EMODnet Thematic Lot n°1 – Bathymetry

EASME/EMFF/2019/1.3.1.9/Lot1/SI2.836043

Start date of the project: 20/12/2022 (24 months)

Centralisation Phase

Quarterly Progress Report 2

Reporting Period: 01/04/2023 – 30/06/2023

The European Marine Observation and Data Network (EMODnet) is financed by the European Union under Regulation (EU) 2021/1139 of the European Parliament and of the Council of 7 July 2021 establishing the European Maritime, Fisheries and Aquaculture Fund and its predecessor, Regulation (EU) No. 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund.

Contents

1. Highlights in this quarter

*[**List the quarterly progress for each of the tasks specified in Section 1.4.1 of the Tender Specifications**; provide an explanation for any tasks in which progress has not been noted. Provide in the table a list of **all** Milestones and Deliverables as from the technical workplan in numerical order, the date due, status and date delivered. Max 2 pages]*

- **Task 1 - Maintain and improve a common method of access to data held in repositories:**

  During the reporting period, the number of survey data sets has increased slightly from 41427 to 41574 CDI entries, while the number of Composite DTM entries stayed at 277. The new CDI entries for bathymetry survey data sets were contributed by 5 data providers. Gathering and population of new survey data sets will gain more momentum soon as part of the new contract for which it is planned to bring in new data sets in the period till end 2023. Next to survey data sets and composite DTMs, this will also concern producing and including more Satellite Derived Bathymetry (SDB) files for coastal areas without survey coverage.

- **Task 2 - Construct products from one or more data sources that provide users with information about the distribution and quality of parameters in time and space:**

  Task 2 activities by data providers for processing and pregridding new survey data sets and composite DTMs using the GLOBE software will start in September – October 2023 and will be kicked off by a plenary meeting annex training workshop in Brest – France, 25-26 September 2023. The Workshop will focus on data providers and regional coordinators, to refresh how to populate new data sets (survey data sets / Composite DTMs) and how to use GLOBE software, thereby giving instructions on the upgraded functionality of GLOBE. In preparation of the Workshop and these population and processing activities, IFREMER has updated the guidelines which are published as D2.1 and attached to this report as Annex 1.

  The preparation of data input by data providers for the regional DTMs will continue till end 2023, so that the regional coordinators can work on the compilation and generation of the 12 regional DTMs early 2024 till summer 2024. While, integration and publication of the new 2024 EMODnet DTM is then planned in the period after summer 2024 till end 2024. Activities by data providers for additional HR-DTMs are planned to take place in the first half of 2024.

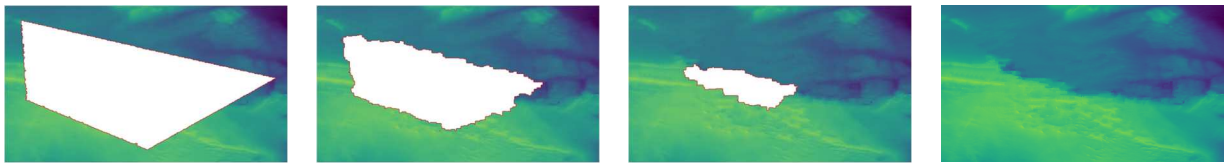
  Regarding the improvement of the interpolation tools in the Globe software, Coronis started exploring the possibility of using the technique of Criminisi et al. [1], originally devised for image inpainting, to preserve gradients during DTM interpolation. This method uses the texture (i.e., colors and gradients) present in the known areas of the image to fill the missing data. At each step, a part of the known area of the map is used to fill the border of the missing area. By adding small patches at a time, and by using a consistent filling priority, the colors and gradients of the map can be preserved and interpolated within the unknown areas. The iterative process ruling [1] is summarized in the following steps, which are repeated until the image is entirely filled:

  1. Find the *fill front*, which is the border of the area to be filled.
  2. For every pixel in the *fill front*, calculate its *patch priority*, representing the order in which the pixels in the *fill front* should be filled. A patch is just a square window centered on a pixel, and we

calculate its priority based on the number of already-filled surrounding pixels and the magnitude of the gradients arriving at that pixel.

