me know if it worked for you.
Thanks
Helpdesk

Date: Mon, 27 Mar 2017 16:13:46 +0200
From:EMODnet Bathymetry Helpdesk
To: UCC - Ireland

Good to hear that you managed to download the data that you were looking for. EMODnet at the moment has no functionality for the vertical reference adjustments that you need but this likely to come in the (near) future. For now I advise you to contact Martin Verlaan from Deltares in the Netherlands (in the cc). He is the WP leader for this topic. I expect he can help you with a global model for adjusting your data.

Thanks
Helpdesk

From: UCC - Ireland
Sent: Monday, March 27, 2017 11:31 AM

Thank you very much for your quick reply. It is very much appreciated. I managed to download the B3 dataset using the pre-generated products. I read from the "Guidelines for metadata, data and DTM QA/QC" document that the vertical datum from different sources had been adjusted to LAT. Do EMODnet have a functionality/model to convert between vertical datums? More specifically I am looking for a bathymetry dataset with resprct to MSL for an area that cover the Irish sea (i.e. sea in between Ireland and the UK).

Thanks in advance,
Kind Regards,

Subject: Re: EMODnet Bathymetry Feedback form
Date: Tue, 6 Apr 2017 16:51:59 +0200
From: EMODnet Bathymetry Helpdesk
To: UNESCO – IHE - Netherlands

The EMODnet Bathymetry portal has a CDI Data Discovery and Access service which allows to search for data and then to request access to these data sets from their data owner.
See: http://www.emodnet-bathymetry.eu/metadata-and-data
It contains circa 15.000 entries and many are historic. The User Interface allows you to search for a specific lat lon box to see if there are multiple data sets available for that area.
Hope this helps.
Kind regards
Helpdesk

On 4/3/2017 11:32:

Name UNESCO-IHE - Netherlands

Feedback / Question	I am a master student of the IHE institute Delft, the Netherlands. I have some questions regarding how to obtain data. I would like to know if I could obtain historical bathymetry data because my research is concerning the changes to the sea bed and sea level. Thank you.

On 4/10/2017 17:28:

Sorry for some delay in answering.
You are very welcome to refer to the EMODnet Bathymetry portal and to use extracts of the DTM for your paper.
Please use the following acknowledgement:

EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM).
http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238
and website: www.emodnet-bathymetry.eu

Also we would like to receive a copy or link to your paper once it is published so that we can highlight it in the portal.
We recently started a new phase of the project to include also coastal areas, to bring the overall DTM resolution to 1/16 arc minute from 1/8 now, and to expand coverage to include the European arctic and Barentz sea. Moreover to add extra functionality to the DTM viewer and download service, aiming for adding 3D in the browser.
For this development we are always in search of more bathymetry data that can be indexed in our metadata services and then used internally at an agreed resolution to enrich the overall DTM.
Would Fugro be interested to contribute?
Kind regards,
Helpdesk

On 4/7/2017 10:40:

Name	FUGRO – United Kingdom
Feedback / Question	Good morning, I am a geologist at Fugro in the UK, with my work focusing on submarine geohazards and data integration for offshore pipelines, wind farms, oil and gas development etc. We are currently writing a paper for a the Offshore Site Investigation and Geotechnics (OSIG) committee's 8th international conference "Smarter Solutions for Future Offshore Developments" later this year. Would you be happy for us to use extracts of the EMODnet bathymetry data for some figures in the paper, and if so, how

would you like us to reference you in the paper? Also, many thanks for all your work on the database, the level of detail in the data, and the portal interface is fantastic. How often do you update the database? And have you any plans to expand the extents in the future? Regards

---

Subject: Re: EMODnet Bathymetry Feedback form
Date: 15 Apr 2017 17:41:02 +0200
From: EMODnet Bathymetry Helpdesk
To: GEUS - Denmark

I discussed with one of my technical colleagues and he suggested the following:
Try to use the WCS. A grayscale WMS is almost the same. Only it gives te lowest point with 0 and the highest with 100 (or 255) . The WCS gives of course real depths but it shuld not be too difficult for you to work with the WCS service.
http://ows.emodnet-bathymetry.eu/wcs

Hope this helps.

