



## EMODnet Thematic Lot n° 1- Geology

EMODnet Phase III - Trimonthly Report

Reporting Period: 01/07/2017 – 30/09/2017

Date: 13/10/2017

EASME/EMFF/2016/1.3.1.2 - Lot 1/SI2.750862

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# 1. Highlights in this reporting period

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*Provide a short summary of the key achievements and/or events of interest to a wider audience within this reporting period you wish to highlight – this can be based on the indicators or any other of the reporting sections.*

*[Provide a bullet list - maximum 5 bullets]*

- Data harmonization and product design overall is in good progress.
- Guidelines: Except for the new work package 8, the guidelines of the work of the different work packages were updated and distributed to partners by end of September 2017. WP5 will revise the guidelines with coastal resilience during next quarter. WP8 will have their guidelines (which already were agreed upon during a workshop in June) drafted and distributed during the last quarter of the first project year. For this, a workshop will be arranged on 31.1-1.2. 2018 in Crete.
- WP5 - Coastal behaviour has finalized agreement with TNO subcontractor Delft University of Technology for their supply of a full-coverage pan-European coastline-migration analysis based on legacy and modern satellite data covering a 30-year monitoring period, which will be validated with EMODnet-delivered field data.
- WP8 – Submerged landscapes is in good progress with data identification and compilation in all pilot study areas, this was further discussed with all consortium members at the 2<sup>nd</sup> project meeting in Rome on 27.9.2017 during the WP8 workshop.

## 2. Meetings held since last report

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*All the following meetings were organized by the project, except for the Steering Committee Meeting:*

Date	Location	Topic	Short Description
13-15. September 2017	Spazio Europa, Rome	EMODnet 8th Steering Committee meeting	Steering Committee meeting
25. September 2017	Sapienza University, Rome	WP4 workshop	Geomorphology harmonization issues and plans for next 6 months
26-28. September 2017	Sapienza University, Rome	EMODnet Geology, second project meeting	Project meeting discussing progress and future actions
27. September	Sapienza University, Rome	WP8 workshop	Workshop on submerged landscapes issues and plans for next 6 months
27. September	Sapienza University, Rome	Adriatic subgroup meeting	Editing of a harmonized map of solid geology for the Adriatic Sea

### 3. Work package updates

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*Activities that occurred since the last trimonthly report.*

#### ***WP1. Project Management***

The first trimonthly report, which was submitted to EASME, the Secretariat and DG MARE on July 14<sup>th</sup> was accepted on 17<sup>th</sup> August.

The Project Co-ordinator attended the 8<sup>th</sup> EMODnet Steering Committee meeting in Rome on 13-15 September 2017.

The coordination organized the second EMODnet 3 Geology Steering Group meeting in Rome, Italy on 26 September 2017, before the second project meeting, which was held in Rome at University of Sapienza on 26-28 September 2017. During the project meeting, all partners and subcontractors reported progress of the project since the kick-off meeting and the actions of the different WP: s. Time schedules for all future project actions were decided upon, and the time and location of next project meeting was decided to last week of March 2018 in Montenegro.

#### ***WP2. Geological data specification and sourcing (Geological Survey of Finland - GTK)***

This work package was completed according to the project plan and the GANNT chart by month 3. Thus all available data is catalogued and available for the project. Although WP2 officially ended after 3 months of the project start, the process of identifying information that can be used in the EMODnet-Geology is ongoing and will continue until the end of the project. This specifically applies to our new work package, WP8 - submerged landscapes.

#### ***WP3. Sea-bed substrate (Geological Survey of Finland - GTK)***

WP3 Seabed substrate harmonization guidelines were produced and delivered to the Partners (by WP3 leaders) in September 2017. The guidelines are also available from the EMODnet 3 Geology website.

Partners have started data harmonization for WP3 deliverables.

WP3 seabed substrate User Case: EMODnet 3 Geology WP3 product, seabed substrate map/data product was used in a scientific study that was published online in Geomorphology Journal in July 2017.