3. Select the patch with the largest priority as the one to fill.
4. Compute the difference between the selected patch and every patch in the picture using the sum of square differences with all the pixels not in the area to be filled.
5. The patch with the smallest difference is the *donor patch*. Texture from the *donor patch* is used to fill the selected patch in the *fill front*.

The following figure shows some initial results using this method:



(a) (b) (c) (d)

Figures: (a) shows the initial DTM, with the missing area to interpolate in white and the fill front as a red polyline. (b) and (c) shows two intermediate steps of the iterative filling process. Finally, the result is presented in (d).

This technique will be useful in cases where the gap to fill is a large continuous area surrounded by an also continuous known data. As previously mentioned, the results shown above are just a proof of concept and must be tested on a more diverse set of DTMs to prove the utility of the method and its viability before being included in Globe. Coronis will work in this direction in the following months of the project.

- **Task 3 - Develop procedures for machine-to-machine connections to data and data products:**

The migration from the thematic Bathymetry portal to the EMODnet Central Portal has been finalised and the new Central Portal was launched at 23rd January 2023, while the publishing of the EMODnet Bathymetry website was halted at the same date. Redirects were configured to make sure that users following old URLs will be redirected to the Central Portal.

EMODnet Bathymetry now continues to operate and maintain several catalogue services and web services, which are being harvested and/or directly feeding the Central Portal services. The services are following INSPIRE principles and their operations are being monitored from the Central Portal with good results.

EMODnet Bathymetry is regularly testing the functionality of the Central Portal and following up feedback from users. This is aimed at spotting possible bugs in the back- office systems of EMODnet Bathymetry or at the front-office interfaces of the Central Portal. Any identified bugs are reported to JIRA for further action. Also, shortcomings or requests for improved functionality are being gathered from internal consortium testing and following user feedback and these are submitted to the CP team through JIRA as wishes for future developments. Most will be directed towards optimisation of functionalities, while also additional functionalities might come forward.

- **Task 4 - Contribute data, data products and content to a central portal that allows users to find, view and download data and data products:**
  As indicated under Task 2 and Task 3, a lot of activities have taken place in the previous contract for arranging the migration from the thematic portal to a Central Portal. This was originally done around the 2020 EMODnet DTM version, followed in April 2023 with the new 2022 DTM version.
  This procedure will be followed again in the second half of 2024 for publishing the 2024 products of EMODnet Bathymetry.

- **Task 5 - Contributing content to dedicated spaces in Central Portal:**
  Each thematic has its own dedicated space at the Central Portal where it publishes its so-called 'narrative'. The maintenance is done by sending an updated document to JIRA which is then processed by the EMODnet Secretariate. In the near future, the thematic lots will get more direct access to the EMODnet CMS (Drupal) for performing maintenance activities. EMODnet Bathymetry team will provide new and updated content, where required and appropriate.

- **Task 6 - Ensure the involvement of regional sea conventions:**
  Secretariats of the Regional Sea Conventions are kept up-to-date of the EMODnet Bathymetry services, inter alia through regional partners. The 2022 EMODnet bathymetry full grid release, launched in April 2023, provides a good opportunity to reinforce the good relationships with the secretariats of the Regional Sea Conventions who are kept up-to-date of the EMODnet Bathymetry services and products, and where possible, engaged in wider promotion and contributing to mobilising more potential data providers and product users.