Kind regards
Helpdesk

On 4/12/2017 11:06:

Name	GEUS - Denmark
Feedback / Question	Dear EMODnet collegues. Would it be possible to add an extra WMS layer to your service, to provide a gray-scaled layer, where the level of gray is proportional to the depth? I experiment with HTML5 3D viewing of deep layer data by using gray-scaled WMS sources. See example here: http://data.geus.dk/geoterm/get_3d.jsp?bbox=556490,6321102,591922,6356535#layers=dtm,BunterSstFm_BasisDybde (On-shore deep sand formations - in Danish) Best wishes

---

Subject: Fwd: Re: EMODnet Bathymetry Feedback form
Date: 15 Apr 2017 17:36:16 +0200
From: EMODnet Bathymetry Helpdesk
To: ?? - ??

All depth values are referenced to Lowest Astronomical Tide (LAT). See also page :
http://www.emodnet-bathymetry.eu/data-products/qaqc-and-dtm-production-details
Kind regards
Helpdesk

On 4/13/2017 18:12:

Name	?? - ??
Feedback / Question	In the bathymetric data the zero above the average sea level to what is reported? Thanks

---

Subject: Re: EMODnet Bathymetry Feedback form
Date: Tue, 15 Apr 2017 18:08:48 +0200
From: EMODnet Bathymetry Helpdesk
To: ?? - Spain

You can download the EMODnet DTM in tiles from the EMODnet Bathymetry portal. Have a look at:
http://www.emodnet-bathymetry.eu/data-products
and use the Bathymetry Viewing and Downloading service at:
http://portal.emodnet-bathymetry.eu/
This is quite user friendly. Otherwise read the Help section:
http://portal.emodnet-bathymetry.eu/help/help.html
The Mediterranean Sea consists of a number of tiles that you can download.
Thereafter you might load these tiles in the dedicated 3D software that you can also download from another portal:
http://www.geo-seas.eu/content/content.asp?menu=0290000_000000
which allows you then to have the full Mediterranean Sea in 3D view. Please do read the manual of that software.
Hope this helps.
Kind regards
Helpdesk

On 4/14/2017 1:50:

Name	?? - Spain

Feedback / Question	Hello, I would like to know if it's possible to obtain bathymetric data for the whole Mediterranean Sea. As part of an educational project I would like to print a 3D model of the volume of water seafloor

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-------- Forwarded Message --------
Subject:RE: EMODnet Bathymetry Feedback form
Date: Mon, 8 May 2017 10:52:58 +0000
From: FUGRO – United KIngdom
To: EMODnet Bathymetry Helpdesk

I've been away for a couple of weeks so please forgive my late reply.
Thank you for your response. We have included an acknowledge in the paper, which will form a keynote at the OSIG 8th International Conference "Smarter Solutions for Future Offshore Developments" in September this year. Once reviewed and published I will send you a link.
Regarding provision of bathymetry data for your database, the data that Fugro acquires is owned by our clients and so unfortunately we cannot provide our datasets for public use. However, we do get permissions off some of our clients to present their data in papers, and so in some of these cases, they may be more inclined to make the data available for the EMODnet database. I will enquire and get back to you on this.
Kind regards
Fugro GB Marine Limited

From: EMODnet Bathymetry Helpdesk
Sent: 25 April 2017 16:29
To: FUGRO – United Kingdom
Subject: Re: EMODnet Bathymetry Feedback form

Sorry for some delay in answering.
You are very welcome to refer to the EMODnet Bathymetry portal and to use extracts of the DTM for your paper.
Please use the following acknowledgement:

EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM).
http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238
and website: www.emodnet-bathymetry.eu

Also we would like to receive a copy or link to your paper once it is published so that we can highlight it in the portal.
We recently started a new phase of the project to include also coastal areas, to bring the overall DTM resolution to 1/16 arc minute from 1/8 now, and to expand coverage to include the European arctic

and Barentz sea. Moreover to add extra functionality to the DTM viewer and download service, aiming for adding 3D in the browser.
For this development we are always in search of more bathymetry data that can be indexed in our metadata services and then used internally at an agreed resolution to enrich the overall DTM.
Would Fugro be interested to contribute?
Kind regards,
Helpdesk

Subject: Re: EMODnet Bathymetry Feedback form
Date: Wed, 17 May 2017 00:25:39 +0200
From: Dick M.A. Schaap <dick@maris.nl>
To: ?? - ??
All depths are to LAT (Lowest Astronomical Tide).