Kaskela & Kotilainen, 2017. Seabed geodiversity in a glaciated shelf area, the Baltic Sea. *Geomorphology* 295, 419–435.

Permission to publish Finnish Marine Geological data at a scale of 1: 100000 was received from the Finnish Defense Forces Headquarters in September 2017.

WP3 plans and activities were presented to partners in the EMODnet 3 Geology Workshop meeting in Rome, 25-28th September 2017.

***WP4. Sea-floor geology. (Bundesanstalt für Geowissenschaften und Rohstoffe – the Federal Institute for Geosciences and Natural Resources, Germany - BGR).***

WP4 –Guidelines for the Quaternary, pre-Quaternary updated, with additional guidance on the new geomorphology layers provided to all participants

Vocabulary for all three themes provided to all participants

WP 4 Harmonization workshop in Rome on 24th September successfully realized, with 24 participants and excellent contributions

Synergies: WP 4 lead attended WP 8 Workshop (26th September) WP8 and many WP 8 participants leader attended WP 4 Harmonization Workshop

New vector and raster data received for the geomorphology and Quaternary theme layers (see chapter 7)

***WP5. Coastal behaviour (Geological Survey of the Netherlands – TNO)***

Finalized agreement with TNO subcontractor Delft University of Technology for their supply of a full-coverage pan-European coastline-migration analysis based on legacy and modern satellite data covering a 30-year monitoring period, which will be validated with EMODnet-delivered field data.

Reviewed the newly released BGS Coastal Vulnerability Dataset, which is the starting point for a broader coastal-vulnerability assessment for the Atlantic Region (case study)

Published separate erosion, accretion and stability WMS output for new portal, using data from EMODnet 2; these supplement the coastline-migration WMS merging erosion, accretion and stability coastlines

Draft update of WP5 Guideline for partners

Communicated with partners about format mismatches between source data and EMODnet requirement.

### ***WP6. Geological events and probabilities (Istituto Superiore per la Protezione e la Ricerca Ambientale -ISPRA)***

An enquiry was carried out regarding definitions of “geological events probabilities” in the literature, asking Partners to seek for them within their mother tongue publications.

The discussion led to the definition of “Probability” as “Susceptibility” in agreement with INSPIRE data specification on Natural Risk Zone. The probability of a natural hazard is defined by the concept “likelihood of occurrence” which can be expressed either quantitatively or qualitatively. In order to model the quantitative likelihood “which is either a probability of occurrence or a return period” very detailed and complete data are needed. The qualitative likelihood (also known as susceptibility) is defined as a descriptive assessment of the likelihood of occurrence of a hazard event.

Assessment of probabilities relies on many different parameters including geomorphological elements. A slope gradient map of European Seas was elaborated as a first step in this process.

In the present phase of the Project, earthquakes will be included among the products to be delivered, whereas in the previous phase it had been agreed to rely on the EMSC website. The possibility to obtain data from the EMSC database is being explored.

Connections among different WPs have also been highlighted in particular regarding WP5 Coastal behavior in relation to events occurring along the coastline.

### ***WP7. Minerals (The Geological Survey of Ireland - GSI)***

For EMODnet Geology WP7, the spatial extent of known geological occurrences comprising 11 different types of marine minerals will be mapped regardless of whether resource estimations have been recorded. Where information on the economic feasibility of known deposits is available, this information will be included in the comprehensive attribute table associated with each mineral type shapefile, with a view to making these data and information visibly available via the open source web portal in the future.

All partners are tasked with mapping marine geological knowledge by collating information from all available sources.

Sub-classifications will be mapped for Aggregates and Hydrocarbons.

Digital Object Identifier and Creative Commons licenses are to be assigned to the first iteration of data that will be published for EMODnet III Geology in the new year. If all partners agree. Partners have been tasked to let us know if there is a problem before the end of the year.

For this phase, additional minerals information data related to the marine mineral types include: pegmatite, metal-rich sediment, coal, shale.

The WP updates, new or additional data requests were presented to all partners at the second project meeting, with WP information, data descriptions, requests, timelines and plans for dissemination.