- **Task 7: Contribute to the implementation of EU legislation and broader initiatives for open data:**
  On a global scale, good synergy is continued with GEBCO and the Seabed 2030 project. In this context, George Spoelstra (GGSgc) and Federica Foglini (CNR), both members of the EMODnet Bathhymetry consortium, act as Chair and Vice-Chair of the GEBCO subcommittee TSCOM (Technical Subcommittee on Ocean Mapping). One of their targets is to promote adoption of the metadata – data management practices in GEBCO and Seabed 2030, following SeaDataNet CDI standards and services, as applied by EMODnet Bathymetry. Also, the collaboration with IHO is continued and leads to data contributions by several other national hydrographic services beyond the consortium partners.

- **Task 8 - Monitor quality / performance and deal with user feedback:**
  The overall performance of the portal and its services is continuously measured and its results are reported in the separate indicators spreadsheet. It demonstrates that Bathymetry and its services and products continue to be quite popular, also in the new setting on the Central Portal. In the reporting Quarter, there has been quite an increase in visitor and download statistics, which were also expected considering the 2022 DTM release. While the traffic on the webservices is somewhat lower, but still very high. The user feedback is at the same level as earlier and a lot of questions are from users asking about how to do queries and downloads in the new configuration. Also, some earlier functions are being missed. These are put on a wish list from EMODnet Bathymetry for future developments and will be included in JIRA.

- **Task 9 - Maintain the existing thematic web portal for a maximum of six months from the start of the project:**
  The earlier EMODnet Bathymetry portal was maintained till 23rd January 2023 when the actual migration was finalised. The Central Portal is now the shop-window, while EMODnet Bathymetry is maintaining the operation and maintenance of the various Bathymetry catalogues and web services that feed into the Central Portal.

- **Project management:**
  The existing contract for EMODnet Bathymetry has been extended by EU CINEA for another 2 years without the need for a new tender. There was only an amendment necessary to include UK partners now as subcontractors and now longer as full partners due to Brexit. Therefore, Shom as coordinator has adapted the prevailing Consortium Agreement to be signed by all partners, which has been completed. Moreover, Shom has concluded subcontracts with the UK partners. The new contract phase runs from 20 December 2022 to 20 December 2024.

  Shom and MARIS prepared the Q1-2023 progress report which was reviewed and accepted by the EU CINEA. The EU has also accepted the final report from the previous contract, including contributions and deliverables from WP and Task leaders, and the transfer protocol. Curently, Shom is working on the payments to partners.

Milestone/Deliverable in numerical order	WP	Date due	Status (To do/ Delivered/ Delayed)	Date delivered	If Delayed: reason for delay and expected delivery date
D1.1: Quarterly concise progress reports	WP1	M4, M7, M10, M13, M16, M19, M24,	Delivered D1.1a,b	M4, M7	
D1.2: Annual Interim report	WP1	M12			
D1.3: Final report	WP1	M24			
D1.4: Plan for service continuity, incl. docs and sources	WP1	M24			
D2.1: Upgraded guidelines for data pre-processing and population of metadata	WP2	M6	Delivered	M6	See Annex 1
D2.2i: Training Workshop for data pre-processing and metadata population	WP2	M9	Planned for 25-26 Sept 2023 in Brest - France		

D2.3: Pre-processed survey data sets and included in CDI Service	WP2	M12	Underway		
D2.4: Pre-processed composite DTMs and included in Sextant service	WP2	M12	Underway		
D2.5: Satellite Derived Bathymetry data sets and included in Sextant Service	WP2	M12	Underway		
D3.1: Upgraded guideline of EMODnet methodology for DTM production, including using prototype CVE	WP3	M9			
D3.2i: Upgraded Globe software	WP3	M9			
D3.3i: Training and intercalibration Workshop	WP3	M11	Planned for 25-26 Sept 2023 in Brest - France		
D3.4i: Processed and pre-gridded data sets as input for RDTMs	WP3	M14			
D3.5i: Regional DTMs with common resolution of 1/16 arc minutes grid	WP3	M17			
D3.6i: Best version HR DTMs for coastal waters and hotspots	WP3	M20			
D3.7: New EMODnet DTM incl Quality Index and loaded in EMODnet web services for viewing and downloading	WP3	M23			
D3.8: HR-DTMs loaded as separate layer in EMODnet web services for viewing and downloading	WP3	M23			
D3.9: Source reference layer in EMODnet web services to link to CDI	WP3	M23			