Kind regards
Helpdesk

On 5/15/2017 9:45
Name: ?? - ??
Feedback: What vertical datum are the depths referenced to?
==========

Subject: Re: EMODnet Bathymetry Feedback form
Date: Tue, 16 Jun 2017 17:12:55 +0200
From: EMODnet Bathymetry Helpdesk
To: IGME - Spain
Thanks for your interest. Please follow the steps:
* go to: www.emodnet-bathymetry.eu
* click on: EMODnet DTM - Bathymetry Viewing and Download service
* click on: the MAP Picture => this brings you to: portal.emodnet-bathymetry.eu
* open the layer menu on the left in the top bar
* activate a waterdepth layer, e.g.: Mean depth full coverage
* you will then see a map of European waters with the bathymetry
* in the top bar at the right you will see a button: Download products
* click on this button and a grid with 16 tiles will appear
* click on a tile and you will be able to download the selected tile in a format of your choice.

There is also a HELP ? in the Bathymetry Viewing and Download service which explains additional functionality for this service. Moreover there is additional information about the EMODnet DTM and ways to use the downloaded files in the section: http://www.emodnet-bathymetry.eu/data-products

Hope this helps.

Kind regards,
Helpdesk

On 6/14/2017 13:16 :	
Feedback / Question	Dear Mr/Mss I am really interested in new EMODnet DTM released with high resolution of 1/8*1/8 arc minutes grid. I would thank you so much if you could guide me how to download it. Best regards.

==========

Subject: EMODnet Bathymetry Feedback form
Date: Sun, 2 Jul 2017 10:07:15 +0200
From: EMODnet Bathymetry Helpdesk
To: DDNI - Romania

Your change has been updated in the SeaDataNet EDMO directory which also feeds into the EMODnet Bathymetry website.
Kind regards
Helpdesk

Name	DDNI - Romania
Feedback / Question	Dear colleagues, Let me introduce myself: I work for Danube Delta National Institute for Research and Development (DDNI) from Tulcea (RO) since December 2012 within the Information System and Geomatics. I am part of the bathymetrical studies team. Within this message, I kindly want to inform you that that www address of our institute is www.ddni.ro and the e-mail address is office@ddni.ro. Thank you for your attention! With kind regards.

Subject: Re: EMODnet Bathymetry Feedback form
Date: Thu, 31 Aug 2017 14:06:08 +0200
From: EMODnet Bathymetry Helpdesk

To: ?? - ??

Yes, the water depths in the EMODnet Bathymetry data product are relative to LAT. This applies for all the areas. LAT can be quite different compared to Mean Sea Level, depending on where you are. In areas with high tidal ranges the difference between LAT and MSL can be quite large (several meters) while in areas with hardly tidal ranges, such as most of the Mediterranean Sea it can be negligible.
Kind regards
Helpdesk

On 8/31/2017 13:46:

Name	?? - ??
Feedback / Question	Hi there, Thanks for providing this great service and range of products. I was hoping you could confirm for me whether or not the bathymetry surface is measured at the LAT standard or if it is something else? I am especially interested in data for the NOrth and Baltic Seas. Thanks again.

Subject: Re: EMODnet Bathymetry Feedback form
Date: Tue, 5 Sep 2017 08:29:34 +0200
From: EMODnet Bathymetry Helpdesk
To: RBINS – Belgium

You can download the EMODnet DTM in tiles from the EMODnet Bathymetry portal. Have a look at:
http://www.emodnet-bathymetry.eu/data-products
and use the Bathymetry Viewing and Downloading service at:
http://portal.emodnet-bathymetry.eu/
This is quite user friendly. Otherwise read its Help section:
http://portal.emodnet-bathymetry.eu/help/help.html
The EMODnet DTM is divided over 16 tiles that you can download in several formats.
The vertical reference level is always LAT.
Thereafter you might load these tiles in the dedicated 3D software that you can also download from another portal:
http://www.geo-seas.eu/content/content.asp?menu=0290000_000000
which allows you then to have all (NetCDF) tiles in 3D view. Please do read the manual of that software.

Hope this helps.

Helpdesk

On 8/31/2017 17:54:

Name	RBINS - Belgium
Feedback / Question	Dear Sir or Madam, Could you please explain me how I can donwload in netcdf the Emodnet bathymetry for the full area? The verical datum should be MSL if possible (or the geoid)?

Subject: Re: EMODnet Bathymetry Feedback form
Date: Wed, 6 Sep 2017 19:55:56 +0200
From: EMODnet Bathymetry Helpdesk
To: GEOCENTO - ??