All project partners are actioned to locate new information on marine minerals, not yet submitted to the project; and to consider ways of filling out missing information in the data attribution tables.

Partners will QC the data provided so far and provide the first iteration of updates before the new year.

### ***WP8. Submerged landscapes (NERC-British Geological Survey - BGS)***

Data identification and compilation is proceeding in all the pilot areas:

- UK Shelf (drainage/coastlines/palaeo environments) datasets identified, the results of the regional UK BRITICE project were published in August, the project focuses on the last ice age limits and contains a GIS of the data, so very useful for WP8;
- Baltic (Coastlines/palaeo environments/Holocene thickness), new work on testing landscape features and compilation of archaeological features;
- Aegean (Palaeoshorelines/drainage/lakes/springs/karst), progress on palaeogeographic reconstruction and mapping palaeshorelines, late glacial lakes, palaeorivers and karst features, GIS database of Greek archaeology compiled;
- Tyrrhenian Sea (Holocene thickness/drainage/coastlines/karstified limestone), progress on mapping palaeorivers and lakes;
- Ireland, (Karst/drainage), progress on data identification, researchers working in this area and palaeorivers.
- In the Sea of Marmara, our Turkish partners had made progress in identifying submerged shorelines and made archaeological discoveries south of Istanbul during tunnel construction.

At the 2nd Project meeting in Rome, there was a plenary breakout session on WP8 during which the latest progress was reported and a very useful exchange with other WP leaders on data acquisition procedures and how harmonization may be organized in the very different postglacial areas of WP8 on the European shelf.



## ***WP9. Data management, web portal and services (Geological Survey of Denmark and Greenland - GEUS)***

Update on data management, web portal and services:

- New Intranet site with file sharing made available for partners.
- Product download with questionnaire and statistics.
- All products available as download\*, WMS, Web GIS (one download package pending).
- “Borings” index schema version 1.0.1 ready (in corporation with EGDI and EPOS projects).
- “Multibeam and seismic surveys” index schema version 0.1 ready.

## ***WP10. Dissemination (Geological Survey of Finland - GTK)***

During the first Steering Group meeting, it was emphasized that there is a need for a visually impressive EMODnet Geology poster /poster layout, which partners could use if they want to present the EMODnet Geology project in meetings and conferences. To advance this issued, the project leader was asked to contact the EMODnet Secretariat for EMODnet poster layout request, as it would be good if there would be a “standard layout” for posters for all EMODnet lots. This was done by the coordinator, and the new visual guidelines presented by Trust-IT, and the Secretariat is a good step in the right direction. The geology lot would very much appreciate to get a poster template, which could be used for dissemination at various conferences, scientific meetings and public events.

The new visual guidelines were very actively discussed at the second project meeting in Rome on 28<sup>th</sup> September. The consortium appreciated the work that had been done with the visual guidelines, but wished to change the colour, payoff and visual drafted in the guidelines. The colour will be a brownish yellow, which better resembles a typical seabed substrate. The visual was slightly changed, such that it includes a fault, which gives it a geological touch. The payoff of geology will be “Discover Europe’s seabed geology”.

The EMODnet Annual Report 2016 was distributed to the whole consortium during the project meeting in Rome on 26-28.9 and the coordination reminded the partners of the importance of good use cases for dissemination purposes, to be submitted to coordinator and further to the Secretariat.

## ***WP11. EMODnet collaboration (Geological Survey of Finland - GTK)***

The EMODnet Geology lot is actively communicating with other EMODnet lots, especially the Seabed Habitats lot, the Human Activities lot, the Data Ingestion project as well as the High Resolution Seabed mapping Project, with which cooperation plans have been drafted, agreed upon, and last time discussed at the 8th EMODnet Steering Committee meeting in Rome on 13-15.9.2017. The three regional sea conventions (RSC’s) have been officially invited to our two project meetings. The RSC’s

haven't responded to the invitations so far, and the EMODnet geology lot is now planning to pay a visit to HELCOM, and in case that shows out to be successful, visits to other RSC's will be on the list for last quarter of this first year of the project or the first quarter of the second year. Partners who are members in the EMODnet Seabed habitats lot and the High Resolution Seabed mapping project have participated in project meetings of the different lots and information has thus been exchanged between the EMODnet lots.