and Sextant Catalogue services					
D3.10: Refined best-estimate European digital coastlines in EMODnet web services for a range of vertical levels	WP3	M22			
D3.11: Updated Inventory of existing and ratified baselines and registered claims / disputes under UNCLOS, for European countries at the portal	WP3	M22			
D3.12: Methodology for assessing bathymetry between coastline and foreshore	WP3	M23			
D4.1: Standard machine- to-machine services delivered for common functionalities	WP4	M3	Delivered	Operational since M0	
D4.2: Dedicated machine- to-machine services adapted / delivered for special functionalities	WP4	M6	Delivered	Operational since M0	
D4.3i: CVE optimised for reginal coordinators	WP4	M14			
D4.4i: Globe software + GGSGC workbench upgraded with extra functionality	WP4	When required	Following requests and suggestions		
D5.1: Operational Help-desk	WP5	continuously			
D5.2: Monitoring data about visits and usage	WP5	continuously			
D5.3: Promotional material and up-to-date thematic space at central portal	WP5	continuously			
D5.4: Presentations at relevant conferences	WP5	Regularly			

2. Identified issues: status and actions taken

*[Provide an **overview of issues** identified by CINEA/ DG MARE/ Secretariat (Table A) in the past quarter - new as well as pending ones, the status of those issues, and actions taken to address them and/or roadmap with remaining actions planned to resolve the issues. In Table B, provide information about any issues and challenges identified by yourself.]*

A. Priority issue(s) identified and communicated by CINEA/ DG MARE/ SECRETARIAT				
Priority issue	Status (Pending/ Resolved)	Action(s) taken/ remaining actions planned	Date due	Date resolved
EM-715 EMODnet BathymetryURL direct to new EMODnet portal	Resolved	Redirect matrix made and deployed		23 Jan 2023
EM563 Feedback on CP Main Menu (related to EM527)	Resolved	Done		05/04/2023
EM631 Standardise the navigation menu	Resolved	Done – No changes needed		20/04/2023
EM646 Bathymetry to review layer legend	Resolved	All layers have a legend		20/04/2023
EM658 Problem with coastline around Ireland	Resolved	Solved with the new version of the EMODnet Bathy deliverables		20/04/2023

B. Issues / challenges identified by the thematic assembly group itself				
Priority issue / challenge	Status (Pending/ Resolved)	Action(s) taken / remaining actions planned	Date due	Date resolved
EM477 Add CDI bathymetry survey tracks/polygons layers to CP Map Viewer Configuration JSON file (linked to EM487)	Resolved	Done by CP Team		30/05/2023
EM-584 Supply list of rational file formats for Bathymetry downloads	Resolved	List of format provided to CP. Suggest to use those hard coded formats.		23/05/2023
EM679 Bathymetry DTM Publication (relate also to EM713, EM755)	Resolved	Done in strong relation with CP team		20/04/2023
EM800 Download Bathymetric data via ERDAPP not working	resolved	Reloaded dataset in the ERDAPP. Further investigation needed by CP team to know why that had happened		13/06/2023

EM806 Increase zoom level for coastline	pending	Action to be undertaken by CP to increase the zoom level. Pre-tiled level already existing	27/06/2023	
EMODnet Baselayer is using WebMercator tileset in EPSG4326 projection	pending	Use of the appropriate tileset is suggested from Bathy. Discussion undergoing for this implementation	12/04/2023	
EM703 Bathymetry narrative update	pending	One series of update in the narrative done. Ticket left opened as a new series should come shortly	03/01/2023	
EM774 GetFeatureInfo shows unnecessary RGB info for HR depth and natural colors	pending	Actions have been undertaken by CP team to use the appropriate field for display. Ticket is left open for REST service issue.	23/04/2023	
EM805 EMODnet Bathymetry land topography cache issue	pending	Updates of OSM have been done. Cached dataset from previous release of OSM have been cleared out. As OSM is continuously updated, it is suggested to clear out the CP cache frequently. Investigation on the best clearing cache frequency is undergoing	27/06/2023	