For EMODnet Bathymetry we are giving viewing and downloading access to the EMODnet DTM in 16 tiles in a number of formats. This is complemented by OGC WMS and WCS services, which can be found at:
http://www.emodnet-bathymetry.eu/data-products/web-services-and-standards
There is no implementation of OpenSearch or APIs.
Kind regards
Helpdesk

On 9/5/2017 18:03:

Name	GEOCENTO - ??
Feedback / Question	Dear EMODNET, We (Geocento Ltd) are currently leading a consortium of companies for an ESA funded GSTP project called the EOBroker. We are currently adding content, and would be keen to understand if you have implemented any OpenSearch functionality or other API interfaces? Best regards

---

On 9/25/2017 15:33 Helpdesk:

First of all thank you for pointing out these coastal issues to us. This should be largely due to using and interpolating with GEBCO where we have no other data sources near the coast. GEBCO is quite coarse with a grid of 1km * 1 km and does not have a real coastline. Between the EMODnet 2015 and 2016 version there is also a slightly different methodology used as we moved from a grid of circa 500 meter to 250 meter.

A major issue is that we are missing bathymetry data for the near-coastal and coastal zones in most of the current EMODnet DTM and therefore it is more fit for open seas. However we are aiming to overcome this in the ongoing EMODnet HRSM project where we are gathering bathymetry data for the coastal zones and land - sea interactions, also taking into account tidal elevations, where possible and available. The gathering is focused on multibeam, LIDAR and also Satellite Derived Bathymetry data products in order to generate a more reliable DTM, both for open seas and coastal zones. Thereby we also will improve the grid resolution to circa 125 meter overall. And for sure we will take your issues into account.
So far for UK waters we have access to bathymetry data of UKHO (through OceanWise) and NERC institutes; however these do not include coastal surveys. Are you possibly in contact with regional authorities that manage coastal and near coastal surveys. If so, can you inform us of their names and contacts including email so that we can approach them for possible data deliveries.
Hoping to hear from you.
Coordinating team EMODnet HRSM

Van: MetOffice – United Kingdom
Datum: 15 september 2017 13:44:42 CEST
Aan: EMODnet Bathymetry Helpdesk
Onderwerp: EMODnet Bathymetry Feedback form

Name:	UkMetOffice – United Kingdom
Feedback:	Problematic data near coastal points. Dear Sir/Madam, we are using the data in the NEMO model. However, there are problems in the data set with regards to near coastal points in proximity to mountains. Points that are designated sea are often 10s of metres above sea level which cant be correct. (There are plenty of examples of this around the Scottish coast.) Older versions of Emodnet (Pre Sept 2015) did not have this particular issue. Please contact me for further details.

Subject: EMODnet Bathymetry Feedback form
Date: Fri, 6 Oct 2017 21:33:23 +0200
From: EMODnet Bathymetry Helpdesk
To: FUGRO – United Kingdom

We have IOLR from Israel as a partner in EMODnet and they will bring in additional bathy datasets for their EEZ. Attached is an image of the R/V Bat-Galim multibeam survey conducted in the summer of 2016 that they will contribute. The new Bathy DTM will be released by us in spring 2018 (that is the plan).

BTW: Is Fugro involved in surveys and environmental monitoring for the oil & gas exploration / exploitation in the Cyprus license blocks South of Cyprus? We are in contact with the Cyprus government for structuring the sharing of data from the Cyprus base line studies and environmental impact monitoring and will contact later the organisations collecting the data.
Will hear from you.
Helpdesk

PS We are now also running the EMODnet Ingestion portal (www.emodnet-ingestion.eu) aimed at getting access to marine datasets from third parties such as industry. Please have a look and discuss in your community whether some submissions might be possible, following up from our earlier discussions.

On 10/6/2017 10:32:

Name	FUGRO – United Kingdom
Feedback / Question	Good morning, Do you know if any of the publicly available Israeli EEZ data is likely to be built into your bathymetry portal? They have some great data, and it looks like the ascii data is available for public download. http://energy.gov.il/Subjects/OilSearch/Pages/GxmsMniOSReportsBathymetricMap.asp Thanks

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Subject: Re: EMODnet Bathymetry Feedback form
Date: Tue, 10 Oct 2017 14:26:07 +0200
From: EMODnet Bathymetry Helpdesk
To: Coventry University

Please have a look at:
http://resources.esri.com/help/9.3/arcgisdesktop/com/gp_toolref/spatial_analyst_tools/esri_ascii_raster_format.htm
and
https://en.wikipedia.org/wiki/Esri_grid
with some more information on the ESRI format.