International collaboration or outreach in international seabed mapping "standards" has been an important issue of cooperation. Session proposals on this topic were by project partners submitted to three different important scientific meetings, and all of them were approved: The AGU 2017 Fall Meeting will take place in New Orleans, Louisiana. 11-15. December 2017; The 2018 Ocean Science meeting, 11-16. February, Portland, Oregon, and the "Marine geoscience and geospatial data crossing borders" as well as the "From Continental Shelf to Slope – Mapping the Oceanic Realm" to the IUGS Resources for Future Generations Conference to be held on June 16-21, 2018 in Vancouver, BC, Canada. The EMODnet approach will be marketed also at the GeoHab 2018 meeting, Santa Barbara, California, 7-11.5.2018. The EMODnet geology meeting in Rome, was also attended by YY from Geoscience Australia, who was invited by the coordination. Dr. Y presented the Australian approach of seafloor mapping. The Australians are drafting their own seafloor-mapping program and interested in the European approach of data collection and dissemination of results for the society.

## ***WP12. Project analysis and sustainability (Geological Survey of Finland - GTK and Geological Survey of Denmark and Greenland - GEUS)***

During the kick-off meeting it was agreed upon that the objective of WP12 is to analyse each phase of the project and to provide a report of the lessons learned. This includes the analysis of the main barriers to the provision of data by data holders, the challenges related to rendering the interoperable data and the challenges related to producing contiguous data over the maritime basins. The progress and possible barriers will be monitored during the execution of the project and proposals of steps that can be improved in possible later EMODnet phases will be provided in co-operation with other WPs. To ensure the sustainability of the EMODnet Geology project, EGDI provides an appropriate platform for developing a long-term infrastructure. Priorities and effort required for improving the accuracy, precision and coverage of data and products will be considered, and the chosen portal technology will be reviewed. Full assessment of project implementation and recommendations for future steps provide an outcome that can assist the EC in developing its maritime strategy.

## 4. Specific challenges or difficulties encountered during the reporting period

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*Specific problems encountered during this period, including related to technical and data provision issues*

- WP4: Seafloor geology:
  - Subcontract was signed late, so additional staff is expected to be employed by December 2017.
  
- WP5: Coastal behavior:
  - Much of the WP5 information that will be provided by partners as part of the current EMODnet phase will be more difficult to incorporate into the existing data product than previously provided information. Typically, it is in formats such as polygons that need to be projected onto polylines portraying the coastline at the time of measurement.
  - A second challenge is the fact that the coastline changes constantly, not just through erosion or accretion, but also because of tidal influence or wave setup affecting the water level. To provide a measure of this latter influence, we will test if satellite data can be used to determine the present-day low- and high-tide lines, providing a coastline range rather than a precise coastline position. The coastline range could then be considered as a measure of accuracy for individual measurements: the larger the range, the lower the accuracy of a data point.
  
- WP6: Geological events and probabilities:
  - Data collected in EMODNET will not allow assessing a quantitative likelihood of occurrence, whereas a qualitative assessment might be possible. However, no well-known models exist to assess the susceptibility of all marine geological events. Extensive literature research and experimentation is needed to elaborate susceptibility maps in European seas.
  