3. Communication assets

[In Table A, list peer reviewed publications directly (co-)authored by consortium and project partners in the reporting period. In Table B, list all non-peer reviewed publications (co-)authored. In all cases, indicate the type of publication, provide the full reference incl. title, volume and issue etc., and whether the publication is open or closed access.]

A. (Co-)Authored peer-reviewed publications in the quarter					
Date of publication	Type of publication	Full reference	ISBN	DOI	Is it open access? Yes/No

B. Other/non-peer reviewed types of publications (co-)authored in the quarter					
Date of publication	Type of publication	Full reference	ISBN	DOI	Is it open access? Yes/No

For a compressive overview of publications referring to/making use of EMODnet data and/or data products, please consult Google Scholar.

4. Monitoring indicators

[Refer to the standardised monitoring tool, i.e. Europa Analytics, to complete the indicators excel template, and provide a short explanation in the table below on the numbers and trends for each indicator when possible/applicable. Indicate clearly if monitoring was carried out using tools other than Europa Analytics.]

Comments on the progress indicators in the indicators spreadsheet		
Progress indicator	Means of collecting figures	Comment
1. Current status and coverage of total available thematic data A) Volume and coverage of available data	CDI catalogue service	There is a moderate increase of CDIs. In the next quarters more data population is expected.
What is your opinion on the data coverage within EMODnet for your thematic?	Considering population of CDI and Sextant catalogues	Overall, EMODnet Bathymetry has brought together an excellent data collection (CDIs and Composite DTMs), covering all European sea regions and compiled by 65 data providers. In the coming half year this will be further expanded.
B) Usage of data in this quarter	CDI RSM shopping ledger service	The number of downloaded CDIs went down dramatically, while number of users continued at 7 like in previous quarter.
2. Current status and coverage of total number of data products A) Volume and coverage of available data products	Statistics from downloading at the Bathymetry system	In the previous quarter, the 2022 DTM has been released which comprises 58 DTM tiles in 8 different formats. This covers the European seas and now also the Caribbean region. Moreover, additional HR-DTMs have been published as well as an updated version of the Satellite Derived Coastlines for Europe and Caribbean.
B) Usage of data products in this quarter	Analysing download statistics	The number of DTM tile downloads has increased considerable, which might relate to the new EMODnet 2022 DTM release. While the number of HR-DTM downloads is stable. The number of WMS - WFS requests has decreased somewhat, but is still very high.

3. Internal and external organisations supplying/approached to supply data and data products within this quarter	CDI catalogue service	These are new entries as part of the new contract. Coming 6 months we expect considerable more entries as part of the first year activity for gathering new data sets
4) Online 'Web' interfaces to access or view data	N.A.	No changes
5.1 Daily number of page views of EMODnet Thematic entry page	Europa Analytics	Daily number of page views of the Bathymetry narrative has decreased somewhat from around 200 to 160. This is the static content. Unfortunately, we cannot see how the bathymetry map layers and products are visited
5.2 Quarterly total number of visitors, page views, unique page views and percentage of returning visitors	Europa Analytics	The quartely numbers are reasonable as the bathymety narrative is a static story. See the earlier remark under 5.1.These numbers are much lower than previously as thematic portal. Moreover, there is a small decrease in all numbers compared to the previous quarter.

The monitoring numbers reported as part of the progress monitoring of EMODnet performance are collected through Europa Analytics, unless reported otherwise.

5. Annex 1: Deliverable D2.1