Hope you can solve your issue.
Kind regards
Helpdesk

On 10/10/2017 13:36:
Hi there again!
Yes, I did just that and the ASCII file was kind of disorientated ‘cos what I was expecting to find is a three column file with long., lat. and depth data. But contrary to this, I have attached herewith what I got.
Your help is highly appreciated.
Cheers,

From: EMODnet Bathymetry Helpdesk]
Sent: 10 October 2017 11:31
To: Coventry University

I tried it myself for almost the same area as you and this took quite some time to open the XYZ file in notepad, while I have a really powerful notebook with a lot of memory.
Can you try it for a smaller area and see if that works?
Btw the tiff files are much smaller and work faster.
Will hear from you.
Kind regards
Helpdesk

On 10/10/2017 1:11:

Many thanks for your prompt response. Yes, I did select ASCII file option as it’s also an acceptable format but no download was undertaken. After the click, I waited severally and nothing came. I have just repeated the same process and show below the excerpt. Please advice. Many thanks.

From: EMODnet Bathymetry Helpdesk
Sent: 09 October 2017 07:20
To: Coventry University

These options are the standard output for the OGC WCS service which is driving the area of interest service., However chose the ASCII option which is a form of xyz.
Kind regards
Helpdesk

On 10/9/2017 0:22:

Name	Coventry University
Feedback / Question	Please, how can i "download (bathy data) area of interest" in .xyz format? The only options on offer are ASCII, GeoTiff and RGB GeoTiff. The .xyz file format is what i require to undertake further processing of the bathy data. Thanks for your help.

Subject:RE: EMODnet Bathymetry Feedback form
Date: Tue, 10 Oct 2017 10:15:27 +0000
From: BP
To: EMODnet Bathymetry Helpdesk
Yes – big fans! Find it's an nice supplement for where we don't have our own high resolution coverage..
Keep up the good work!

Best regards,
Steve

From: Dick M.A. Schaap [mailto:dick@maris.nl]
Sent: 10 October 2017 10:49
To: Bjerring, Steven (ABW)
Subject: Re: EMODnet Bathymetry Feedback form

Dear Steve,
Thanks. Please check with your IT department and let us know.
Anyway good to know that you as BP like our services!
Greetings
Dick

On 10/10/2017 11:01, Bjerring, Steven (ABW) wrote:
Hi Dick,

Screenshot below. My colleagues also have the same issue – so you may be right in saying it's a local issue. I'll contact our IT department.

Best regards,

From: EMODnet Bathymetry Helpdesk
Sent: 10 October 2017 09:59
To: BP
Subject: Re: EMODnet Bathymetry Feedback form

We have checked our logs and could not find any disturbance. Also some colleagues tested with the mentioned browsers and could find no issues.
Can you try again and please send us screengrabs. It might be a local issue with networks.
Will hear from you.
KInd regards
Helpdesk

On 10/10/2017 10:20, EMODnet Bathymetry Helpdesk wrote:

Could you send us a screengrab because I do not experience your issue when using any of the named browsers.
Kind regards
Helpdesk

On 10/10/2017 9:29:

Name	BP
Feedback / Question	Hi, You bathymetry portal/download page is currently down - http://portal.emodnet-bathymetry.eu It doesn't display correctly in either IE or Chrome. Any ideas when this will be fixed? Thanks in advance.

==========

Subject: Re: EMODnet Bathymetry Feedback form
Date: Sat, 21 Oct 2017 13:26:29 +0200
From: EMODnet Bathymetry Helpdesk
To: ??

Chose the option: ESRI ASCII format. This can be used for deriving XYZ.
More info on that format can be found at:
http://resources.esri.com/help/9.3/arcgisdesktop/com/gp_toolref/spatial_analyst_tools/esri_ascii_raster_format.htm
and
https://en.wikipedia.org/wiki/Esri_grid

Kind regards
Helpdesk
PS: Do not make the area too large, because then it will not function.

On 10/19/2017 14:15:

Name	??
Feedback / Question	Hello, In your website, I wanted to choose a specific area for my work and I clicked on "Download area of interest". However, the site does not show an option like download as .xyz format. It only showed the option, when I chose the "Download product" tab. Can you fix this problem? it is really important for my thesis. Best Regards.