- WP7: Minerals:
  - Creating style files for new mineral types; there is no existing standard. The INSPIRE guidelines were used to inform the solution
  - We will need to devise a way to visualize subclassification where assigned to mineral types: Aggregates and Hydrocarbons
  - We will need to devise a way to visualize quantity and quality of data where information is provided as well as resource/reserve and resource potential or such economic definitions

- WP9: Data management – web portal:
  - Data owners found it difficult to comprehend the entity index concept. In addition, the drafted exchange format (WFS) raised concern if data owners would be able to setup online services complying with both OGC standards and INSPIRE directives. To make sure we are gaining access to as much content as possible, we are now working on a “maturity ladder” for data owners allowing them to initially share entity indexes with simpler techniques and requirements. Then later, they can improve the setup with the assistance from other partners.
  - Data management in EMODnet Geology involves a wide variety of technologies and components. The complexity puts high demand on all participants. To decrease the workload, we are joining forces with EGDI (functionality), EPOS (schema definitions and data harvesting), and the EMODnet main portal (social platforms and user experience/statistics).
  
- WP10: Dissemination:
  - Due to organizational changes in the communications team of the responsible partner GTK dissemination issues have been delayed, but will be updated during the next quarter.

## 5. User Feedback

Date	Name	Organization	Type of user feedback (e.g. technical, case study etc)	Response time to address user request
11.07.2017	*****	*****	Support: "Problems with access to seabed substrate data"	Resolved by GTK immediately
23.08.2017	*****	*****	Question: "Acknowledgement/citation of EMODnet geology project"	GTK answered immediately
31.08.2017	*****	*****	Question: "EUNIS sensitivity"	Forwarded to EMODnet Biology.
29.9.2017	*****	*****	WP 4 EMODnet Habitat lot : Interest in WP 4 Geology Lot, geomorphology – Offer to provide list of attributes of interest	A week-end

The Geological Survey of Spain recently presented a paper at the Underwater Mining Meeting 2017 called: First map and catalog of submarine mineral deposits from Spain; EMODnet-Geology project. Communication with the lead author, XX has revealed he has found the WP7 framework a useful baseline data set that the Spanish survey will develop further to highlight occurrences of marine minerals and energy resources.

Following publications from BBC, Forbs and many Spanish national publications, with contrasting information about an exploration cruise that discovered and studied cobalt rich ferromanganese crust on a seamount close to the Canary Islands; the Survey were accused of hiding information relating to marine minerals from the public. The Spanish survey used the EMODnet Geology project, viewer, and open source minerals dataset as proof that the national geoscience agency does not hide information on marine minerals from the public.

## 6. Outreach and communication activities

Date	Media	Title	Short description and/or link to the activity
29.9.2017	<i>Eurogeosurveys, Marine Geology Expert Group Annual Meeting</i>	<i>*****; EMODnet Geology</i>	<i>Presentation of EMODnet geology to the network</i>
29.9.2017	<i>BGR Newsletter</i>	<i>Geoinformationen: Teilnehmer Arbeitspaket EU-Projekt zu Meeresdaten</i>	<i>A short article in the BGR Newsletter (4/2017) announcing that BGR is participating in the EMODnet project <a href="https://www.bgr.bund.de/SharedDocs/Newsletter/DE/2017/newsletter-2017-04.html?view=renderNewsletterHtml&amp;nn=1544598">https://www.bgr.bund.de/SharedDocs/Newsletter/DE/2017/newsletter-2017-04.html?view=renderNewsletterHtml&amp;nn=1544598</a></i>
4-6.9.2017	<i>Italian Volcanology Association Congress Pisa, Italy.</i>	<i>Geosciences: a tool in a changing world.</i>	<i>Map of submerged volcanic structures in Italy  Presentation of EMODnet Geology products at the Italian Volcanology Association Congress</i>
29.9.2017	<i>European Researchers Night</i>	<i>Relief model of submerged volcanic structures in Italy</i>	<i>European dissemination project: research meets society</i>
12-15. 9. 2017	<i>RAO/CIS Offshore 2017, St. Petersburg</i>	<i>“Role of EMODnet”</i>	<i>Round table in the frame of 13-th International Conference and Exhibition on Oil and Gas Recourses Exploration in Russian Arctic and continental Shelf of CIS</i>
24-29. 9. 2017	<i>46th Underwater Mining Conference, Berlin, Germany</i>	<i>First map and catalogue of submarine mineral deposits from Spain: EMODnet-Geology project</i>	<i>Economical, Technological and Environmental Aspects: Cooperative Solutions for Future Deep-sea Mining UMC 2017 · Federation of German Industries (BDI)</i>
8-17. 9. 2017	<i>82nd Thessaloniki International Fair</i>	<i>“IGME: The Hellenic state’s advisor on geoscientific issues”</i>	<i>Presentation of EMODnet as a part of a slideshow in Greek at the International exhibition</i>

## 7. Updates on Progress Indicators

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### ***Indicator 1 - Volume of data made available through the portal***

- Seabed Substrates: Four layers totalling 106.499 features
- Sea-floor Geology: One layer (four variations) totalling 7.754 features
- Coastal behaviour: Two layers totalling 137.679 features
- Events & Probabilities: 12 layers totalling 10.155 features
- Mineral occurrences: 14 layers totalling 12.199 features

### ***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)***

In the EMODnet – Geology technical tender chapter 5 members of the consortium have listed all the primary data, which is been made available for the EMODnet project. The table was, updated during the three first months of the project. Additionally one of the six members of the consortium, that are not data suppliers to the EMODnet project, but will work on interpretations of coastal and marine data, mainly the submerged landscapes topic, has already promised to make available marine data for EMODnet - geology.

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

- SeaDataNet has expressed willingness to give WFS access to their borehole and geophysics indexes but until now has only granted point search access via WMS requests. Reason unknown.
- In June talks, EMODnet Human Activities expressed willingness to harvest more attributes for their hydrocarbon boreholes (e.g. link to contact/download). A new harvesting is pending.

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

- Coastal Behaviour: 43 MB zip
- Events & Probabilities: 77 MB zip
- Minerals: 21 MB zip
- Substrate map: 88 MB + 132 MB zip

### ***Indicator 5 - Organisations that have downloaded each data type***

- 2017.08.16 Coastal Behaviour by \*\*\*\*\*
- 2017.08.18 Coastal Behaviour by \*\*\*\*\*
- 2017.08.18 Events & Probabilities by \*\*\*\*\*
- 2017.08.18 Minerals by \*\*\*\*\*
- 2017.08.24 Coastal Behaviour by \*\*\*\*\*
- 2017.09.04 Minerals by \*\*\*\*\*
- 2017.09.05 Events & Probabilities \*\*\*\*\*
- 2017.09.12 Events & Probabilities \*\*\*\*\*
- 2017.09.18 Coastal Behaviour \*\*\*\*\*
- 2017.09.19 Coastal Behaviour \*\*\*\*\*
- 2017.09.19 Events & Probabilities \*\*\*\*\*
- 2017.09.23 Events & Probabilities \*\*\*\*\*
- 2017.09.25 Minerals \*\*\*\*\*
- 2017.09.19 Coastal Behaviour \*\*\*\*\*
- 2017.09.19 Coastal Behaviour \*\*\*\*\*
- 2017.09.19 Coastal Behaviour \*\*\*\*\*
- Substrate Map was moved to portal on September 25th. Previous statistics from 2017:  
University of California, Berkeley, USA; the Thuenen-Institute, Hamburg, Germany;  
Liikennevirasto, Finland; Bangor University, Maine, USA; CEFAS, UK; Basque Centre for Climate  
Change, Spain; TU Delft, The Netherlands; Individual, Hamburg, Germany.



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

- Not yet implemented. Will be available for next report.

***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.)***

- Not known. We only ask for name and organisation. We plan to add this to the download request questionnaire.

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

- A WMS exists for each data product.
- Access is anonymous (IP only), so organisations connected are unknown, unless we do look-up for each IP-address. We know only of EMODnet main portal using our service.
- We plan to extend with WFS services this quarter.

***Indicator 11.***

July 2017	Geomorphology	Kaskela, A. & Kotilainen, A. Seabed geodiversity in a glaciated shelf area, the Baltic Sea.	Peer reviewed scientific article on geodiversity in Geomorphology 295, 419–435.
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***Annex X***

*List in annex if you wish to provide any additional information*