==========

Subject: Re: EMODnet Bathymetry Feedback form
Date: Fri, 3 Nov 2017 18:32:57 +0100
From: EMODnet Bathymetry Helpdesk
To: IMDC - Belgium

Thanks for your compliments. The present EMODnet DTM is indeed using LAT as reference. However as part of the new EMODnet High Resolution Seabed Mapping activities we are developing a new EMODnet DTM with an overall higher resolution and it will become available both for LAT and MSL. This will be solved by having a high resolution tidal model for European waters. The publishing is planned mid 2018.
Hope you will look forward.
Kind regards
Helpdesk
On 10/30/2017 10:31:

Name	IMDC - Belgium
Feedback / Question	Hi, I am very pleased with the EMODnet Bathymetry, it provides a very useful source of information. From what I can see, the vertical reference level of EMODnet is LAT (Lowest Astronomical Tide). For many applications, including hydrodynamic modelling (storm surges, waves, ...), it is necessary to have a bathymetry referenced to MSL (Mean Sea Level) or a geoid. I can imagine that this a need for many (potential) users. Is there a transformation available to transform the bathymetry to MSL? Or are there any efforts underway to make the Bathymetry dataset available in a geoid reference system, e.g. in

conjunction with some of the efforts to develop a Europe-wide vertical reference datum such as EVRS? Many thanks.

Subject: Re: EMODnet Bathymetry Feedback form
Date: Mon, 6 Nov 2017 15:32:45 +0100
From: EMODnet Bathymetry Helpdesk
To: ERILAW – United Kingdom

We provide a REST service to retrieve depth details of a specific point as follows:
http://rest.n4m5.eu/depth/point?geom=POINT(-13.11953125%2058.909375)
with geom is the location in WKT
Please note: %20 is the separator in -13.11953125%2058.909375
This URL retrieves the value table as a JSON file:
{"min":1526.0,"max":1528.4,"avg":1527.4,"stdev":0.52,"elementarySurfaces":11.0,"smoothed":1527.95,"smoothedOffset":0.54992676}
Note: The rest service will return the following in case no min, max and stdev is available:
{"min":null,"max":null,"avg":4382.8,"stdev":null,"elementarySurfaces":null,"smoothed":null,"smoothedOffset":null}

The relevant waterdepth is the avg

Reference level = LAT which is quite equal to MSL in most of the Mediterranean Sea.

Hope this helps you.
Kind regards
Helpdesk

On 10/24/2017 16:58:

Name	ERILAW – United Kingdom
Feedback / Question	Dear all, good evening, we are starting a dive site with collective data of diving spots around Greece mostly and i was wondering if its possible from your behalf and of course if you have the ability to give an api to retrieve depth data from specific locations. Sincerely yours.

Subject: Re: EMODnet Bathymetry Feedback form
Date: Tue, 7 Nov 2017 14:08:15 +0100
From: EMODnet Bathymetry Helpdesk
To: Student - Germany

The waterdepth profile function in the portal viewer only supports images. However you could also download the relevant tiles of the EMODnet DTM in NetCDF format as another function of the portal viewer.
Then you should also download and install the free 3D viewer that is advertised at the website: http://www.emodnet-bathymetry.eu/data-products
This page contains a section as follows:
3D Viewer: the DTM files in NetCDF format can also be visualised by using the 3D visualisation tool (3D Viewer) that has been developed in the EU FP7 Geo-Seas project. This viewer is based on the existing open source NASA World Wind JSK application. This software is freely available after registration and allows the visualisation of Digital Terrain Models (DTM) in the existing GLOBE NetCDF format and Web Map Service (WMS) which are plugged into a virtual globe. More info about the 3D viewer and link to the registration page can be found here.
The mentioned link for downloading the 3D software goes to: http://www.geo-seas.eu/content/content.asp?menu=0290000_000000
This 3D Viewer allows you to import the EMODnet DTM tiles (in NetCDF) and then it gives a lot of functionality for working with the EMODnet DTM in 3D.
It takes some preparation and you have to practice somewhat with the software, but it is quite powerfull and great fun, and might help you in many ways.
Hope this helps.
Kind regards
Helpdesk

On 11/7/2017 13:42:

Name	Student – Germany Anne
Feedback / Question	Hello, Hello BelÃ©n, I am a student from Germany currently working on a project at the Po river delta (Italy). For the project I would need the water depth of 9 transects, which I want to show in one graph. I have the starting and end coordinate of the transects, but also need the water depths in between those points. Is there format way to download the values of the profile and not only pictures? Is there a way to enter the coordinates at

the portal? Going with the mouse is a bit too inaccurate for the project work. Thank you, kind regards.

Subject: Re: EMODnet Bathymetry Feedback form
Date: Wed, 6 Dec 2017 09:35:10 +0100
From: EMODnet Bathymetry Helpdesk
To: PERIPLUS - Netherlands

Please have a look at: http://www.emodnet-bathymetry.eu/data-products/web-services-and-standards which gives you the required information for OGC web services.
The wrecks layer is not included as this is a proprietary layer that we can not redistribute as OGC service.
Kind regards,
Helpdesk

On 12/6/2017 9:23:

Name	PERIPLUS - Netherlands
Feedback / Question	Dear Sir/Madam, Thank you for starting up this great project to reveal the secrets of the European seas. Very useful indeed. I think it would be a great feature if you could download some of the layers or -even better- link to the layers using a WFS or WMS. For example, this layer (http://portal.emodnet-bathymetry.eu/) would be very handy to have in our own GIS systems, but it cannot be downloaded and there is no WFS/WMS available. The same goes for the 'Wrecks' layer I(http://portal.emodnet-bathymetry.eu/wrecks). Will there be a solution for this in the future? And can you send me the layers in shape format? Thank you for your answer. Kind regards.

Subject: EMODnet Bathymetry Feedback form
Date: Thu, 7 Dec 2017 15:34:02 +0100
From: EMODnet Bathymetry Helpdesk
To: CUT - CYPRUS

It is very good to hear that you will use the EMODnet Digital Bathymetry for your project.
As acknowledgement please include: Digital bathymetry has been derived from the EMODnet Bathymetry portal (http://www.emodnet-bathymetry.eu). This is a European initiative, started in 2009, to compile and maintain a catalogue of available bathymetric data sets and to produce and publish the EMODnet Digital Terrain Model (DTM) for the European sea regions. The latest DTM has a grid

resolution of 1/8 * 1/8 arc minutes, was released in October 2016 and has the following reference: http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238

Can you keep us informed about your progress and experiences? And are you willing to participate later in an interview as we are building use cases?
Kind regards
Helpdesk

On 12/7/2017 15:15:

Name	CUT - Cyprus
Feedback / Question	To whom it may concern, I am coordinator of iMARECULTURE a non-commercial research and innovation project funded under Horizon2020 programme of the EU. Projectâ?Ts scope is to raise public awareness of underwater cultural heritage, using Virtual Reality, Augmented Reality applications and Serious Games. One of the deliverables will be an interactive seafaring serious game. In order to create a realistic game, we will be using bathymetric data obtained from your database The game will be open access and free to the public. Please let us know, what credits you wish us to include in the titles. Looking forward to your reply Kind regards

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Subject: Re: EMODnet Bathymetry Feedback form
Date: Wed, 20 Dec 2017 12:54:10 +0100
From: EMODnet Bathymetry Helpdesk
To: MPETROGAS - Oman

Our portal only brings together existing survey data sets in order to produce a harmonised DTM for the European seas. We are not in the business of performing bathymetric surveys itself.
Kind regards
Helpdesk

On 12/12/2017 14:16:

Name	MPETROGAS - Oman
Feedback / Question	Dear Team, We are having an enquiry from a customer of ours in Sultanate of Oman for carrying out Bathymetric survey, Please let us know about your interest to participate in the same so that we can provide you that further details about the tender. With Warm Regards, Business Development Manager Al Mirath Pertogas LLC Al Wadi Al Kabir Street 58, 381A Muscat, Oman Website : www.mpetrogas.net

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Subject: Re: EMODnet Bathymetry Feedback form
Date: Wed, 20 Dec 2017 09:59:14 +0100
From: EMODnet Bathymetry Helpdesk
To: CARDIFF UNIVERSITY – United KIngdom

The EMODnet Bathymetry portal does not deal with currents, but with bathymetry. Please have a look at www.emodnet-physics.eu which might be useful.
Kind regards,
Helpdeskr

On 12/19/2017 12:14:

Name	CARDIFF UNIVERSITY – United KIngdom
Feedback / Question	Hey there, Ive been looking for some specific tidal stream info for a GIS project , is there any data I could use that you have in more detail for the UK - specifically the Isle of Wight. Many thanks.